RECLAMATION

Managing Water in the West

Westlands Water District

Mendota Pool Group 20-Year Exchange Program

Draft Environmental Impact Statement/ Environmental Impact Report

State Clearinghouse # 2013041028

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Estimated Lead Agency Total Costs Associated with Developing and Producing this EIS/EIR

$2,115,000

U.S. Department of the Interior
Bureau of Reclamation

Westlands Water District
3130 N. Fresno Street
Fresno, CA 93703

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Mission Statements

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

The mission of Westlands Water District is to provide timely, reliable, and affordable water services, including the sustainable management and delivery of water supply to landowners and water users in western Fresno and Kings County.

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Mendota Pool Group 20-Year Exchange Program
Draft Environmental Impact Statement/Environmental Impact Report

NEPA Lead Agency: United States Department of the Interior, Bureau of Reclamation, Mid-Pacific Region, South-Central California Area Office
CEQA Lead Agency: Westlands Water District

The United States Department of the Interior, Bureau of Reclamation (Reclamation) and the Westlands Water District (Westlands) have jointly prepared this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Mendota Pool Group (MPG) 20-Year Exchange Program (Proposed Action).

The EIS/EIR evaluates the proposed exchange of up to 25,000 acre-feet of water per year (AFY) through a series of exchange agreements over a 20-year period between Reclamation and the MPG as authorized by Section 14 of the Reclamation Project Act of 1939 (53 Stat. 1197; 43 U.S.C., subsection 389) and the Warren Act of 1911 (36 STAT.925; 43 U.S.C., subsection 523), and 34 U.S.C. §3408(d). The need for the proposed Exchange Agreements is to supplement Westlands CVP water deliveries and conservation practices with affordable, reliable, and good quality irrigation water delivered via the San Luis Canal to maintain production by the MPG on historically irrigated lands in Westlands. The MPG proposes to pump non-CVP groundwater into the Mendota Pool in exchange for CVP water, which would otherwise be delivered to the Mendota Pool.

The Proposed Action (Alternative 1) is the continuation of a groundwater exchange program that first began in 1989 and was modified in 2005. The Proposed Action includes design constraints, a monitoring and reporting program, groundwater recharge components, and an adaptive management approach. Alternative 2 is also considered, which includes all the components of Alternative 1 plus construction of an 85-acre groundwater recharge facility. A No Action alternative is considered where a series of exchange agreements would not be issued, and MPG would either pump 25,000 AFY of groundwater in Westlands or fallow/idle farmland in Westlands. Six primary resource areas are evaluated: groundwater levels, groundwater quality, surface water quality, sediment quality, land subsidence, and biological resources. Ten other resource areas are also evaluated. The Proposed Action would have less-than-significant effects on all resource areas with the implementation of mitigation measures for archeological, cultural, and paleontological resources. Alternative 2 would have less-than significant effects on all resource areas with the implementation of mitigation measures for biological resources and archeological, cultural, and paleontological resources. The No Action Alternative may result in the fallowing/idling of important farmland, and/or could affect subsidence in Westlands.

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Executive Summary

ES-1 INTRODUCTION

This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) has been prepared pursuant to the requirements of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) for the proposed approval of the Mendota Pool Group's (MPG) 20 Year groundwater exchange program (Proposed Exchange Agreements). Because the Central Valley Project (CVP) is administered by the Bureau of Reclamation (Reclamation) and the exchange of groundwater for CVP water constitutes a Federal discretionary action that requires review under NEPA, Reclamation is acting as the Federal Lead Agency for this EIS/EIR pursuant to NEPA.

Reclamation and the Westlands Water District (Westlands), the Lead Agency under CEQA, are considering approval of the MPG's Proposed Exchange Program. The Exchange Program is based on a previously approved 10 Year Exchange Program, that was subject to a 2004 Final EIS, Settlement Agreements, and subsequent 3-year and 1-year extensions (hereafter referred to as the Existing Exchange Agreements). Under the Proposed Action, Reclamation would issue a series of exchange agreements over a period of 20 years to allow up to 25,000 acre-feet of water per year (AFY) to be exchanged and/or conveyed and stored within federal facilities. This exchange would allow the delivery of CVP water that would otherwise be delivered to the Mendota Pool via the Delta-Mendota Canal (DMC) to MPG farmlands in Westlands via the San Luis Canal (SLC). In exchange, MPG would introduce an equivalent amount of groundwater to the Mendota Pool (plus a 5 percent "leave-in" quantity of water) that would be used by Reclamation to meet existing CVP contractual demands. The exchange of water would be subject to management mechanisms (design constraints) that were implemented under the Existing Exchange Agreements, and further revised under the Proposed Action.

The EIS/EIR includes analysis of two Action alternatives that would involve the exchange of CVP water and utilize CVP infrastructure for conveyance and storage over a 20-year period. Both alternatives include recharge components using existing infrastructure, while one of the alternatives proposes to construct additional groundwater recharge facilities on MPG farmlands. Based on information provided in the Draft EIS/EIR and during public review, Reclamation and Westlands will identify the environmentally preferred alternative in the Final EIS/EIR.

The EIS/EIR assesses potential environmental effects of a No Action Alternative, the Proposed Action (Alternative 1), and one alternative to the Proposed Action (Alternative 2) on 14 resource areas: groundwater levels; groundwater quality; surface water quality; biological resources; sediment quality; land subsidence land use and agricultural resources; noise; traffic; air quality; climate change and greenhouse gas (GHG) emissions; CVP operations; environmental justice and socioeconomics; and archaeological, cultural, and paleontological resources.

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No Action Alternative

Under the No Action Alternative, Reclamation would not issue a series of exchange agreements over a 20-year period with MPG. Reclamation would continue to provide contractually obligated CVP water to Westlands and to its contractors around the Mendota Pool. However, MPG would discontinue their association, and up to 25,000 AFY of groundwater exchanged for Delta water delivered via the CVP would no longer be available to farmers with lands in Westlands. The management strategies (design constraints) included under the Existing Exchange Agreements that limit and monitor groundwater pumping by MPG members would also no longer be implemented by the former members of MPG.

Under the No Action Alternative, it is estimated that approximately 33,395 AFY of groundwater pumping from MPG's Adjacent Overlying Lands would be needed to support the following actions within this area: (1) continued irrigation of existing cropland, (2) reactivation of fallowed farmland, and (3) continuation of crop conversion trends from row crops to permanent crops such as almonds and pistachios. Although 33,395 AFY is the average pumping quantity anticipated under the No Action Alternative, further restriction may be applied by the future management actions under the Sustainable Groundwater Management Act (SGMA).

To capture the range of potential environmental impacts, the No Action Alternative evaluates two scenarios that are considered the outer range of reasonably foreseeable responses by MPG farmers in Westlands. Ultimately, the response would likely fall within the range of these two scenarios, depending upon their particular circumstances and water availability for each farming season. Under both scenarios, MPG farmlands in Westlands would continue to rely on their existing CVP allocations. The first scenario assumes that MPG farmers in Westlands would adjust the use of their farmlands in the absence of exchange water, including changing agricultural practices, crop types, short-term fallowing or long-term retirement of farmland. The second scenario assumes that MPG farmers in Westlands maintain current crop production and type by meeting water supply demands by pumping up to 25,000 AFY of additional groundwater from within Westlands.

Proposed Action

Reclamation's proposed federal action is the exchange of up to 25,000 AFY of non-CVP groundwater introduced into the Mendota Pool by the MPG for CVP water delivered via the SLC as well as the potential storage and conveyance of non-CVP water within federal facilities facilitated by the exchange. MPG could pump a not-to-exceed total of 38,316 AFY, which includes up to 26,316 AFY for exchange (less 5 percent [1,316 AFY] required to remain in the Mendota Pool under MPG's Settlement Agreement No. 2 with the San Joaquin River Exchange Contractors Water Authority [Exchange Contractors]) and the remainder for Adjacent Overlying Use. In a year where 26,316 AFY was pumped for exchange, pumping for Adjacent Overlying Use would be limited to 12,000 AFY by MPG's Settlement Agreement No. 2 with the Exchange Contractors. Over the 20-year period of the Proposed Action, pumping for exchange would be capped at 421,053 AF, which equates to an annual pumping average of 21,053 AFY for exchange. Please refer to Section 1, *Introduction*, and Section 2, *Description of Alternatives*, for a detailed description of pumping and exchange limits.

The Proposed Action also incorporates design constraints, management actions, monitoring, and reporting requirements as well as a groundwater recharge component intended to replenish the

local groundwater basin through existing recharge facilities (Terra Linda Farms Recharge Canal and New Columbia Ranch Recharge Ponds).

Alternative 2

Similar to the Proposed Action, Alternative 2 would include a 20-Year MPG Exchange Program, but in addition to utilizing the existing Terra Linda Farms Recharge Canal and New Columbia Ranch Recharge Ponds for recharge, MPG would also construct and operate a groundwater recharge basin adjacent to the canal within Terra Linda Farms. The proposed recharge basin, referred to as the River Ranch Recharge Basin, would replenish underlying local groundwater aquifers during periods when water is available for recharge activities. The purpose of this alternative would be to offset drawdown of local groundwater aquifers over the 20-year duration of the exchange program with recharge activities and, in doing so, reduce the potential for undesirable effects such as groundwater level declines and migration of a naturally occurring saline groundwater front west of the Fresno Slough. The recharge basin under this alternative would function solely for the purpose of recharging the local groundwater aquifer and would not be used as a water bank (e.g., Meyer's Water Bank) wherein water is contractually recharged, banked and extracted for later use. Under this alternative, MPG would maximize recharge with the goal of achieving over 43,000 AF of recharge over the 20-year life of the exchange program using the River Ranch Recharge Basin, the Terra Linda Canal, and the New Columbia Ranch Recharge Ponds, dependent upon the availability of water supplies and capacity of recharge facilities.

ES-2 BACKGROUND

The Primary Study Area for this EIS/EIR comprises approximately 143 square miles (92,000 acres) in western Fresno and southwestern Madera Counties, and is contained within a four- to six-mile radius around the Mendota Pool and San Joaquin River. The Primary Study Area includes 7,542 acres of MPG-owned or operated farmland within the Farmers Water District (FWD) and areas surrounding Mendota Pool called Adjacent Overlying Lands. These lands have facilities to either withdraw water from, or discharge water to, the Mendota Pool for irrigation. The Secondary Study Area for this EIS/EIR encompasses approximately 1,836 square miles (1,174,825 acres) in Fresno and Madera Counties, and includes all MPG farmlands in Westlands that can receive irrigation water under the Proposed Action or Alternatives.

MPG was formed in 1989 with the overall purpose of providing an organization and framework to coordinate landowner responses to declining surface water supplies available to farms on the west side of California's Central Valley, and eventually, to improve coordination with Reclamation for exchange of water through the CVP from the Mendota Pool (or Pool) area to the west side of the Central Valley. In addition, MPG also has an agreement with Mr. Don Peracchi to coordinate his exchange pumping program, which is conducted with Reclamation and is similar to MPG's program. For the purposes of this document, all subsequent reference to MPG will include both formal MPG members as well as Mr. Peracchi. Together, MPG owns and/or operates approximately 49,860 acres of historically irrigated farmland that would be served by the Proposed Action or alternatives.

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MPG first started pumping groundwater for exchange in 1989 to make up for cutbacks in CVP water deliveries to contractors south of the Delta. These MPG groundwater pumping and exchange programs were developed through discussions between MPG, Reclamation, Exchange Contractors, local water districts, the Regional Water Quality Control Board, Fresno and Madera Counties, the City of Madera, United States Fish and Wildlife Service, California Department of Fish and Wildlife, and adjacent landowners from the early 1990s until DWR and Westlands prepared a Final EIR in 1998 to address potential environmental impacts of MPG's groundwater pumping and exchange program. Subsequent to certification of the 1998 Final EIR, a lawsuit was filed by the Exchange Contractors and the Newhall Land and Farming Company (Newhall) due to concerns regarding potential environmental impacts. In response, MPG, Exchange Contractors, and Newhall entered into a settlement agreement in January of 2001 to govern the pumping program (Settlement Agreement No. 1). This settlement set forth a 10-year program from 2001–2010 with groundwater pumping for exchange permitted in 8 of the 10 years for a cumulative total of up to 269,600 AF, as well as requiring monitoring and adaptive management actions be included in the Settlement Agreement. Upon the expiration of Settlement Agreement No. 1 in 2010, the agreement was extended by MPG, Exchange Contractors, and Paramount Farming Company (who had purchased Newhall) through a new agreement (Settlement Agreement No. 2) which expired in 2014. Since 2014, MPG has been operating under 1-year extensions of Settlement Agreement No. 2 to maintain operation of the exchange program until this EIS/EIR can be approved and certified.

In 2004, Reclamation completed a Final EIS and signed the Record of Decision in 2005 for the Mendota Pool 10-Year Exchange Agreements to satisfy the requirements under NEPA (hereafter referred to as the 2004 Final EIS). The 2004 Final EIS defined a 10-year Exchange Program that was based on Settlement Agreement No. 1, and also required implementation of a test pumping program, design constraints, a monitoring program, and an adaptive management approach to address concerns over groundwater levels and quality, surface water flow and quality, and land subsidence. Under the 2004 Final EIS, Reclamation issued annual exchange agreements with MPG, which allowed for the exchange of up to 25,000 AFY of water during normal and dry years (discussed in further detail below).

Following the expiration of the 10-Year Exchange Program analyzed in the 2004 Final EIS in 2015, Reclamation prepared Environmental Assessments (EAs) for a 3-year extension and a 1-year extension of the 10-Year Exchange Program through 2019. The current 1-year extension approved by Reclamation incorporates the same design constraints and pumping limits proposed in this EIS/EIR.

ES-3 PURPOSE AND NEED

All members of MPG own and/or operate farmland located in the western portion of the San Joaquin Valley, either along the San Luis Canal in Westlands, in the vicinity of the Mendota Pool, in FWD, or in surrounding areas. While farmlands in the FWD and in the vicinity of the Mendota Pool may rely on groundwater sources, the farmlands in Westlands rely predominately on CVP water deliveries via the San Luis Canal due to lack of any other available surface water supplies and restraints on groundwater use in this area. Specifically, a consistently reliable surface water supply is limited in the western portion of the San Joaquin Valley since regional

surface water supplies are located primarily to the north of the Delta and along the east side of the San Joaquin Valley, at the base of the Sierra Nevada Mountains. Inadequate infrastructure and supply prevent these sources from being delivered to the western side of the San Joaquin Valley. In addition, groundwater from the upper aquifer in the Westlands area has saline levels that make it unsuitable for irrigation. Moreover, the pumping of deeper, higher quality groundwater from the lower aquifer has historically resulted in significant land subsidence in this and other areas of the San Joaquin Valley. Westlands has taken steps to obtain additional sources of irrigation water and to implement water conservation practices (Westlands 2012).[1] However, farmers in Westlands need to supplement their CVP water deliveries and conservation practices with affordable, reliable, and good quality water in order to maintain production on historically irrigated lands.

The purpose of the Proposed Action is to ensure the continued availability of affordable, reliable, and good quality irrigation water. Implementation of the Proposed Action would not interfere with Reclamation's contractual obligations to other water rights' holders within the Mendota Pool area. The availability of irrigation water during the growing season (primarily April through October) is one of the most important factors in crop production. Inadequate water supplies and poor water quality reduce crop yields and crop quality, thereby reducing the agricultural productivity and economic viability of the affected farms. The Proposed Action and Alternative 2 would allow the continued exchange of water between Reclamation and MPG for a 20-year period.

The Proposed Action is needed to allow MPG to continue the exchanging water in order to maintain agricultural production on their lands in Westlands regardless of the reductions of CVP water supplies from the Delta. The exchange of up to 25,000 AFY would facilitate continued cultivation of approximately 42,316 acres of MPG-owned farmland in Westlands. The Proposed Action is not intended to increase the amount of water authorized for exchange for farming activities under previous Exchange Agreements or contractual limitations, but to continue to replace Delta water now allocated for other nonagricultural CVP purposes.

The Proposed Action would continue to enable the efficient delivery and transfer of water to facilitate environmental and economic benefits, while limiting future potentially adverse effects to groundwater levels and surface and groundwater quality in the Mendota Pool area. The Proposed Action also includes a recharge component that would enable use of excess flood waters and other identified supplies available during wet years to replenish the San Joaquin Valley Groundwater Basin by delivering such water to existing recharge basins at the New Colombia Ranch and allowing utilization of an existing recharge canal located on Terra Linda Farms. This would partially offset groundwater level decline associated with the Exchange Agreements. Alternative 2 would include all actions of the Proposed Action, but also develop an even more extensive groundwater recharge facility adjacent to the recharge canal located on Terra Linda Farms.

[1] Westlands has engaged in water marketing, conjunctive use, and purchases from the State Water Bank as new water sources.

ES-4 Partner Agency California Environmental Quality Act Objectives

As discussed above, this EIS/EIR is being prepared jointly by two partner agencies. Reclamation would serve as the Lead Agency under NEPA and Westlands would serve as the Lead Agency under California Environmental Quality Act (CEQA). Similar to the Purpose and Need required under NEPA, CEQA Section 15124(b) requires a project description to contain a statement of a project's objectives and that the statement of objectives includes the underlying purpose of the project. The overall objective of the Proposed Action and Alternative 2 is to enable MPG to maintain production on historically irrigated lands by issuing a series of exchange agreements with Reclamation over a period of 20 years, and thus obtain sufficient good quality and reliable water sources to offset reductions in CVP deliveries. The Proposed Action is not intended to increase the amount of water currently used for farming activities, but to continue to replace water allocated for other nonagricultural CVP purposes.

This EIS/EIR reviews the impacts of the Proposed Action, as well as a second alternative that could, "feasibly attain most of the project objectives" (CEQA Guidelines Section 15126.6[f]). The objectives of the Proposed Action are to:

- Maintain water supply reliability relative to water exports from the Delta;
- Deliver water to farms for an average cost that approximates the cost of contract water and does not exceed the costs of supplemental water on the open market;
- Maintain production on agricultural lands that have historically received CVP water and regularly produced agricultural commodities using this water; and
- Minimize impacts to surface water quality, groundwater levels and quality, land subsidence, and biological resources through incorporation of design constraints and management practices.

ES-5 Public and Agency Involvement

Prior to the preparation of this EIS/EIR, Reclamation published a Notice of Intent (NOI) of this document in the Federal Register on November 13, 2012. In addition, a notice was placed in the "Public Notices" section of the *Fresno Bee* (the local newspaper) summarizing the NOI and requesting input from the public. Reclamation held two public scoping meetings to solicit public comments on the EIS portion of the EIS/EIR. These two scoping meetings fulfilled the public scoping requirements of NEPA. The first public scoping meeting was held on November 27, 2012, in the City of Fresno, CA and the second public scoping meeting was held on December 10, 2012, in the City of Mendota, CA. A total of five persons spoke at the public scoping meetings. Public comments regarding the scope of environmental review for the Proposed Action were due by January 10, 2013. Two comment letters, one from the United States Environmental Protection Agency (EPA) and one from Friant Water Authority were received. Reclamation prepared a Scoping Report that summarizes the scoping process. The Scoping Report is included in Appendix A of this EIS/EIR.

Westlands, as the Lead Agency under CEQA, filed a Notice of Preparation (NOP) of the EIS/EIR with the Office of Planning and Research State Clearinghouse on April 8, 2013, and sent the NOP to responsible agencies and interested parties. The NOP comment period ran from April 9, 2013 through May 8, 2013. A total of six comment letters were received on the NOP (refer to Appendix B) and consisted of letters from the following: CDFW; the Native American Heritage Commission; Friant Water Authority; Madera Irrigation District; Madera County; and Wonderful Orchards.

Areas of concern identified in the response to the NOI and NOP include the impacts of continued groundwater withdrawal on San Joaquin River Restoration Program (SJRRP); impacts on the cost of groundwater to others; the impact on water quality and reliability to other users of, and in the vicinity of, the Mendota Pool; impacts to the Madera Subbasin; and that the continued transfer of water would impact the quality of surface water delivered to the Mendota Wildlife Area under CVP Improvement Act Level 2 and Level 4 water supplies, particularly the concentration of TDS.

ES-6 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This EIS/EIR assesses the Proposed Action and Alternatives for their potential adverse effects (i.e., environmental impacts) under both the NEPA and CEQA. CEQA requires that the impacts of a Proposed Action and its alternatives are identified in terms of their level of significance. To meet this requirement, there are specific "significance criteria" defined for each resource area, and each alternative is assessed for its impact relative to this criteria. This EIS/EIR uses the following terminology based on CEQA to denote the significance of each environmental effect (impact): significant and unavoidable, potentially significant, less than significant, no impact, and beneficial impact. For all impacts that could be identified as potentially significant, appropriate mitigation measures are identified to reduce the impacts.[2] NEPA does not require a determination for the level of significance. Mitigation measures set forth to mitigate potentially significant/adverse effects for NEPA will also address potentially significant impacts for CEQA.

Table ES-1 summarizes and discloses the potential environmental impacts of the Proposed Action and Alternatives, as well as mitigation measures that would apply to these alternatives. The impacts listed in the table are NEPA impacts as well as CEQA impacts, but they are judged for their level of significance only under CEQA. The table includes the significance determinations made pursuant to CEQA throughout the EIS/EIR, as well as the residual impacts after any proposed mitigation is applied.

[2] Potentially significant impacts for cumulative effects do not require mitigation; therefore, these impacts are not included in the table. Refer to the individual resource areas for a discussion of cumulative impacts.

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Table ES-1: Summary Comparison of Impacts of Alternatives and Mitigation Measures

Impact Statement		Level of Significance Before Mitigation			Mitigation Measures	Impact After Mitigation		
		No Project/ Action	Proposed Action	Alternative 2		No Project/ Action	Proposed Action	Alternative 2
Groundwater Levels								
GWL-1	Shallow Zone Groundwater Impacts in the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-2	Deep Zone Groundwater Level Impacts in the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-3	Groundwater Level Declines in the Lower Aquifer within the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-4	Changes to Groundwater Levels in Westlands	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
GWL-5	Induced Seepage of Surface Water from Groundwater Pumping	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-6	(Cumulative): Shallow Zone Groundwater Level Declines within the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-7	(Cumulative): Deep Zone Groundwater Level Declines within the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-8	(Cumulative): Lower Aquifer Groundwater Level Declines within the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWL-9	(Cumulative): Induced Seepage of Surface Water from Increased Groundwater Withdrawals	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Groundwater Quality								
GWQ-1	Migration of the Naturally-Occurring Saline Front in the Shallow Zone of the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWQ-2	Migration of the Naturally-Occurring Saline Front in the Deep Zone of the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWQ-3	Groundwater Quality Impacts in Westlands	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWQ-4	(Cumulative): Migration of the Naturally-Occurring Saline Front in the Shallow Zone of the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
GWQ-5	(Cumulative): Migration of the Naturally-Occurring Saline Front in the Deep Zone of the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Surface Water Quality								
SWQ-1	Effects of Water Quality in the Mendota Pool	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
SWQ-2	Effects on Water Quality in the Fresno Slough and MWA	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
SWQ-3	(Cumulative): Effects on Water Quality in the Mendota Pool	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
SWQ-4	(Cumulative): Effects on Water Quality in the Fresno Slough and MWA	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Biological Resources								
BIO-1	Effects on Freshwater Habitat and Aquatic Species in the San Joaquin River and Mendota Pool from MPG Groundwater Inputs	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
BIO-2	Effects on Freshwater Habitat and Aquatic Species in the Fresno Slough and MWA from MPG Groundwater Inputs	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
BIO-3	Renewed Farming of Currently Fallowed Agricultural Lands within the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
BIO-4	Habitat Modification from the Conversion of Irrigated Croplands to Fallowed or Idled Lands within the Secondary Study Area	LTS	NI	NI	No Mitigation Necessary	LTS	NI	NI
BIO-5	Effects on Biological Resources due to Construction of the River Ranch Recharge Basin	NI	NI	PS	MM BIO-5a: Pre-Construction Survey and Biological Monitoring MM BIO-5b: River Ranch Basin Maintenance	NI	NI	LTS
Sediment Quality								
SED-1	Sediment Quality Impacts associated with Delivery of Groundwater to the Mendota Pool	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
SED-2	Cumulative): Sediment Quality Impacts associated with Delivery of Groundwater to the Mendota Pool	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS

CEQA Impact:
B = Beneficial Impact NI = No Impact LTS = Less Than Significant Impact
PS = Potentially Significant Impact S&U = Significant and Unavoidable Impact
N/A = not applicable

Table ES-1: Summary Comparison of Impacts of Alternatives and Mitigation Measures (Continued)

Impact Statement		Level of Significance Before Mitigation			Mitigation Measures	Impact After Mitigation		
		No Project/ Action	Proposed Action	Alternative 2		No Project/ Action	Proposed Action	Alternative 2
Land Subsidence								
SUB-1	Subsidence in the Upper Aquifer of the Mendota Pool Area	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
SUB-2	Subsidence in the Lower Aquifer in the Mendota Pool Area	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
SUB-3	Subsidence in Westlands	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
SUB-4	Subsidence in Madera County	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
SUB-5	(Cumulative): Subsidence in the Upper Aquifer of the Mendota Pool Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Land Use and Agricultural Resources								
LU-1	Conversion of Important Farmland or Conflict with Williamson Act Contract	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
LU-2	Consistency with Applicable Zoning, General Plans, Policies, and Regulations	PS	LTS	LTS	No Mitigation Required	S&U	LTS	LTS
Noise								
NOI-1	Noise Impacts associated with Groundwater Pumping and Farming Activities in the Mendota Pool Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
NOI-2	Noise Impacts Associated with Alternative Land Uses and Operations in Westlands Water District	LTS	NI	NI	No Mitigation Necessary	LTS	NI	NI
NOI-3	Noise Impacts Related to Construction and Maintenance Events for the River Ranch Recharge Basin	NI	NI	LTS	No Mitigation Necessary	NI	NI	LTS
Traffic								
TR-1	Traffic in the Primary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
TR-2	Traffic in the Secondary Study Area	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Air Quality								
AQ-1	Fugitive Dust Emissions	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
AQ-2	Combustion Emissions	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
AQ-3	Objectionable Odors	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Climate Change/ Greenhouse Gases								
CC-1	Generation of Greenhouse Gases	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Environmental Justice and Socioeconomics								
EJS-1	Impacts on Environmental Justice from Agricultural Land Fallowing	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
EJS-2	Impacts on Socioeconomics from Agricultural Land Fallowing	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Water Conveyance Infrastructure and Central Valley Project Operations								
CVP-1	DMC and Mendota Pool Capacities and Flows to Existing Users	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
CVP-2	SLC and San Luis Reservoir Capacity and Flows to Existing Users	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
Archeological, Cultural, and Paleontological Resources								
CR-1	Effects on the Significance of a Historic Resource	LTS	LTS	LTS	No Mitigation Necessary	LTS	LTS	LTS
CR-2	Effects on an Archaeological Resources	LTS	LTS	PS	MM CR-1: Halt Construction and Evaluate Cultural Resource	LTS	LTS	LTS
CR-3	Effects on Unique Paleontological Resources	LTS	LTS	PS	MM CR-2: Halt Construction and Evaluate Paleontological Resource	LTS	LTS	LTS

CEQA Impact:
B = Beneficial Impact NI = No Impact LTS = Less Than Significant Impact
PS = Potentially Significant Impact S&U = Significant and Unavoidable Impact
N/A = not applicable

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Acronyms and Abbreviations

AB	Assembly Bill
AF	acre-feet
AFY	acre-feet per year
Air Basin	San Joaquin Valley Air Basin
AITS	Agricultural Industries Transportation Services
BAAQMD	Bay Area Air Quality Management District
BPS	Best Performance Standards
bgs	below ground surface
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CARB	California Air Resources Board
CCC	Columbia Canal Company
CCD	Census County Division
CCID	Central California Irrigation District
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CIP	Canal Integration Program
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent(s)
CRPR	California Rare Plant Rank
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Region Water Quality Control Board
Delta	Sacramento-San Joaquin River Delta
dB	decibel
dBA	A-weighted decibel
DMC	Delta-Mendota Canal

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DPS	Distinct Population Segment
DWR	California Department of Water Resources
EA	Environmental Assessment
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
Exchange Agreements	2005 Mendota Pool 10-year Exchange Agreements
Exchange Contractors	San Joaquin River Exchange Contractors Water Authority
FCOG	Fresno County of Governments
FCWD	Firebaugh Canal Water District
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Program
FONSI	Finding of No Significant Impact
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
FWD	Farmers Water District
GHG	greenhouse gas
GIS	Geographic Information System
Groundwater Basin	San Joaquin Valley Groundwater Basin
GSA	Groundwater Sustainable Agency
GSP	Groundwater Sustainability Plan
IPCC	Intergovernmental Panel on Climate Change
IRWMP	Integrated Regional Water Management Plan
L_{dn}	Day-Night Average Noise Level
Leq	equivalent energy noise level
LOS	Level of Service
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
mg/L	milligram(s) per liter
MOU	Memorandum of Understanding
MPG	Mendota Pool Group
msl	mean sea level
MT CO_2e	metric tons Carbon Dioxide Equivalents
MMT CO_2e	millions of metric tons Carbon Dioxide Equivalents

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MWA	Mendota Wildlife Area
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NCR	New Columbia Ranch
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
NO_x	nitrous oxides
NPDES	National Pollutant Discharge Elimination System
O_3	ozone
PBO	Plate Boundary Observatory
PEIS	Programmatic Environmental Impact Statement
$PM_{2.5}$	fine particulate matter
PM_{10}	respirable particulate matter
Reclamation	Bureau of Reclamation
ROD	Record of Decision
RTP	Regional Transportation Plan
SB	Senate Bill
SGMA	Sustainable Groundwater Management Act
SIP	State Implementation Plan
SJRRP	San Joaquin River Restoration Program
SJVAPCD	San Joaquin Valley Air Pollution Control District
SLC	San Luis Canal
SLCC	San Luis Canal Company
SLDMWA	San Luis and Delta-Mendota Water Authority
SO_2	sulfur dioxide
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminant
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineer

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USC	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
US Census Bureau	United States Census Bureau
WQO	Water Quality Objective
Westlands	Westlands Water District
VOC	volatile organic compound
µg/m^3	microgram(s) per cubic meter
µmhos	microhom(s)
µmhos/cm	micromhos per centimeter

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Glossary

A-Clay Layer: The clay layer that lies approximately 70 feet to 130 feet beneath the Mendota Pool and lands in the vicinity of the Mendota Pool and is about 10 to 15 feet thick. The A-clay layer lies between the Corcoran Clay layer and the surface, and divides the upper aquifer into the "shallow zone" (above the A-Clay layer) and the "deep zone" (below the A-Clay layer and above the Corcoran Clay layer).

Adjacent Overlying Lands: Farmland owned and operated by members of the MPG that are adjacent to the Mendota Pool and have facilities to draw from or deliver to the Mendota Pool (see Figure 2-6).

Adjacent Overlying Use: The use of groundwater on Adjacent Overlying Lands. Under the existing and proposed extension of the Exchange Agreements, the MPG is restricted to 14,000 AFY of Adjacent Overlying Use unless there is a corresponding reduction in exchange pumping.

Aquifer: A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant or economic quantities of groundwater to wells and springs.

Confined Aquifer: An aquifer that is bounded above and below by formations of distinctly lower permeability than that of the aquifer itself. An aquifer containing confined ground water.

Exchange: A contractual term referring to the trade of water in one location for an equivalent amount of water from some other source or location.

Fallow Lands: Agricultural lands that have been temporarily taken out of production (less than two years) and will be returned to production as part of normal crop rotation. Fallow lands are subject to weed control and disking, and can be brought back into production quickly.

Fresno Slough: The body of water that extends from the Mendota Pool south through the Mendota Wildlife Area for almost 15 miles. During flood events, the Fresno Slough connects the North Fork Kings River to the south with the Mendota Pool and San Joaquin River to the north, and acts as a tributary of the San Joaquin River.

Groundwater Basin: An alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and having a definable bottom.

Groundwater Pumping for Exchange: MPG pumps groundwater from existing wells into the Mendota Pool and exchanges water with Reclamation, or transfers water across Laterals

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6 & 7 and then exchanges with Westlands, in accordance with Settlement Agreement No.1, Settlement Agreement No. 2, and existing Exchange Agreements.

Groundwater Table: The upper surface of the zone of saturation in an unconfined aquifer.

Hydraulic Conductivity: A measure of the capacity for a rock or soil to transmit water; generally has the units of feet/day or cm/sec.

Idle Lands: Agricultural lands that have been removed from production for a period of greater than two years. Idle lands are not subjected to weed control. Idle lands would require substantial amendments to make them suitable for agriculture.

Mendota Pool: The small non-federal reservoir created by Mendota Dam at the confluence of the San Joaquin River and Fresno Sough.

Overdraft: The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions.

Permeability: The capability of soil or other geologic formations to transmit water. See hydraulic conductivity.

Recharge: Water added to an aquifer or the process of adding water to an aquifer. Ground water recharge occurs either naturally as the net gain from precipitation, or artificially as the result of human influence, such as putting surface water into dug or constructed spreading basins or injecting water through wells.

Retired Land: Agricultural lands that may no longer be irrigated by surface water or groundwater. Retired land may remain productive through dry-land farming practices, so long as the land is not irrigated.

Unconfined Aquifer: An aquifer which is not bounded on top. The upper surface of an unconfined aquifer is the groundwater table or water table.

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Section 1 Introduction

This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) has been prepared pursuant to the requirements of the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) for the proposed approval of the Mendota Pool Group's (MPG) 20-Year groundwater exchange program (Proposed Exchange Agreements). Because the Central Valley Project (CVP) is administered by the Bureau of Reclamation (Reclamation) and the exchange of groundwater for CVP water constitutes a Federal discretionary action that requires review under NEPA, Reclamation is acting as the Federal Lead Agency for this EIS/EIR pursuant to NEPA.

Reclamation and the Westlands Water District (Westlands), the Lead Agency under CEQA, are considering approval of the MPG's Proposed Exchange Program. The Exchange Program is based on a previously approved 10-Year Exchange Program, that was subject to a 2004 Final EIS, Settlement Agreements[3], and subsequent 3-year and 1-year extensions (hereafter referred to as the Existing Exchange Agreements). Under the Proposed Action, Reclamation would issue a series of exchange agreements over a period of 20 years to allow up to 25,000 acre-feet of water per year (AFY) to be exchanged and/or conveyed and stored within federal facilities. This exchange would allow the delivery of CVP water that would otherwise be delivered to the Mendota Pool via the Delta-Mendota Canal (DMC) to MPG farmlands in Westlands via the San Luis Canal (SLC). In exchange, MPG would introduce an equivalent amount of groundwater to the Mendota Pool (plus a 5 percent "leave-in" quantity of water) that would be used by Reclamation to meet existing CVP contractual demands. The exchange of water would be subject to management mechanisms (design constraints) that were implemented under the Existing Exchange Agreements, and further revised under the Proposed Action. MPG lands to be irrigated with the exchanged water are located in Westlands and the water would be conveyed using Westlands' facilities (Figure 1).

1.1 Overview

The MPG was formed in 1989 with the overall purpose of providing an organization and framework to coordinate landowner responses to declining surface water supplies available to farms on the west side of California's Central Valley and to improve coordination with Reclamation for exchange of water through the CVP from the Mendota Pool (or Pool) area to the west side of the Central Valley. MPG is an association comprised of 11 formal members, namely:

- Terra Linda Farms
- Vista Verde Farms
- Coelho West
- Meyers Farming Company
- Casaca Vineyards
- Daddy's Pride Farming
- Solo Mio Farms
- Baker Farming Co.

[3] See Section 1.1.3 for a description of the Settlement Agreements.

- Friedenbach/Turmon Farms (Panoche Creek Trust)
- Frank A. Logoluso Farms
- M. Britz TIC

In addition, MPG also has an agreement with Mr. Don Peracchi to coordinate his exchange pumping program, which is conducted with Reclamation and is similar to MPG's program. For the purposes of this EIS/EIR, all subsequent reference to MPG will include both formal MPG members as well as Mr. Peracchi. Together, MPG owns and/or operates approximately 49,860 acres of historically irrigated farmland that would be served by the Proposed Action within Westlands.

MPG farmers grow both permanent and annual crops, including alfalfa, almonds, cotton, grapes, pistachios, olives, palms, vineyards, and tomatoes. Some crops are flood irrigated, including alfalfa, while others are drip irrigated. MPG farms located within Westlands use groundwater and CVP deliveries from Reclamation for irrigation purposes, while MPG farms in the Mendota Pool area rely solely on groundwater for irrigation (referred to as Adjacent Pumping in Figure 2). MPG owns and/or operates 75 wells that are clustered primarily along the west side of the Fresno Slough, near the Mendota Pool and south of the San Joaquin River. Out of these wells, 46 draw from the shallow zone of the upper groundwater aquifer, 27 draw from the deep zone of the upper aquifer, and 2 composite wells draw from both the upper and lower aquifer.[4]

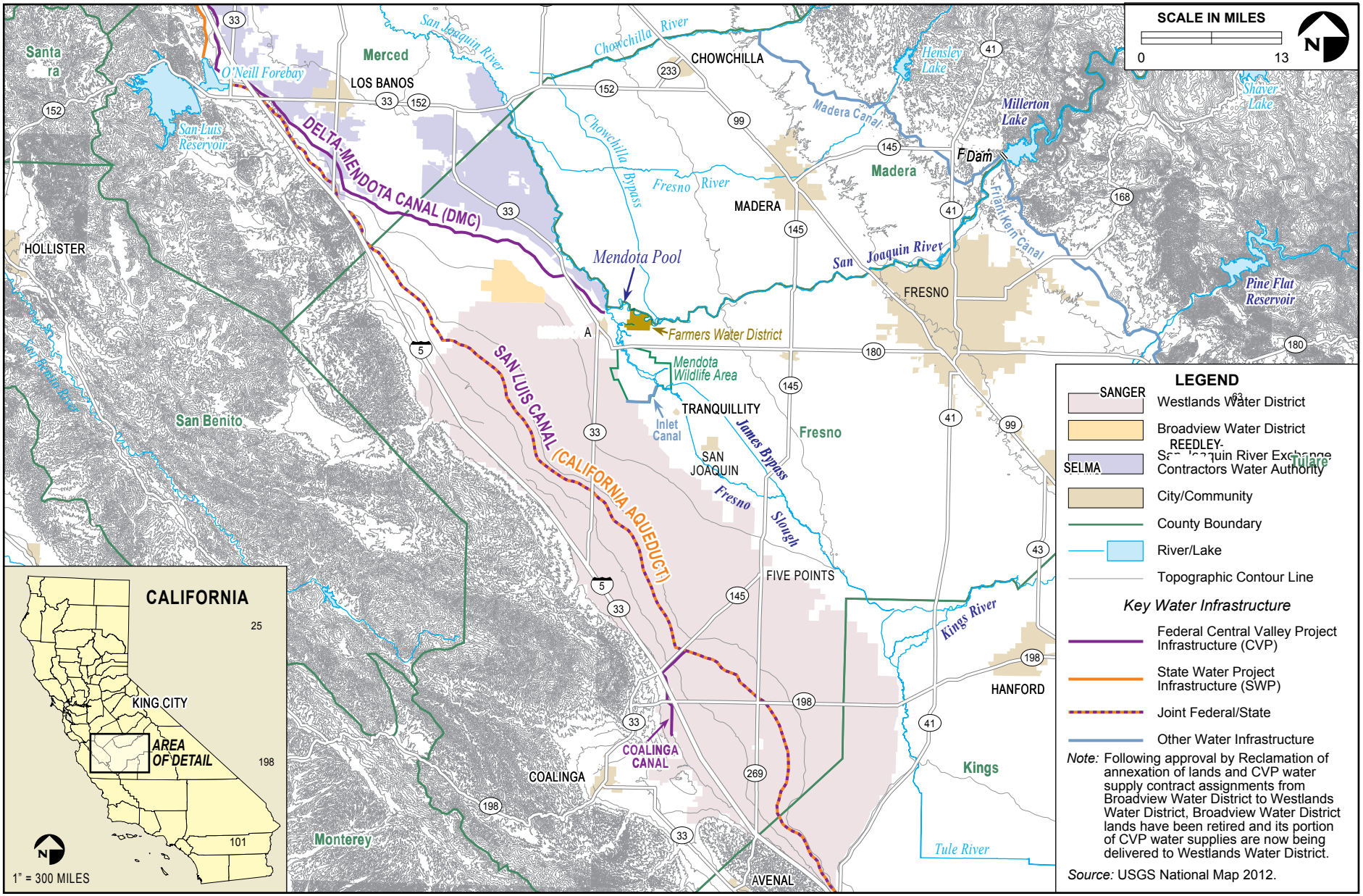
1.1.1 Surface Water Delivery Systems

The two CVP canals that are relevant to the Proposed Action are the SLC segment of the California Aqueduct and the DMC (Figure 1), located within the San Luis Unit and Delta Divisions of the CVP, respectively. Water from the Sacramento-San Joaquin River Delta (Delta) is transported to the San Joaquin Valley via the California Aqueduct and the DMC. The SLC segment of the California Aqueduct is jointly operated by Reclamation and the California Department of Water Resources (DWR). The California Aqueduct carries water from the Delta south approximately 60 miles to the O'Neill Forebay at the San Luis Reservoir. It continues south through the SLC, which flows for 100 miles from the O'Neill Forebay, through the San Luis unit and Westlands, to Kettleman City. In this segment of the SLC, the 11.6-mile Coalinga Canal, branches off to the southwest and then south to carry water to the Coalinga area; this canal is a Federal facility, but is operated by Westlands. After the SLC portion of the California Aqueduct, the aqueduct continues south to the San Fernando Valley.

The 117-mile long DMC also carries water from the Delta south through the Valley, terminating at the Mendota Pool. Water from the Delta is intercepted by a diversion channel and transported to the DMC. The DMC parallels the California Aqueduct to the San Luis Reservoir and conveys CVP water into the San Luis Reservoir via Check 13, a small mechanical dam used to divert water into the reservoir and creates the O'Neill Forebay. From Check 13, water can be diverted into the California Aqueduct/SLC to continue south to the west side of the Valley, as described above, or continue on in the DMC. Additionally, an intertie between the DMC and the California Aqueduct located approximately 40 miles north of the Mendota Pool allows for water to be

[4] Two MPG wells in Farmers Water District are composite wells that can pump groundwater from both the upper and lower aquifers; however, due to their design, most water pumped by these wells is from the upper aquifer. MPG is also considering the possible removal or relocation of several wells, including one composite well, near the San Joaquin River to accommodate the Mendota Pool Bypass and Reach 2B Improvement Project. Refer to Section 3.0, *Scope of Impact Analysis*, for discussion of this Project.

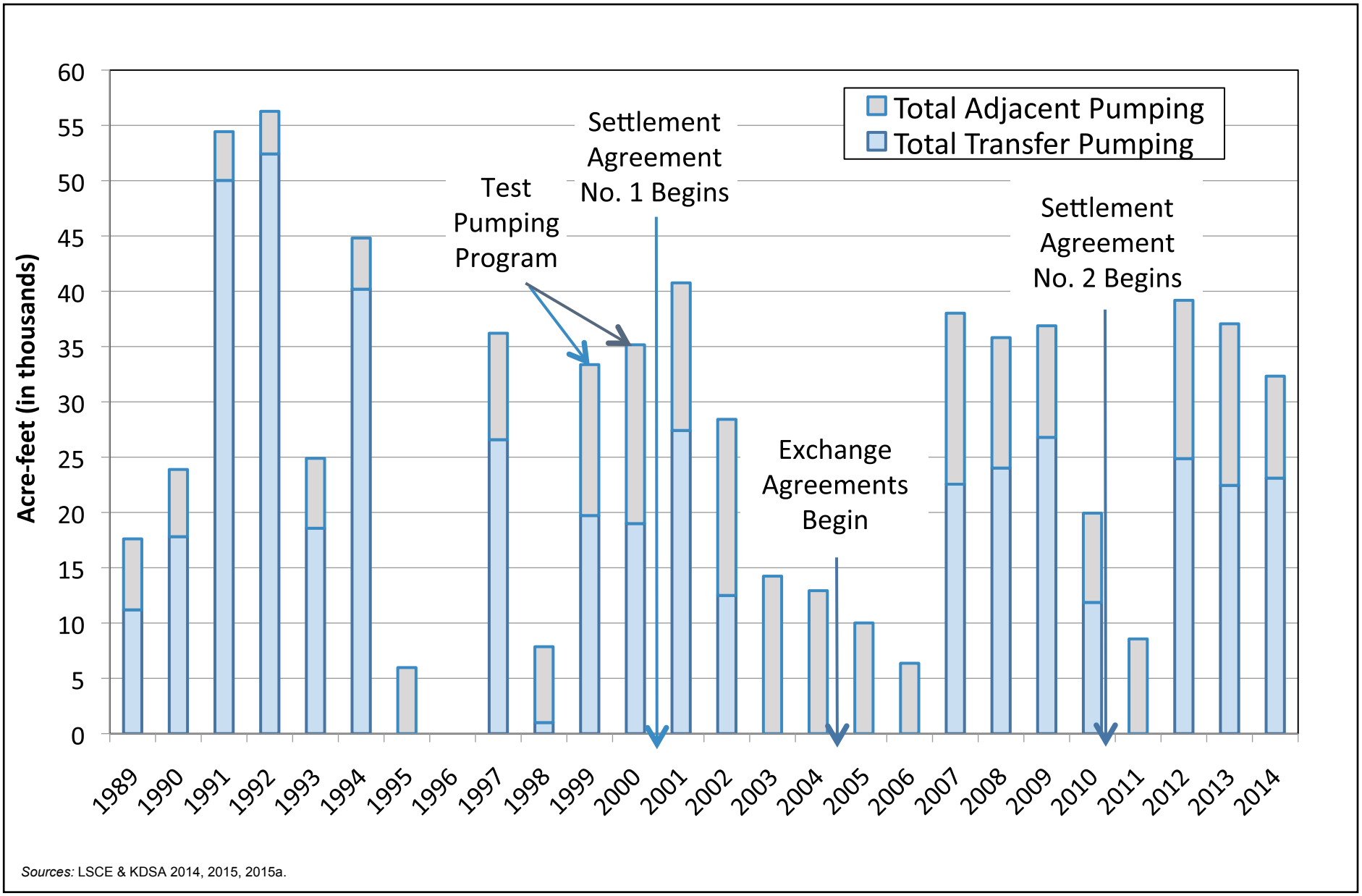
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Project Location and Vicinity Map

FIGURE 1



Sources: LSCE & KDSA 2014, 2015, 2015a.

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Historical MPG Groundwater Pumping

FIGURE 2

moved between the two canals. From Check 13, the DMC branches off from San Luis Reservoir, and flows southeast to the Mendota Pool, where water is conveyed into the Pool via Check 21.

1.1.2 Mendota Pool and Fresno Slough

The Mendota Pool is a small non-Federal reservoir formed by the Mendota Dam at the confluence of the San Joaquin River and the Fresno Slough. The Mendota Dam is owned and operated by the Central California Irrigation District (CCID) in coordination with the San Luis Delta Mendota Water Authority (SLDMWA). The Mendota Pool has a capacity of approximately 3,000 acre-feet (AF) and a surface area of about 1,200 acres (Reclamation 2012). It serves as a managed water supply and a distribution reservoir for the CVP, as well as for local water transfers and conveyance. The Mendota Pool is fed by water from the DMC from the north, the San Joaquin River from the east, and Fresno Slough from the south. During flood events, the North Fork of the Kings River flows north through the Fresno Slough into the Mendota Pool. As part of the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements, the Mendota Pool also receives groundwater that is pumped into the Pool by MPG farmers for exchange across the CVP system and transfer within the Mendota Pool area. The Mendota Pool also receives groundwater from other surrounding landowners. Therefore, the Mendota Pool serves as a key element of the Proposed Action. Agencies that rely on the Mendota Pool for water deliveries include: CCID, Firebaugh Canal Water District (FCWD), James Irrigation District, Tranquillity Irrigation District, California Department of Fish and Wildlife (CDFW), Reclamation District 1606, and many other individual pumpers that use the Mendota Pool for conveyance and delivery of both surface contract water, groundwater, and flood flows from the San Joaquin and Kings Rivers.

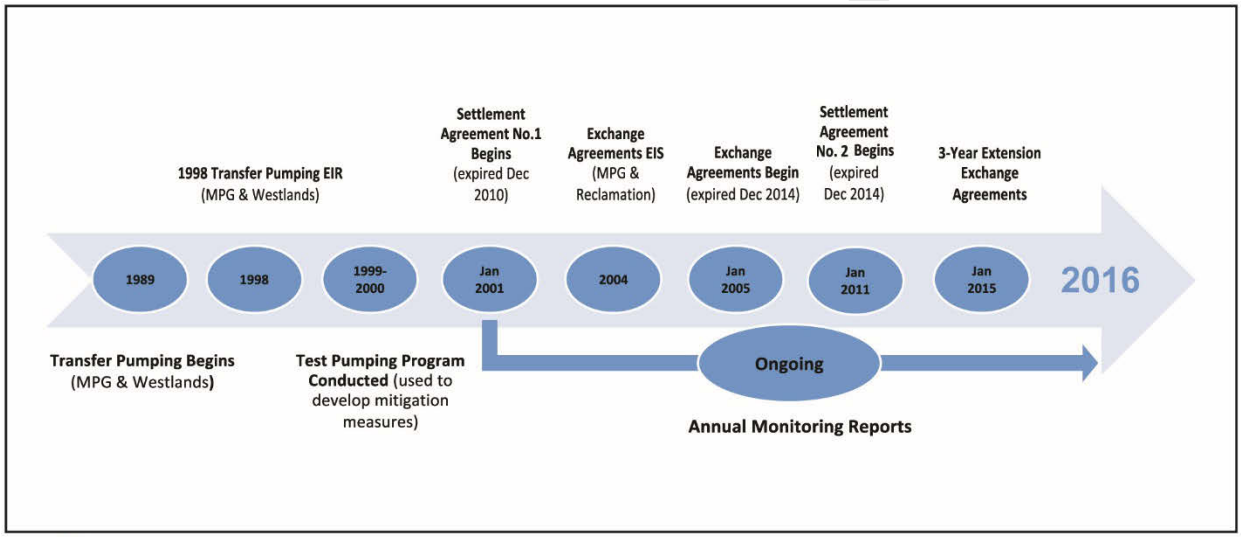
The Fresno Slough is the body of water that extends from the Mendota Pool south through the Mendota Wildlife Area (MWA) for almost 15 miles, extending southeast of the City of Tranquillity. Although generally shallow and narrow, portions of the Fresno Slough south of Mendota Pool are up to 0.5 mile wide. During flood events, the Fresno Slough connects flows from the North Fork of the Kings River to the south with the Mendota Pool and San Joaquin River to the north. The natural historical flow (i.e., prior to the Mendota Dam and CVP projects to convey water from the Delta to the Mendota Pool) through the Fresno Slough is northward toward the Mendota Pool; however, due to CVP deliveries into the Mendota Pool from the DMC, as well as water withdrawals for agricultural use to the south, the flow of water in the Fresno Slough is most often reversed and flows south, particularly during the irrigation season.

1.1.3 History of the MPG Exchange Agreements

Previous MPG groundwater pumping and exchange programs were developed through discussions between MPG, Reclamation, the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors), local water districts, the Regional Water Quality Control Board (RWQCB), Fresno and Madera Counties, the City of Madera, United States Fish and Wildlife Service (USFWS), CDFW, and adjacent landowners from the early 1990s until the execution of Settlement Agreement(s) and Reclamation's approval of the 10-year Exchange Program.[5]

[5] The Settlement Agreement No. 1 is between MPG, the Exchange Contractors, and Newhall. The 10-year Exchange Program is between Reclamation, MPG, and Westlands.

For nearly 30 years, MPG has conveyed or exchanged groundwater from wells near the Mendota Pool to irrigate farmlands in Westlands in accordance with various agreements (Figure 3). MPG first started pumping groundwater for exchange in 1989 to make up for reduced CVP deliveries to contractors south of the Delta (see Figure 2 for historic transfer pumping amounts; Jones & Stokes Associates 1995). The pumped groundwater was either exchanged with DWR or Westlands for a portion of Westlands' CVP allocation (referred to as Transfer Pumping in Figure 2). MPG continued these exchanges throughout the 1990s, with exchange quantities peaking in 1991-1992, and then declining generally to lower levels in 1995 and 1998 corresponding with reductions in CVP water allocations (Figure 2).



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Timeline of the Historic Exchange Agreements between the MPG, Reclamation, and Westlands Water District

FIGURE 3

1998 10-Year Exchange Program & Settlement Agreements 1 and 2

DWR and Westlands prepared a Final EIR in 1998 to address potential environmental impacts of MPG's groundwater pumping and exchange program (i.e., the *1998 Final EIR for the Conveyance of Nonproject Groundwaterfrom the Mendota Pool Area using the California Aqueduct Project*). The 1998 Final EIR evaluated MPG pumping and exchange of up to 620,000 AF of groundwater from wells within the Mendota Pool area for delivery into the Pool for exchange with Reclamation and/or Westlands over a 10-year period. Under this program, groundwater was planned to be pumped annually into Mendota Pool, minus losses, and would be used by Reclamation to offset existing water contract obligations at the Mendota Pool. Reclamation would then reduce CVP deliveries to the Mendota Pool by the quantity exchanged and make an equivalent amount of CVP water available for irrigation purposes to MPG lands in Westlands via the SLC. For exchanges with Westlands, MPG would convey groundwater pumped into Mendota Pool directly to Westlands through Laterals 6 and 7 rather than exchange it through the CVP system. Westlands would then deliver this water to farmers that can receive water from Laterals 6 and 7 and exchange it for an equivalent amount of its allocation of CVP water delivered to MPG farmers in Westlands.

Subsequent to certification of the 1998 Final EIR, a lawsuit was filed by the Exchange Contractors and the Newhall Land and Farming Company (Newhall)[6] to stop implementation of the groundwater pumping project due to concerns regarding potential environmental impacts. In response, MPG, Exchange Contractors, and Newhall entered into a settlement agreement in January of 2001 to govern the pumping program (Settlement Agreement No. 1).

Settlement Agreement No. 1 set forth a 10-year program originally intended to extend from 2001-2010 with groundwater pumping for exchange permitted in 8 of the 10 years for a cumulative total of up to 269,600 AF, as well as requiring monitoring and adaptive management actions be included in the settlement agreement. Under Settlement Agreement No. 1, up to 25,000 AFY can be exchanged with Reclamation pending completion of a NEPA environmental analysis for CVP water to be delivered to MPG farms within Westlands and San Luis Water District; the remaining amount could be transferred to other agricultural water users for use on lands irrigated around the Mendota Pool. Under Settlement Agreement No. 1, MPG pumped a total of 125,142 AF for exchange from 2001–2010, or an average of 20,857 AFY over the six years that the exchanges occurred. MPG pumpage for irrigating lands around the Mendota Pool totaled 118,221 AF and averaged 11,822 AFY during this period (LSCE& KDSA 2012).

Upon the expiration of Settlement Agreement No. 1 in 2010, the agreement was extended by MPG, Exchange Contractors, and Paramount Farming Company (who had purchased Newhall) through a new agreement (Settlement Agreement No. 2) which expired in 2014. Since 2014, MPG has been operating under 1-year extensions of Settlement Agreement No. 2 to maintain operation of the exchange program until this EIS/EIR can be approved and certified.

2005 Mendota Pool 10-Year Exchange Agreements

In 2004, Reclamation completed a Final EIS and signed the Record of Decision (ROD) in 2005 for the Mendota Pool 10-Year Exchange Agreements to satisfy the requirements of NEPA (hereafter referred to as the 2004 Final EIS). The 2004 Final EIS defined a 10-year Exchange Program that overlapped with and was based on Settlement Agreement No. 1, and also required implementation of a test pumping program, design constraints, a monitoring program, and an adaptive management approach to address concerns over groundwater levels and quality, surface water flow and quality, and land subsidence. Under the 2004 Final EIS, Reclamation issued annual exchange agreements with MPG, which allowed for the exchange of up to 25,000 AFY of water during normal and dry years (discussed in further detail below).[7]

Following the expiration of the 10-Year Exchange Program in 2015, Reclamation prepared Environmental Assessments (EA) for a 3-year extension and 1-year extension of the 10-Year Exchange Program through 2019. The current one-year extension approved by Reclamation incorporates the same design constraints and pumping limits proposed in this EIS/EIR.

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[6] On December 1, 2005, Paramount Farming Company purchased the land and associated wells of Newhall Land and Farming Company. Then, on June 1, 2015, Paramount Farming Company changed their name to Wonderful Orchards.

[7] The 2004 Final EIS allows for 25,000 AFY of exchange; however, the exchange is functionally limited to 23,750 AFY due to the 25,000 AFY transfer pumping restriction in the Settlement Agreements with the Exchange Contractors and the requirement in the Settlement Agreements that five percent of transfer water be left in the Mendota Pool.

Groundwater Pumping and Exchange Limits The Settlement Agreement(s) and Reclamation's 2004 Final EIS specified maximum allowable groundwater pumping and exchange limits by MPG for wet, normal, and dry years (Table 1).[8] These limits are specified for the following categories: maximum allowable exchange with Reclamation, maximum pumping for use on Adjacent Overlying Lands (referred to as Adjacent Overlying Use), maximum pumping from the deep zone[9], and maximum allowable exchange with others. Some of these provisions would be carried forward under the Proposed Action, while others would be added, modified or removed from the program (Table 1). These pumping and exchange limits are discussed further below:

Maximum Allowable Exchange with Reclamation and Westlands The Existing Exchange Agreements allow MPG to exchange up to 25,000 AFY of non-CVP groundwater for CVP water delivered to MPG farms in Westlands and San Luis Water District (Table 1). However, due to a provision that requires five percent of the groundwater pumped for exchange to remain in the Mendota Pool, the volume of groundwater pumped and delivered to the Pool in order to exchange the maximum allowable amount was 26,316 AFY. Regardless, the cumulative total allowed for exchange with Reclamation and Westlands over the 10-year period was 200,000 AF.

Groundwater pumped by MPG under the Existing Exchange Agreements could also be exchanged with Westlands by conveying water directly from the Mendota Pool to Westlands through Laterals 6 and 7. Since most MPG farmlands in Westlands are not served by Laterals 6 and 7, some of this water was exchanged with Westlands for other water available to Westlands from the SLC.[10]

Maximum Pumping for Adjacent Overlying Use MPG also pumps groundwater and delivers it to the Mendota Pool for use on Adjacent Overlying Lands. Adjacent Overlying Lands include farmland owned and operated by members of MPG that have canals that connect to the Mendota Pool. The water pumped for Adjacent Overlying Use was either applied directly to lands associated with the groundwater pumps from which it is drawn or delivered to the Mendota Pool for use on lands that were under irrigation by members of MPG around the Mendota Pool. The 2004 Final EIS limited MPG to pumping up to 14,000 AFY of groundwater for use on Adjacent Overlying Lands; however, Settlement Agreement No. 2 with the Exchange Contractors functionally limits Adjacent Overlying Use to 12,000 AFY (Table 1). If pumping for Adjacent Overlying Use exceeded 12,000 AFY, Settlement Agreement No. 2 requires a corresponding decrease in groundwater pumping for exchange.

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[8] Year type classification (e.g., wet, dry, normal) were not included in Settlement Agreement No. 2, and would not be continued in the Proposed Action. New pumping limits do not include a limit for exchange with others, and therefore only define limits on exchange pumping and pumping for Adjacent Overlying Use.

[9] The deep zone refers to the deeper portion of the upper aquifer, ranging from 100 to 420 feet deep, as further discussed in Section 3.1.1, Groundwater Levels.

[10] Direct conveyance through Laterals 6 and 7 is severely limited due to the amount of retired lands. Westlands utilizes most of the remaining farmed land for personal credit and exchange while other water agencies utilize the Mendota Pool for the conveyance of water. The majority of water pumped for exchange or credit from the Mendota Pool must be done through Westlands' Canal Integration Program, which reverse Lateral 7 flows from the Mendota Pool into the SLC. This Program is limited to 30,000 AF and only when CVP allocations are 20 percent or less. The current Program operates separately from the 10-Year Exchange Program under a 5-year Exchange Agreement and Warren Act Contract that expires in 2020.

Table 1: Summary of Arrangements Guiding MPG Pumping and Exchange

Agency	Bureau of Reclamation			Exchange Contractors		
Agreement Name	**2005 10-Year Exchange Agreements (2005-2014)**	**3-Year Extension Exchange Agreement (2015-2017)[1]**	**20-Year MPG Exchange Agreement (Proposed Action)**	**Settlement Agreement No. 1 (2001-2010)**	**Settlement Agreement No. 2 (2011-2014)**	**1-Yr Extensions of Settlement Agreement No. 2 (2015-2017)**
Limit on Pumping for Exchange	40,000 AFY in dry years (max of 2); 31,600 AFY in normal years (max of 6); and 0 AFY in wet years (min of 2); max of 269,600 AF over 10-years	26,316 AF per year or until Proposed Action is approved	26,316 AFY with a maximum of 421,056 AF for the 20-year life of the Proposed Action	40,000 AFY in dry years (maximum [max] of 2); 31,600 AFY in normal years (max of 6); and 0 AFY in wet years (min of 2)	25,000 AFY with a maximum of 90,000 AF for the 4-year term of Agreement	25,000 AFY
Limit on Exchange[2] with Reclamation	25,000 AFY with a maximum of 200,000 AF over the 10-year life of the Project	Up to 25,000 AF per year or until Proposed Actions is approved	25,000 AFY with a maximum of 400,000 AF for the 20-year life of the Proposed Action	Not specifically addressed; effectively any amount approved by Reclamation less 5% pumped for exchange to remain in Pool.	Not specifically addressed; effectively 23,750 AFY (25,000 AFY less 5%) with a maximum of 85,500 AF (90,000 AF less 5%) for the 4-year term of Agreement	Effectively 23,750 AFY (25,000 AFY less 5%)
Limit on Exchange with Others[2]	Exchange pumping limit, less 5%, less the quantity exchanged with Reclamation (e.g., 15,000 AFY in a dry year in which 25,000 AFY is exchanged with Reclamation)	Exchange pumping limit, less 5%, less the quantity exchanged with Reclamation	25,000 AFY less the quantity exchanged with Reclamation	Exchange pumping limit, less 5%, less the quantity exchanged with Reclamation (e.g., 15,000 AFY in a dry year in which 25,000 AFY is exchanged with Reclamation)	Exchange pumping limit, less 5%, less the quantity exchanged with Reclamation	Exchange pumping limit, less 5%, less the quantity exchanged with Reclamation
Deep Zone Pumping Limits[3]	12,000 AFY in any normal or dry year; amount that will not cause more than 0.005 feet/year of subsidence at the Yearout Ranch or Fordel Extensometer[3]	12,000 AFY in any one year; amount that will not cause more than 0.005 feet/year of subsidence at Yearout Ranch Extensometer.	12,000 AFY in any one year; amount that will not cause more than 0.005 feet/year of subsidence at the Yearout Ranch Extensometer	Amount that will not cause more than 0.005 feet/year of subsidence at the Yearout Ranch Extensometer (estimated at 12,000 AFY)	12,000 AFY in any one year and 40,000 AF for term of Agreement; amount that will not cause more than 0.005 feet/year of subsidence at Yearout Ranch Extensometer	12,000 AFY in any one year; amount that will not cause more than 0.005 feet/year of subsidence at Yearout Ranch Extensometer
Shallow Zone Pumping Limits	Depends on deep zone pumping; 28,000 AFY in dry years, 19,600 AFY in normal years, and 0 AFY in wet years if 12,000 AFY is pumped from the deep zone	Depends on deep zone pumping; 13,000 AFY if 12,000 AFY is pumped from the deep zone	Depends on deep zone pumping; 14,316 AFY if 12,000 AFY is pumped from the deep zone	28,000 AFY in dry years, 19,600 AFY in normal years, and 0 AFY in wet years	Depends on deep zone pumping; 13,000 AFY if 12,000 AFY is pumped from the deep zone; 50,000 AF for the 4-year term of Agreement	Depends on deep zone pumping; 13,000 AFY if 12,000 AFY is pumped from the deep zone
Adjacent Pumping Limits	14,000 AFY unless here is a corresponding reduction in exchange pumping	14,000 AFY unless there is a corresponding reduction in exchange pumping	12,000 AFY unless there is a corresponding reduction in exchange pumping	14,000 AFY unless there is a corresponding reduction in exchange pumping	12,000 AFY unless there is a corresponding reduction in exchange pumping	12,000 AFY unless there is a corresponding reduction in exchange pumping
Pumping Limits	**54,000 AFY**	**40,316 AFY**	**38,316 AFY**	**54,000 AFY**	**37,000 AFY**	**37,000 AFY**

[1] The "3-Year Extension Exchange Agreement" is designed to be renewed annually, and is often described as a "one-year exchange agreement". This is related to the fact that in any given year, the 1-year extension would be superseded by the approval of the proposed 20-Year Exchange Program, based on the estimated demand for each irrigation season.

[2] Five percent of groundwater pumped for exchange is required to remain in the Mendota Pool; therefore, exchange limits are five percent lower than pumping limits.

[3] Yearout Ranch and Fordel Extensometer are wells that monitor compaction located east of Fresno Slough and west of Fresno Slough, respectively.

Settlement Agreement No. 2 required that the portion of groundwater pumped by MPG from wells within Farmers Water District (FWD) for use on Adjacent Overlying Lands shall only be used on those Adjacent Overlying Lands that lie within FWD.

Maximum Allowable Exchange with Others Under the Settlement Agreement(s) with the Exchange Contractors, MPG was permitted to pump water up to a defined quantity beyond the maximum 25,000 AFY exchanged with Reclamation under the 2004 Final EIS and the maximum 14,000 AFY pumped for Adjacent Overlying Use (Table 1). This additional groundwater was used for what was referred to in the 2004 Final EIS as "Exchange with Others", which is the exchange between MPG and "other" agricultural users for use on lands that were under irrigation around the Mendota Pool. The maximum allowable quantity of water to be pumped in a given year depended on whether the year was classified as wet, normal, or dry.

Management Strategies/Design Constraints The pumping programs under the Existing Exchange Agreements are adaptively managed to minimize environmental impacts (see Table 2 for the design constraints from the previous Exchange Agreements and Table 3 for the existing Design Constraints that are incorporated into the current 1-year extension and would be continued under the Proposed Action and Alternative 2). MPG pumping programs were developed, reviewed, and approved on an annual basis by Reclamation and the Exchange Contractors to allow for year-to-year variations in hydrologic conditions. They were defined in the spring of each year, prior to the start of pumping, and each year's pumping program was based on consideration of several factors, including design constraints (e.g., water quality at Exchange Contractor's canal intakes or at MWA), the results of the previous year's monitoring program, the extent of groundwater level recovery, and hydrologic conditions.

1.1.4 Monitoring and Reporting

As a result of the 1998 Final EIR, the MPG Annual Pumping and Monitoring Program was established in 1999, in compliance with a requirement of the then current exchange agreements, to identify the effects of groundwater pumping for exchange on non-MPG groundwater wells and natural resources in the general vicinity and report on findings annually. The MPG Annual Pumping and Monitoring Program includes the monitoring of groundwater wells owned and/or operated by MPG, as well as the monitoring of approximately 180 groundwater wells owned by many other entities in the area around Mendota Pool. Data collected during each annual reporting period are presented in an annual report and discussed in the context of the historical data record.

The original groundwater monitoring area was established in 1999 and encompassed the region in the immediate vicinity of the Mendota Pool, including all groundwater wells owned by MPG. The results of this original monitoring area found that groundwater withdrawal from the deep zone and a historic cone of depression around MPG wells had the potential to affect groundwater levels in the deep zone up to 3.5 miles away, and that MPG pumping and exchange program, along with other inputs into the pool, had the potential to affect surface water quality downstream at the MWA. In order to better assess groundwater level and surface water quality impacts, the study area for the program was extended in 2001 to encompass the area within a six-mile radius from the approximate center of MPG groundwater wells in FWD. However, the MPG monitoring network analyses of pumping impacts on other resources, such as groundwater quality and subsidence, remain focused on the original groundwater monitoring area because the effects of MPG pumping on these resources remained localized. Potential broader effects to

Table 2: Design Constraints Under the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements

#	Design Constraint
1	Exchange pumping from the deep zone shall be conducted primarily during March, April, and May, and from September through November. No exchange pumping from the deep zone shall be conducted during June, July, and August of any year unless expressly permitted by the Exchange Contractors and Wonderful Orchards and shall not be conducted during more than 10 months of any year.
2	Exchange pumping from the deep zone shall not exceed 12,000 AFY during any one year.
3	Exchange pumping from the deep zone shall not exceed an amount that will cause subsidence at the Yearout Ranch Extensometer due to exchange pumping to average more than 0.005 feet per year. The amount of exchange pumping from the deep zone shall be subject to adjustment by the Technical Committee[1].
4	Shallow zone pumping shall not be conducted more than 10 months of any year.
5	If 12,000 AF of water is pumped from the deep zone, shallow zone pumping would be limited to 19,600 AF during a normal year and 28,000 AF in a dry year. Shallow zone pumpage may also be limited due to: 1) the quality of water pumped from these wells, 2) potential impacts to deep zone groundwater (e.g., overdraft or groundwater quality), and 3) potential overdraft of the shallow zone.
6	The amount of groundwater pumped for use on Adjacent Overlying Lands shall not be greater than 12,000 AF in any year unless there is a corresponding reduction in the amount of exchange pumping that year.
7	By March 1st of each Year, the MPG shall declare its intent to conduct exchange pumping for that year and to provide a schedule and amounts for that year based on the expected surface water allocation to be available to members of the MPG that year.
8	Exchange pumping shall be reduced if there is evidence that exchange pumping from the shallow zone significantly affects the quality of water in the deep zone in the Exchange Contractor and Wonderful Orchard service areas (refer to Figure 4 [of the 2004 Final EIS]).
9	Minimize groundwater quality degradation by modifying the pumping program, based on the results of predictive modeling of the effects of the pumping program and the results of the groundwater monitoring program, and by minimizing drawdowns.
10	Pump MPG wells along the west side of the Fresno Slough only when flow in the Fresno Slough is to the south. Wells in FWD could pump irrespective of flow direction in the Mendota Pool.
11	Shut off MPG wells if electrical conductivity (EC) measurements at the Exchange Contractors' canal intakes exceed that of the DMC by 90 micromhos per centimeter (µmhos/cm) for a period of three days or more. If the MPG wells were shut off for this reason, they would not be turned back on until the EC at the canal intakes returns to a level that is no more than 30 µmhos/cm above the DMC inflow.
12	Shut off wells with selenium concentrations equal to or greater than the water quality criterion of 2 micrograms per liter (µg/L).
13	During the fall pumping period, when there is reduced flow in the Mendota Pool and water quality at the MWA is most critical, wells with total dissolved solids (TDS) higher than 1,200 milligrams per liter (mg/L) will not be pumped for exchange.
14	Modify the pumping program based on the results of the surface water monitoring program to reduce overall surface water quality degradation, particularly with respect to salinity (TDS or EC). This will ensure that the quality of water supplied to the MWA and other users in the southern portion of the pool will meet applicable water quality criteria. Wells with TDS concentrations greater than 2,000 milligrams per liter mg/L will not be pumped into the Mendota Pool.

[1] The Technical Committee, as defined and determined under the Settlement Agreement consists of a group of individuals, one appointed to serve on the Committee by each exchange party. The Technical Committee consist of persons experienced in groundwater hydrology or hydrogeology.

groundwater quality of the MPG pumping and exchange program are also informed by monthly well data from a number of other non-MPG farms and agencies, such as Reclamation, USFWS, and the City of Mendota, while broader subsidence impacts are informed by two extensometers in the Mendota Pool area.

Pumpage from MPG wells along the Fresno Slough is metered by the SLDMWA at the discharge points where groundwater from MPG wells enter the Mendota Pool. MPG maintains records of this metered discharge to determine whether water from its wells is being pumped for

exchange or adjacent use. Additionally, other participants within the monitoring area provide monthly data for wells within their service areas, outside of MPG lands. MPG collects annual samples from their production wells along the Fresno Slough and in FWD in order to assess groundwater quality. All well samples retrieved by MPG are analyzed for electrical conductivity (EC) and total dissolved solids (TDS) on an annual basis, with more comprehensive analyses (e.g., for general minerals and trace elements) conducted either annually or biennially (i.e., every two years). The program also addresses surface water flow and quality and sediment quality. Further, it also addresses compaction and land subsidence by reviewing continuous data that is collected from two extensometers in the Mendota Pool area in order to evaluate compliance with the subsidence criteria specified in the 2004 Final EIS.

The data collected during the 1999 and 2000 pumping seasons were used to evaluate the long-term impacts of MPG groundwater pumping for exchange on the service area for the Exchange Contractors and on land owned by Newhall (purchased by Paramount Farming Company, who refers to the farm as Wonderful Orchards) and to develop management strategies and measures (referred to in the agreements as "design constraints"). These design strategies are intended to address potentially significant increases in surface water salinity, groundwater basin overdraft, and land subsidence. Adjustments are made to the pumping program if and when the monitoring program indicates that actions need to be taken to prevent significant impacts to key resources. Additionally, the results of the annual monitoring programs are used as input to a series of groundwater and surface water models used to: forecast subsidence and water quality impacts; design the subsequent year's pumping program; and ensure that all design constraints are met.

1.1.5 Results of the 2005 Mendota Pool 10-Year Exchange Agreements

As demonstrated in the existing setting discussions throughout this EIS/EIR and in the 2014 Annual Report (Appendix D), with the previous design constraints, no substantially adverse effects resulted from implementation of the 10-Year Exchange Agreements. The level and quality of groundwater in the study areas remains suitable to support identified beneficial uses such as agricultural, municipal, and biological uses (see Section 3.1, *Groundwater Levels* and Section 3.2, *Groundwater Quality*). Surface water quality has not been substantially degraded due to MPG pumping actions and remains suitable to support agricultural uses and the protected habitat within the MWA (see Section 3.3, *Surface Water Quality*). The sampling data indicates that salinity within the Fresno Slough and MWA is highly variable and identified periodic exceedances of the established annual TDS threshold at the MWA. Although TDS concentrations have periodically exceeded the annual threshold, the concentrations remained below the tolerance levels of plant and wildlife species in the MWA (see Section 3.4, *Biological Resources*). The 10-Year Exchange Program has not been determined to contribute to any exceedance of thresholds for trace elements in the sediment of the Mendota Pool, and a significant increase beyond the existing conditions of the 2004 Final EIS have not been observed (see Section 3.5, *Sediment Quality*). The rate of subsidence has slowed due to efforts by MPG and others, and the 2014 Annual Report demonstrates that MPG pumping has not caused exceedance of subsidence thresholds (see Section 3.6, *Subsidence*). The design constraints and monitoring and reporting program also allowed MPG to achieve the Purpose and Need of the 10-Year Exchange Agreement to maintain continued cultivation of approximately 42,316 acres historically irrigated lands. The monitoring and reporting program remains one of the most comprehensive efforts in the region and provides a level of surety and reporting not typically yet found for other groundwater users in the region.

The existing settings discussion and annual reports demonstrate that the monitoring and reporting program generally prevented any exceedance of established thresholds and that any problems identified were quickly remedied, so that these exceedances did not evolve into substantially adverse effects on the environment. When established thresholds were exceeded, it was typically the result of an extreme natural condition or regional circumstance beyond the control of the MPG pumping program. For instance, as discussed in Section 3.1, *Groundwater Levels*, shallow zone groundwater levels near the San Joaquin River branch of the Mendota Pool were about 15 feet lower in January 2015 than when groundwater measurements began in 2000 (LSCE & KDSA 2015). Although not considered a substantial depletion of groundwater supplies, even this decline was not necessarily representative of long-term impacts because it occurred during the extreme drought conditions that began in 2012 and corresponded with regional declines in shallow groundwater levels. As another example, Section 3.2, *Groundwater Quality*, notes that the MPG pumping program west of the Fresno Slough had been modified in accordance with design constraints to respond to the migration of a naturally-occurring saline front west of the Fresno Slough. This design constraint served two purposes, first to slow the migration of the saline front, and second to prevent high salinity groundwater from being discharged into the Mendota Pool. Even with the modification of pumping activities, the naturally occurring saline front continues to gradually migrate northeastward. However, this migration is primarily influenced by non-MPG pumping due to severe overdraft and groundwater drawdown occurring in areas of Madera County.

1.2 Purpose and Need

NEPA regulations require a statement of "the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action" (40 CFR 1502.13). The State CEQA Guidelines require a clearly written statement of objectives, including the underlying purpose of a project (Section 15124(b)).

1.2.1 Reclamation's Purpose and Need under NEPA

The CVPIA of 1992, Title 34 (of Public Law 102-575), Section 3408, Additional Authorities (c) authorizes the Secretary of the Interior to enter into contracts pursuant to Reclamation law and this title with any Federal agency, California water user or water agency, State agency, or private nonprofit organization for the exchange, impoundment, storage, carriage, and delivery of CVP and non-CVP water for domestic, municipal, industrial, fish and wildlife, and any other beneficial purpose, except that nothing in this subsection shall be deemed to supersede the provisions of section 103 of Public Law 99-546 (100 Stat. 3051).

Section 14 of the Reclamation Project Act of 1939 (53 Stat. 1197; 43 U.S.C., subsection 389) authorizes the Secretary, for the purpose of orderly and economical construction or operation and maintenance of any project, to enter into such contracts for exchange or replacement of water, water rights, or electric energy or for the adjustment of water rights, as in his judgment are necessary and in the interests of the United States and the project.

The Warren Act (Act as of February 21, 1911; (36 STAT.925; 43 U.S.C., subsection 523) authorizes the Secretary to contract for use of available excess capacity in Reclamation facilities for the impoundment, storage, and conveyance of non-project irrigation water.

The purpose for the action by Reclamation, as the Federal Lead Agency, is to consider, under the above cited authorities, the request by the MPG to use federal facilities for the storage and conveyance of groundwater (non-CVP water) and the exchange of CVP surface water for non-CVP groundwater pumped by the MPG to meet existing water supply demands for their irrigated lands within Westlands. Reclamation's need for the action is to respond to MPG's request for use of federal facilities and the exchange of CVP water for non-CVP water under the above cited authorities.

1.2.2 MPG Need for the Proposed Action

The CVP has historically provided water supplies for both agricultural and nonagricultural uses with the majority of available water supply allocated to beneficial agricultural uses. In this context, the initial 10-Year Exchange Agreement was started to provide a supplemental water source to MPG farmlands in Westlands during periods of reduced CVP allocations, but has since become a primary source of water for MPG farmlands in Westlands because reduced CVP allocations have become more frequent. For example, since 1989, water supplies to CVP agricultural users have been reduced due to Delta pumping restrictions resulting from the passage of the CVPIA, water rights decisions that were implemented to address Delta water quality objectives, National Marine Fisheries Service (NMFS) salmon and USFWS Delta smelt biological opinions, and drought conditions. As a result, CVP deliveries to Westlands from 1990 to 2016 have averaged 54 percent of Westlands' allocations.[11] For the period from 2007 to 2016, CVP average deliveries dropped to 29 percent of Westlands' allocations (Westlands 2018).[12] This reduction in water deliveries from the CVP has required agricultural users in Westlands to obtain a large portion of their water needs from alternative sources, such as groundwater, or to fallow, idle, or retire additional farmland acreage that would otherwise serve as productive farmland (e.g., land that would not be fallowed as a result of drainage impairments or other issues).[13]

All members of MPG own and/or operate farmland located in the western portion of the San Joaquin Valley, either along the SLC in Westlands, in the vicinity of the Mendota Pool, in FWD, or in surrounding areas. While farmlands in the FWD and in the vicinity of the Mendota Pool may rely on groundwater sources, the farmlands in Westlands rely predominately on CVP irrigation water deliveries via the SLC due to lack of any other available surface water supplies and restraints on groundwater use in this area. Specifically, consistently reliable surface water is limited in the western portion of the San Joaquin Valley since regional surface water supplies are located primarily to the north in the Delta and along the east side of the San Joaquin Valley, at the base of the Sierra Nevada Mountains. Inadequate infrastructure and supply prevent these

[11] Full CVP allocations for Westlands are 1,150,000 AFY. In the ten-year period prior to 1990, Westlands received full or nearly full allocations (Westlands 2012).

[12] Reductions in CVP deliveries vary from year to year, with the largest reduction occurring in 2014 when deliveries were reduced to 0 percent of Westlands' allocation.

[13] In 2015, approximately 218,112 acres were fallowed within Westlands (Westlands, personal communication, July 14, 2016).

sources from being delivered to the western side of the San Joaquin Valley. In addition, groundwater from the upper aquifer in the Westlands area has saline levels that make it unsuitable for irrigation. Moreover, the pumping of deeper, higher quality groundwater from the lower aquifer has historically resulted in significant land subsidence in this and other areas of the San Joaquin Valley. Westlands has taken steps to obtain additional sources of irrigation water and to implement water conservation practices (Westlands 2012).[14] However, farmers in Westlands need to supplement their CVP water deliveries and conservation practices with affordable, reliable, and good quality water in order to maintain production on historically irrigated lands.

The purpose of the Proposed Action is to ensure the continued availability of affordable, reliable, good quality irrigation water. Implementation of the Proposed Action would not interfere with Reclamation's contractual obligations to other water rights' holders within the Mendota Pool area. The availability of irrigation water during the growing season (primarily April through October) is one of the most important factors in crop production. Inadequate water supplies and poor water quality reduce crop yields and crop quality, thereby reducing the agricultural productivity and economic viability of the affected farms. The Proposed Action would allow the continued exchange of water between Reclamation and MPG for a 20-year period.

The Proposed Action is needed to allow MPG to continue exchanging water to maintain agricultural production on their lands in Westlands regardless of the reductions of water supplies from the Delta via the CVP. The exchange of up to 25,000 AFY would facilitate continued cultivation of approximately 42,316 acres of MPG-owned farmland in Westlands. The Proposed Action is not intended to increase the amount of water currently authorized for exchange for farming activities under previous Exchange Agreements or contractual limitations, but to continue to replace Delta water now allocated to other nonagricultural CVP purposes. The Proposed Action would continue to enable the efficient delivery and transfer of water to facilitate economic benefits, while limiting future potentially adverse environmental effects to groundwater levels and surface and groundwater quality, and subsidence in the Mendota Pool area. The Proposed Action also includes a recharge component that would begin utilizing a recharge canal on Terra Linda Farms and providing additional recharge water to the four existing groundwater recharge ponds on the New Columbia Ranch (NCR) property. This recharge component would enable use of excess flood waters and other identified supplies available during wet years to replenish the San Joaquin Valley Groundwater Basin (Groundwater Basin) by delivering such water to the Terra Linda Farms Recharge Canal and the four existing NCR recharge ponds. This would partially offset groundwater level decline associated with the Exchange Agreements.

1.3 California Environmental Quality Act Objectives

The overall objective of the Proposed Action is to enable MPG to maintain production on historically irrigated lands through the issuance of exchange agreements with Reclamation over a period of 20 years, and thus obtain sufficient good quality and reliable water sources to offset

[14] Westlands has engaged in water marketing, conjunctive use, and purchases from the State Water Bank as new water sources.

reductions in CVP deliveries. The Proposed Action is not intended to increase the amount of water currently used for farming activities, but to continue to replace water allocated for other nonagricultural CVP purposes.

This EIS/EIR reviews the impacts of the Proposed Action, as well as a second alternative that could, "feasibly attain most of the project objectives" (CEQA Guidelines Section 15126.6[f]). The objectives of the Proposed Action are to:

- Maintain water supply reliability relative to water exports from the Delta;
- Deliver water to farms for an average cost that approximates the cost of contract water and does not exceed the costs of supplemental water on the open market;
- Maintain production on agricultural lands that have historically received CVP water and regularly produced agricultural commodities using this water; and
- Minimize impacts to surface water quality, groundwater levels and quality, land subsidence, and biological resources through incorporation of design constraints and management practices.

1.4 Previous Studies

As described in Section 1.1, the Proposed Action evaluated in this EIS/EIR has evolved over an extended period beginning in the early 1990s. The following environmental documents and studies were prepared as a part of the evaluation of MPG pumping programs.

- 1995: In October 1995, a Draft EIR for the *Conveyance of Nonproject Groundwater from the Mendota Pool Area using the California Aqueduct Project* was published by Westlands for public review.
- 1998: The Final EIR for the *Conveyance of Nonproject Groundwaterfrom the Mendota Pool Area using the California Aqueduct Project* was completed and certified by Westlands.
- 1999: As a result of the legal challenges to the Final EIR, a joint study was initiated in 1999 to determine the impacts of the proposed MPG pumping on the Exchange Contractors and Newhall. The results of the 1999 Test Pumping Program for MPG wells were included in a Phase I Report, *Results of 1999 Test Pumping Program for MPG Wells*.
- 2000: A subsequent Phase II report entitled *Long-term Impacts of Transfer Pumping by the MPG* was published. This report contained recommended design constraints and modifications to MPG's monitoring program.
- 2000: A Categorical Exclusion was prepared by Reclamation for the 2000 Test Pumping and Transfer Pumping Program. In November 2000, Reclamation issued a Finding of No Significant Impact (FONSI) that allowed MPG to pump groundwater for a 3.5- month period while the monitoring program and negotiations between the parties continued.

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- 2001: Reclamation prepared an EA for the Mendota Pool 2001 Exchange Agreement which was finalized in August 2001.
- 2002: Reclamation prepared an EA for the Mendota Pool 2002 Exchange Agreements, which was finalized in May 2002.
- 2004: A Final EIS for the Mendota Pool 10-Year Exchange Agreements (EIS No. 01-81) was prepared by Reclamation, which would allow MPG to obtain exchange agreements with Reclamation for a 10-year transfer pumping program.
- 2005: The Record of Decision for the 2004 Final EIS for the Mendota Pool 10-year Exchange Agreements was signed on March 30, 2005.
- 2015: Reclamation prepared an EA for the 3-Year Extension of the Mendota Pool Group Exchange Agreements (EA-14-033) which was finalized in April 2015.
- 2018: Reclamation prepared an EA for the Additional One-Year Extension of the Mendota Pool Group Exchange Agreements (EA-17-053) which was finalized in May 2018.

The 2004 Final EIS is particularly relevant to the analysis for this EIS/EIR since it provides an analysis of the previous 10-Year Exchange Program. The 2004 Final EIS evaluated six primary categories of potential impacts: groundwater levels, land subsidence, groundwater quality, surface water quality, sediment quality, and biological resources. The 2004 Final EIS also evaluated eight other impact categories that were not considered to have the potential to create significant impacts: CVP operations, archeological and cultural resources, land use, traffic, air quality, noise, and environmental justice and socioeconomics. The primary adverse effect of the action evaluated in the 2004 Final EIS was to increase the cumulative rate of groundwater quality degradation in wells west of the Mendota Pool, primarily MPG wells. Mitigation actions that addressed potential impacts to these resource categories were included in the 2004 Final EIS. These mitigation actions include a baseline pumping program, design constraints, a monitoring program, and adaptive management. The discussion of existing conditions in each section of this EIS/EIR describes the results of a 10-year period of exchanges approved by the 2004 Final EIS.

1.5 Setting and Study Areas

The regional setting of the Proposed Action and Alternatives is within the San Joaquin Valley in Central California, situated between the Sierra Nevada and Coast Ranges. This region includes lands in Fresno, Madera, and Kings Counties, and is within a region that is mostly rural, cultivated agriculture or grazing lands. Cities and established communities within the region include the Cities of Mendota, Fresno, Madera, Tranquillity, and San Joaquin (Figure 1). Primary roadways are Interstate 5 (I-5), State Route (SR) 180, and SR-33, SR-198 and SR-145.

Major surface water bodies in the area associated with the Proposed Action and Alternatives include the San Joaquin River, the Kings River, the Mendota Pool, the Fresno Slough, and Millerton Lake. Key regional water infrastructure and CVP facilities that would convey water under the Proposed Action and Alternative 2 include the SLC, San Luis Reservoir, Coalinga

Canal, DMC, and canal systems that transfer water via the Mendota Pool (refer also to Section 3.13, *Water Conveyance Infrastructure and Central Valley Project Operations*).

Groundwater pumping activities under the Proposed Action and Alternatives would occur on MPG lands near the Mendota Pool, which is located on the San Joaquin River in the central portion of the Valley near the City of Mendota. To the south of the City of Mendota is the MWA, a natural conservation area managed by the CDFW.

1.5.1 Study Areas

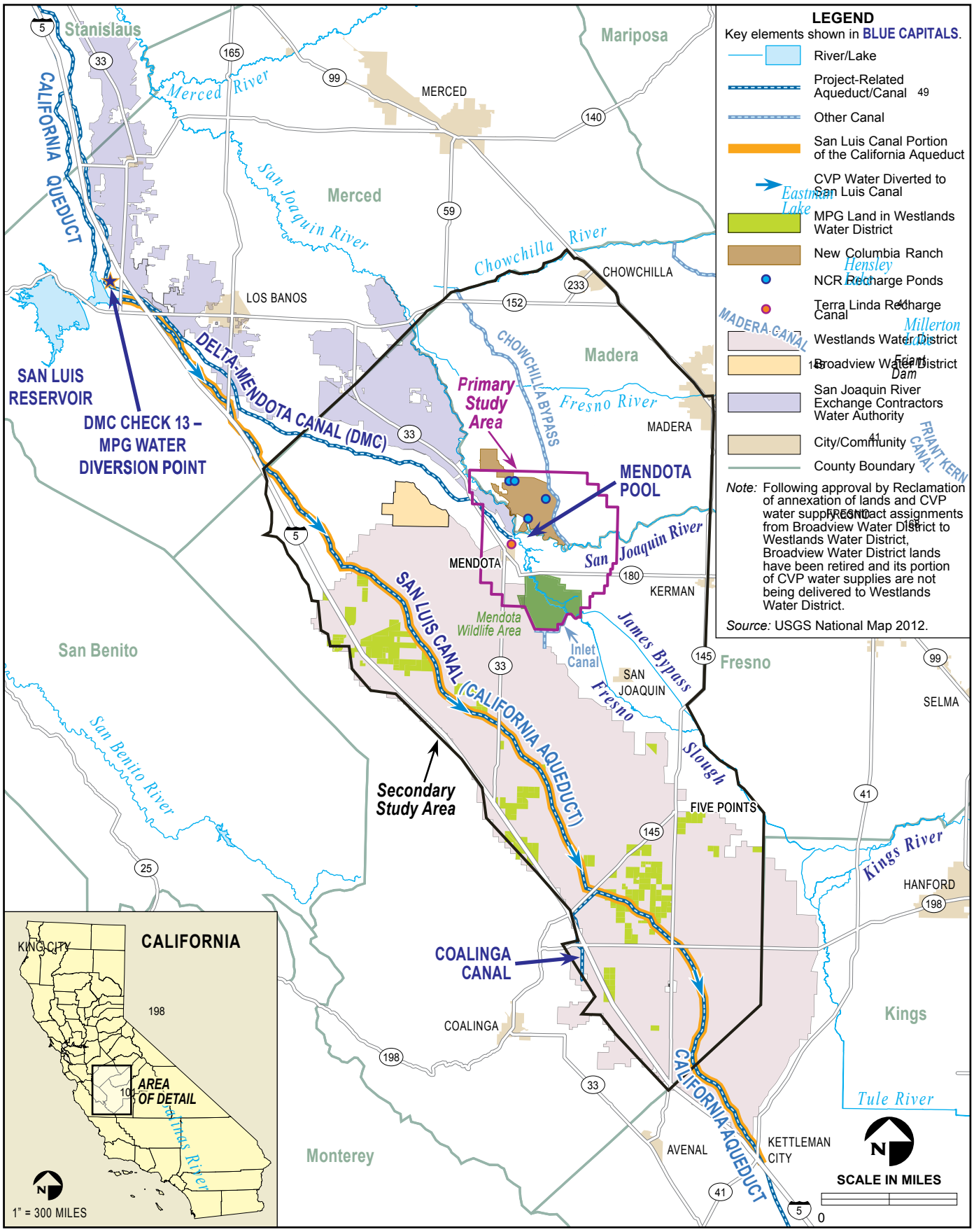
This EIS/EIR includes a Primary Study Area and Secondary Study Area (Figure 4). The Primary Study Area represents the area where most direct environmental impacts related to groundwater pumping activities under the Proposed Action or Alternatives have the potential to occur. The Secondary Study Area encompasses Westlands, and represents the larger area within which all potential direct and indirect impacts may occur. These study areas are distinguished from one another to provide clarity in impact discussions and are described in further detail below.

Primary Study Area

The Primary Study Area for this EIS/EIR comprises approximately 143 square miles (92,000 acres) in western Fresno and southwestern Madera Counties, and is contained within a four- to six-mile radius around the Mendota Pool and San Joaquin River (Figure 4).[15] The Primary Study Area includes 7,542 acres of MPG-owned or operated farmland within FWD and areas surrounding Mendota Pool called Adjacent Overlying Lands (Figure 5). These lands have facilities to either withdraw water from, or discharge water to, the Mendota Pool for irrigation. Some groundwater pumped out of MPG wells is delivered to the Mendota Pool to supply Adjacent Overlying Lands. To deliver irrigation water to Adjacent Overlying Lands, pumped groundwater is delivered to the Mendota Pool and then pumped directly out of the Pool into canals connected to adjacent farmlands owned and operated by MPG members (See Section 1.1.3 for more detail on pumping for Adjacent Overlying Use). Other land uses within the Primary Study Area include the MWA, farmland surrounding MPG lands, and the City of Mendota.

As of November 2015, MPG members can pump groundwater from 75 groundwater wells, with the majority (54) of these wells located south of Mendota Dam, along the west bank of the Fresno Slough. The remaining wells (22) are east of Fresno Slough or in FWD (Figure 6). There are currently 46 wells that are constructed in the shallow zone of the upper aquifer, 27 wells that are constructed in the deep zone, and 2 composite wells that draw from both the deep zone of the upper aquifer and the upper portion of the lower aquifer. The total number and location of MPG wells changes slightly over time, as wells are either replaced (for various operational reasons) or abandoned. The majority of MPG's wells discharge their pumped groundwater directly into the Mendota Pool in exchange for CVP water deliveries to MPG lands located in Westlands. However, some of the wells in FWD pump water into the San Joaquin River for delivery into the Mendota Pool rather than directly into the Pool itself. In addition to MPG wells, there are multiple non-MPG wells in the Primary Study Area operated by other users including Wonderful Orchards, Meyers Water Bank, CCID, Columbia Canal Company (CCC), the City of Mendota, and others.

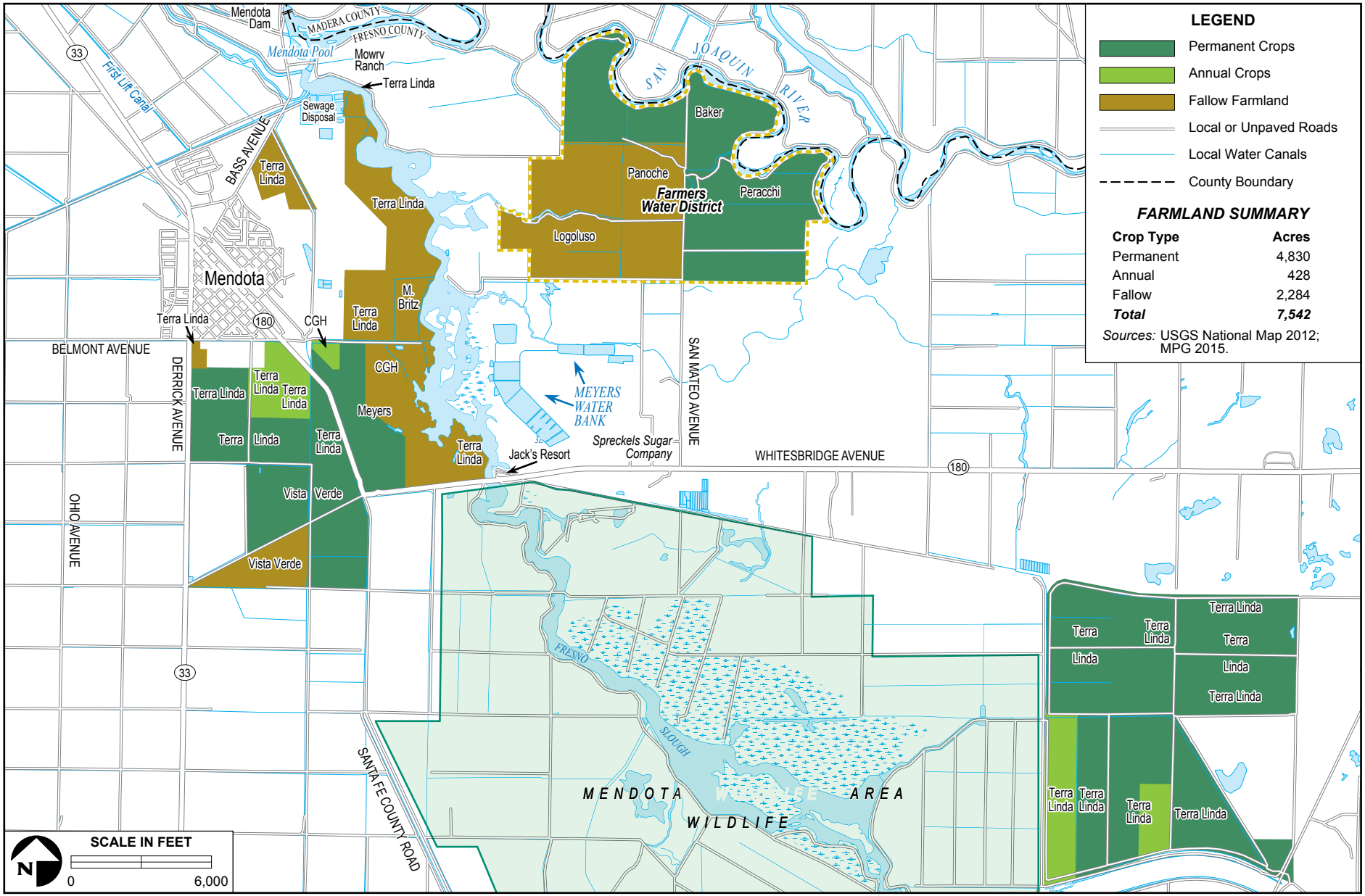
[15] The Primary Study Area for this EIS/EIR is consistent with the boundaries of the ongoing MPG Pumping and Monitoring Program, which is performed by MPG as one of the provisions of the 2004 Final EIS.



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Proposed Action Area

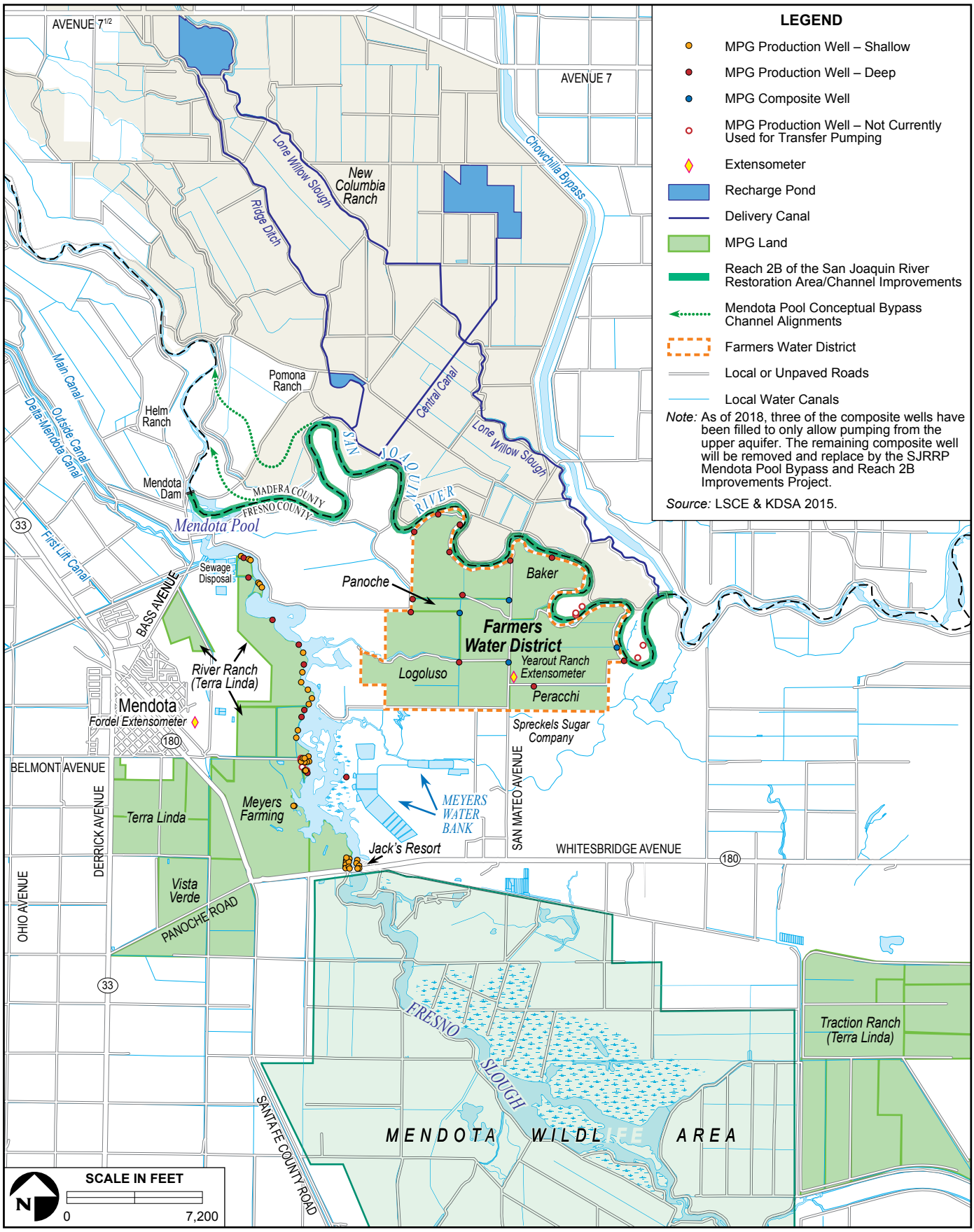
FIGURE 4



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MPG Adjacent Overlying Lands (2015)

FIGURE 5



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MPG Groundwater Wells around Mendota Pool

FIGURE 6

Surface water bodies potentially affected by the Proposed Action or Alternative 2 are the San Joaquin River, Fresno Slough, and Mendota Pool. Water infrastructure in the Primary Study Area includes the Mendota Dam, a segment of the DMC, and various intake and outtake canals. The Primary Study Area also includes the Meyers Groundwater Bank (Figure 5) (which is used to store available water in the local groundwater basin for future irrigation uses) and NCR recharge Ponds (Figure 4).

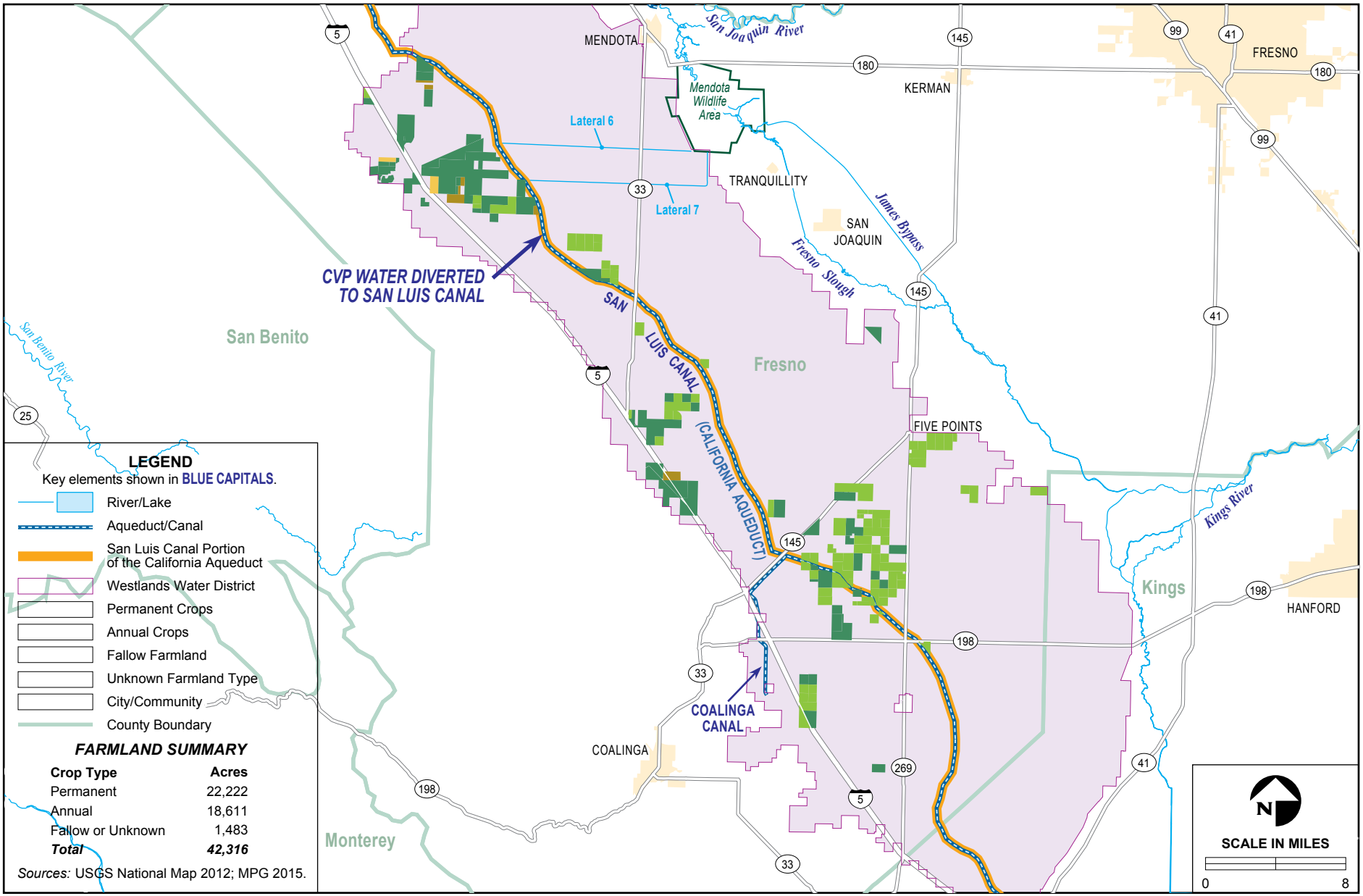
Secondary Study Area

The Secondary Study Area for this EIS/EIR encompasses approximately 1,836 square miles (1,174,825 acres) in Fresno and Madera Counties, and includes all MPG farmlands in Westlands that can receive irrigation water under the Proposed Action or Alternative 2. MPG records indicate that in 2015, MPG owned 42,316 acres of agricultural lands within the secondary study area, and this land is situated along approximately 40 miles of the SLC, with most lands located east of Interstate 5 and north of SR-198 (Figure 7). This region is predominantly agricultural and encompasses the Cities and unincorporated communities of Huron, Five Points, Cantua Creek, and Avenal.

1.6 Summary of Public Scoping/Public Involvement

Prior to the initiation of preparation of this EIS/EIR, Reclamation published a Notice of Intent (NOI) for the preparation of the EIS portion of this document in the Federal Register on November 13, 2012. In addition, a notice was placed in the "Public Notices" section of the *Fresno Bee* (the local newspaper) summarizing the NOI and requesting input from the public. Reclamation held two public scoping meetings to solicit public comments on the EIS portion of the EIS/EIR. These two scoping meetings fulfilled the public scoping requirements of NEPA. The first public scoping meeting was held on November 27, 2012, in the City of Fresno, CA and the second public scoping meeting was held on December 10, 2012, in the City of Mendota, CA. A total of five persons spoke at the public scoping meetings. Public comments regarding the scope of environmental review for the Proposed Action were due by January 10, 2013. Two comment letters, one from the United States Environmental Protection Agency (EPA) and one from Friant Water Authority were received. Reclamation prepared a Scoping Report that summarizes the scoping process. The Scoping Report is included in Appendix A of this EIS/EIR.

Westlands, the lead agency under CEQA, filed a Notice of Preparation (NOP) of the EIS/EIR with the Office of Planning and Research State Clearinghouse on April 8, 2013, and sent the NOP to responsible agencies and interested parties. The NOP comment period ran from April 9, 2013 through May 8, 2013. A total of six comment letters were received on the NOP (refer to Appendix B) and consisted of letters from the following: CDFW; the Native American Heritage Commission (NAHC); Friant Water Authority; Madera Irrigation District; Madera County; and Wonderful Orchards.



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MPG Land in Westlands Water District

FIGURE 7

Areas of concern identified in the response to the NOI and NOP include the impacts of continued groundwater withdrawal on San Joaquin River Restoration Program (SJRRP); impacts on the cost of groundwater to others; the impact on water quality and reliability to other user of, and in the vicinity of, the Mendota Pool; impacts to the Madera Subbasin; and that the continued transfer of water would impact the quality of surface water delivered to the MWA under CVPIA Level 2 and Level 4 water supplies, particularly the concentration of TDS.

1.7 References

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Section 2 Description of Alternatives

This chapter describes the alternatives developed for the Proposed Action or Project. There is a No Action (No Project) Alternative, the Proposed Action, and one additional alternative to the Proposed Action (Alternative 2: 20-Year Exchange Program and Additional Groundwater Recharge Facilities). The No Action Alternative reflects future conditions without the Proposed Action and serves as a basis of comparison for determining potential effects to the human environment. As discussed in greater detail in Section 3.0, *Scope of Impact Analysis*, of this Draft EIS/EIR, the effects of the No Action Alternative are compared against slightly different conditions under NEPA and CEQA. Under NEPA, the Proposed Action and Alternative 2 are compared against conditions that would occur under the No Action Alternative, whereas, under CEQA, the Proposed Action and Alternatives are compared against existing physical conditions at the time of issuance of the NOP. Although exchange agreements with Reclamation would be required to maintain the existing conditions (there are no other technically feasible conveyance mechanisms to maintain the transfer of groundwater that began in 1989), accounting for groundwater pumping that occurs under the Existing Exchange Agreements most accurately represents the existing and long-term historic physical setting for CEQA purposes. Similarly, although not required by NEPA, because the existing conditions would not be obtainable without exchange agreements, this EIS/EIR also compares the No Action Alternative to existing conditions in the NEPA findings. Please see Section 3.0.1, *Environmental Review Under NEPA and CEQA*, for a more detailed description of the baseline of comparison under both NEPA and CEQA.

2.1 No Action Alternative

Under the No Action Alternative, Reclamation would not issue a series of exchange agreements over a 20-year period with MPG and/or allow the storage and conveyance of non-CVP groundwater within federal facilities. Reclamation would continue to provide contractually obligated CVP water to Westlands and to its contractors around the Mendota Pool including the 25,000 AFY that was previously exchanged with the MPG.

Under the No Action Alternative, the MPG would discontinue their association, and up to 25,000 AFY of groundwater exchanged for CVP water would no longer be available to farmers with lands in Westlands. Further, the existing use of Laterals 6 and 7 by MPG to convey water from the Mendota Pool to farmlands in Westlands would be discontinued.[16] Westlands would continue to convey allowable quantities of non-MPG water from the southern end of the Fresno

[16] Direct conveyance through Laterals 6 and 7 is severely limited due to hydrologic conditions, a limited conveyance network, and the amount of lands served by the laterals that are retired. The conveyance of water would continue to be subject to Westland's Canal Integration Program, which reverse Lateral 7 flows from the Mendota Pool into the SLC. This Program is limited to 30,000 AF and only when CVP allocations are 20 percent or less. The current Program operates separately from the MPG 10-Year Exchange Program under 5-year Exchange Agreement and Warren Act Contract that expires in 2020.

Slough and SLC through Laterals 6 and 7 for irrigation. The management strategies (design constraints) included under the Proposed Action that limit and monitor groundwater pumping by MPG members would also no longer be implemented by the former members of MPG.

Groundwater pumping on MPG lands may eventually become part of the larger basin-wide management of groundwater resources required under the Sustainable Groundwater Management Act (SGMA) passed in 2014 (DWR 2018). However, groundwater pumping activities would no longer be internally coordinated between MPG members. SGMA designates the power to regulate groundwater basins to local Groundwater Sustainability Agencies (GSAs), which are required to adopt Groundwater Sustainability Plans (GSPs) by 2020. The GSPs are required to set objectives to achieve sustainability within 20 years of plan implementation (i.e., 2040), report data to DWR, mitigate overdraft, and address groundwater dependent ecosystems. As of May 2017, the DWR-approved GSAs within the Delta-Mendota and Westside Groundwater Subbasins include the Exchange Contractors, Westlands, Fresno County, FWD, Aliso Water District, Merced County, the City of Mendota, the City of Los Banos, Central Delta-Mendota Region Multi-Agency, Madera County and the Grasslands GSA. Fresno County is the GSA for the area immediately west of the Fresno Slough. Because these GSAs are still in the early processes of developing their GSPs, the groundwater management strategies to regulate the Delta-Mendota and Westside Subbasins are not fully known at this time. For instance, the GSPs may not require a reduction in withdrawal, but rather identify a series of recharge facilities and conveyance structures to offset groundwater pumping impacts.

Due to this uncertainty, forecasting the likely content of or schedule for implementation of potential actions is challenging. Because local authorities are still in the initial phases of groundwater study and the preparation of their GSPs, the effect of any specific management strategies cannot yet be quantified with certainty. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, it is also very likely that management strategies to reduce water use, such as more efficient irrigation systems, and an increase in the development of groundwater recharge facilities, would be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. These strategies are becoming more likely as federal and state grant money is being made available to address groundwater sustainability in the Central Valley. Because an exchange program that carefully manages pumping represents an existing example of the type of programs that may be required to achieve sustainable yield by 2040, some components of the Proposed Action could ultimately be incorporated into a GSP. Please refer to Section 3.0.3, *Related Projects* of this Draft EIS/EIR for a detailed description of the management strategies expected to be implemented, and their effect on MPG pumping, to achieve sustainable groundwater yield by 2040.

Until such time and without the design constraints of the Proposed Action, groundwater pumping for use on Adjacent Overlying Use would not be monitored by the MPG due to the disbandment of the MPG and the discontinuation of the Monitoring Program. Groundwater use by individual farmers would continue to be subject to federal, state, and local regulations to manage groundwater basins and maintain water quality for beneficial uses, but these regulations are currently less restrictive and subject to lower levels of enforcement than the project design constraints. While the level of regulation may change under planned GSPs, such provisions are not yet in place and details remain unknown. Under the No Action Alternative, it was estimated that approximately 33,395 AFY of groundwater pumping from MPG's Adjacent Overlying

Lands would be needed to support the following actions within this area: (1) continued irrigation of existing cropland, (2) reactivation of fallowed farmland, and (3) continuation of crop conversion trends from row crops to permanent crops such as almonds and pistachios. This irrigation demand was estimated based on crop evapotranspiration rates and irrigation efficiency, assuming that 90 percent of the 7,542 acres of MPG farmland within the Adjacent Overlying Lands would transition to permanent crops (which have an estimated water demand of about 5.1 AFY per acre) and 10 percent would remain fallow.[17] Although 33,395 AFY is the average pumping quantity anticipated under the No Action Alternative, further restriction may be applied by the future management actions under SGMA; however, as discussed above, a range of actions are possible from increased recharge to reductions in pumping.

The estimated groundwater pumping of 33,395 AFY from MPG's Adjacent Overlying Lands under the No Action Alternative would be less than what has been done under Existing Exchange Agreements (40,316 AFY), and the Proposed Action (38,316 AFY) due to cessation of pumping up to 25,000 AFY for exchange with Reclamation.

Outside of the Adjacent Overlying Lands, the individual response of MPG farmers in Westlands to the loss of 25,000 AFY of exchange water under the No Action Alternative is less predictable. Groundwater in the upper aquifer of the western San Joaquin Valley is of lower quality than in the Mendota Pool Area and not likely to be used.

Groundwater withdrawal from the lower aquifer has been associated with land subsidence in some areas.[18] Therefore, individual MPG farmer response in Westlands may vary from year-to-year over the 20-year period and would depend upon the availability of water from alternative sources, such as increased groundwater pumping where available, purchasing surface water on the open market when available, the cost of acquiring alternative water sources, crop prices, and the pending requirements of SGMA. Because each farmer's response would vary depending upon circumstances, a range of outcomes would likely occur.

Exchange water represents a supplemental supply in dry years to MPG farmlands in Westlands that are developed with permanent crops (e.g., orchards, vineyards), which require a reliable and continuous supply of irrigation water for the crop to survive. If exchange water becomes unavailable, these farmers may have to remove substantial areas of high-value permanent crops and instead switch to lower-value annual crops (e.g., alfalfa, wheat, barley) as they are more readily fallowed in dry years when there isn't sufficient water supply to meet demand.

Where farmlands are already developed with annual crops, farmers may fallow part of their land in dry years, resuming the farming of fallowed areas in wet years. Alternately, some farmers could decide to permanently retire some of their land to permit higher intensity cultivation of crops on remaining irrigated acreage, such as almonds or pistachios, which require a dedicated reliable water supply. Farmers may also turn to alternative agricultural uses to irrigated farmland that would not require substantial water sources, including the dry land farming of crops such as winter wheat, barley, or other grains, and dry land grazing. Feedlots may also be an alternative for a small portion of this land, although this use would also require a dependable water supply.

[17] Estimation of the remnant fallow land on Adjacent Overlying Lands is based on common agricultural practices of crop turnover rates and crop rotation.

[18] The primary cause of land subsidence within this area is associated with groundwater withdrawals from the lower aquifer, below the Corcoran Clay layer, where groundwater is of much higher quality than that of the upper aquifer. Refer to Section 3.6, *Land Subsidence*, for detailed discussion of this issue.

Lastly, in recent years, Westlands has been adopting land management practices to develop selected areas that are retired from farming due to lack of drainage and salt accumulation into solar projects. There are currently six completed solar projects and 31 planed solar projects (Westlands, 2018).

To capture the range of potential environmental impacts, the No Action Alternative evaluates two scenarios that are considered to be the outer range of reasonably foreseeable responses by MPG farmers in Westlands. Ultimately, the response would likely fall within the range of these two scenarios, depending upon their particular circumstances and water availability for each farming season. Under both scenarios, MPG farmlands in Westlands would continue to rely on their annual CVP allocations.

The first scenario assumes that MPG farmers in Westlands would adjust the use of their farmlands in the absence of exchange water, including changing agricultural practices, crop types, short-term fallowing or long-term retirement of farmland. In this scenario, it is estimated that up to 10,000 acres of farmland in Westlands would shift from cultivated, irrigated farmland to dry land farming or be fallowed or retired.[19] In addition to the 10,000 acres that would be fallowed, alternative agricultural uses are assumed to replace portions of 18,611 acres currently cultivated with non-permanent, annual crops. Similarly, several thousand acres of the 22,222 acres of permanent crops may shift to annual crops or be fallowed. This scenario assumes that no additional groundwater would be pumped in Westlands to replace the 25,000 AFY of exchange water that would have been used under the Proposed Action to continue to meet the water supply demands for these areas as had been done previously. Year-to-year crop production would be based on irrigation water available from CVP allocations and other sources. This scenario assumes the amount of retired farmland occupied by solar projects would remain unchanged.

The second scenario assumes that MPG farmers in Westlands maintain current crop production and type by meeting water supply demands from additional groundwater pumping from existing wells. Some individual farmlands may not have access to groundwater or use of groundwater may be constrained due to the physical limitations of the underlying geology. Given the poorer groundwater quality in Westlands, and other physical limitation, it is possible that groundwater could replace only a portion of exchange water currently available under the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension. Still, to provide a conservative analysis, the EIS/EIR evaluates the pumping of 25,000 AFY of additional groundwater in Westlands since lower quality groundwater can be blended with other sources, such as high-quality water sources available through the Westlands' Canal Integration Program (CIP), to be made suitable for irrigation.[20] Factors that would affect the availability of groundwater include the location and capacity of existing groundwater wells, crop types, fallowing, and the timing of well utilization in relation to the need for these wells. Similar to the Proposed Action, replacement groundwater wells may be constructed to replace existing wells, as needed. For example, normal irrigation

[19] The analyses in this Draft EIS/EIR assume that farmers in Westlands could reallocate approximately 2.5 AF of water per acre of land fallowed (based on the historic use of all applied water, including allocation, transfers, supplemental and groundwater sources). In order to compensate for the 25,000 AF of water that would not be exchanged, this analysis estimates that a total of 10,000 acres would need to be fallowed on an annual basis.

[20] It is assumed that farmers in Westlands would draw more water from the lower aquifer, were groundwater tend to be of much higher quality and more suitable for crop irrigation.

practices may require refurbishment or replacement of existing groundwater wells and some wells may be taken out of service during the 20-year period due to water quality impacts or declines in production.

2.2 Action Alternatives

This EIS/EIR includes analysis of two action alternatives: the Proposed Action and Alternative 2. Both alternatives include the 20-year Mendota Pool Exchange Agreements with some modifications, primarily consisting of a more extensive recharge component under Alternative 2.

2.2.1 Proposed Action

Reclamation's proposed federal action is the exchange of up to 25,000 AFY of non-CVP groundwater introduced into the Mendota Pool by the MPG for CVP water delivered via the SLC as well as the potential storage and conveyance of non-CVP water within federal facilities facilitated by the exchange as described in more detail below.

Under the Proposed Action, groundwater (non-CVP water) introduced annually into the Mendota Pool by the MPG over a 20-year period would be used by Reclamation to meet up to 25,000 AF of existing CVP water supply demands at the Pool, in exchange, a like amount of CVP water that would have been delivered to the Pool via the DMC would be diverted to the SLC at O'Neill Forebay and conveyed to Westlands for delivery to MPG lands in Westlands that are otherwise under contract to receive available CVP water.

Under the Proposed Action, MPG could pump a not-to-exceed total of 38,316 AFY, which includes up to 26,316 AFY for exchange and the remainder for Adjacent Overlying Use. In a year where 26,316 AFY is pumped for exchange, pumping for Adjacent Overlying Use would be limited to 12,000 AFY. Over the 20-year period of the Proposed Action, pumping for exchange would be capped at 421,053 AF, which equates to an annual pumping average of 21,053 AFY for exchange. The total amount of groundwater pumped would be dependent upon the amount of precipitation in a given year. For instance, the amount of groundwater pumped by MPG may be greater during a dry year and less in years where there is more rainfall and natural irrigation of crops.

The Proposed Action also incorporates design constraints, management actions, monitoring, and reporting requirements as well as a groundwater recharge component intended to replenish the local groundwater basin. The key components of the Proposed Action are as follows:

Groundwater Pumping for Exchange

The MPG would continue to pump groundwater from up to 75 existing groundwater wells and any potential replacement wells, with the majority of these wells located south of Mendota Dam and the remaining wells located within FWD (Figure 6). Under the Proposed Action, wells would supply water from the shallow zone and the deep zone of the upper aquifer. Although the MPG would forego any withdrawals from the lower aquifer by the end of the 20-year period under the Proposed Action, some limited water production would occur from the lower aquifer in the early stages of the 20-year period, prior to the two remaining composite wells being plugged by the

end of the 20-year exchange period to prevent groundwater withdrawal from the lower aquifer.[21] It is currently anticipated the remaining composite wells would be plugged prior to the start of the 2020 irrigation season. The mix of water withdrawals from the shallow and deep zones of the upper aquifer is anticipated to continue under the Proposed Action as it occurred in previous years, with more than half of the water pumped for exchange drawn from the shallow zone and the remaining water drawn from the deep zone. Shallow zone pumping for exchange would be dependent on deep zone pumping as follows: up to 14,316 AFY can be pumped from the shallow zone if 12,000 AFY are pumped from the deep zone. Deep zone pumping would be limited to 12,000 AF in any one year. A 1957 contract between Reclamation and FWD prohibits any FWD well from pumping in the shallow zone.[22] Thus, all FWD wells in the upper aquifer, which represent the MPG wells nearest the San Joaquin River, would continue to pump only from the deep zone as under existing conditions. As discussed above, given that MPG has one of the most rigorous agricultural water management practices in the study area, it is unclear to what degree implementation of a GSP may require a reduction in pumping as opposed to other actions such as enhanced groundwater recharge or more efficient irrigation. Please refer to Section 3.0.3, *Related Projects*, of this EIS/EIR for a detailed description of the management strategies expected to be implemented, and their effect on MPG pumping, to achieve sustainable groundwater yield by 2040, which happens to be toward the very end of the Proposed Action's 20-year exchange period.

Exchange Agreements

Under the Proposed Action, Reclamation would execute a series of exchange agreements with MPG over a 20-year period. Some of the exchange provisions previously authorized under the Existing Exchange Agreements would continue, however, stricter water quality standards have been included to ensure protection of the environment. Under the Proposed Action, MPG would be authorized to pump up to 26,316 AFY of water from groundwater wells, discharged directly to the Mendota Pool, and then, MPG would be authorized to exchange it for up to 25,000 AFY of water from the CVP at Check 13 of the DMC.[23] Groundwater pumping under the Proposed Action would be limited to a maximum of 421,053 AF and the exchange would be limited to a maximum of 400,000 AF over the 20-year period. The amount of water to be exchanged each year would vary based on a number of factors, including review of the monitoring data, the demonstrated effectiveness of the design constraints and management strategies (refer to *Monitoring Program, Design Constraints and Adaptive Management* below), changes required under the local GSPs, and concurrence of pumping quantities by Reclamation, the Exchange Contractors, and Wonderful Orchards.

The exchange of water is anticipated to primarily occur through existing CVP infrastructure and would be administered by Reclamation. Groundwater discharged into the Mendota Pool by MPG would be made available to Reclamation to satisfy existing CVP water contract obligations at the

[21] It should be noted that MPG pumping from the lower aquifer represents only a small fraction of the total groundwater withdrawals for transfer under the Existing Exchange Agreements. For instance, MPG pumping from the lower aquifer in 2014 accounted for only 3 percent of total pumping, or approximately 670 AF (LSCE & KDSA 2015; Appendix D).

[22] Contract No. 14-06-200-6221: Contract Between the United States and Farmers Water District. August 28, 1957.

[23] Under the Proposed Action, 5 percent of the water pumped into the Mendota Pool for exchange must remain in the Pool. Therefore, 26,316 AF of water pumped into the Pool for exchange results in 25,000 AF of water available for exchange.

Mendota Pool. An equitable quantity of exchange water would then be conveyed by Reclamation from the San Luis Reservoir to MPG farms in Westlands via the SLC rather than being conveyed to the Mendota Pool via the DMC.

As discussed above, MPG may also use Westlands existing infrastructure to convey allowable quantities of water to their properties for irrigation. Existing Laterals 6 and 7 would allow Westlands to convey Kings River flows from the southern end of the Fresno Slough. Any water exchange from MPG members in the Mendota Pool area to MPG members in Westlands through the Westlands conveyance system would be considered as part of the total exchange quantity authorized under the Proposed Action and be within the 25,000 AFY limit and other program limits. This infrastructure is also used to deliver other supplemental water supplies to Westlands such as CVP 215 surplus water and Kings River flows. While other non-MPG water (e.g., Kings River flows) may also be conveyed through Laterals 6 and 7, the ability to convey water through Laterals 6 and 7 is currently limited due to the availability of water, use of the laterals for other priority water transfers, and the limited amount of farmland that is served by these laterals (Figure 7). Westlands may consider construction of future interties from Laterals 6 and 7 to other parts of Westlands conveyance infrastructure which may allow for wider distribution (Westlands 2014).[24]

Groundwater pumping for the exchange program refers to all water discharged into the Mendota Pool by the MPG in accordance with the exchange agreements issued by Reclamation, and does not include water discharged into the Mendota Pool for Adjacent Overlying Use.

Adjacent Overlying Use

Under the Proposed Action, MPG would pump up to 38,316 AFY of groundwater, which includes up to 26,316 AFY for exchange and up to the remaining 12,000 AFY to irrigate Adjacent Overlying Lands. This water can be either applied directly to the farms on which the well is located or discharged to the Mendota Pool for use on MPG-owned land that is presently under irrigation around the Mendota Pool. This provision also requires that the portion of water pumped for Adjacent Overlying Use in FWD must be used within FWD. In years where less than 26,316 AFY is pumped for exchange, a corresponding increase in pumping may occur to irrigate Adjacent Overlying Lands.

Monitoring Program, Design Constraints and Adaptive Management

The Monitoring Program, design constraints, and an adaptive management approach established by the 1998 Final EIR, 2004 Final EIS and Settlement Agreements would continue under the Proposed Action, with revisions, and may also include possible new actions consistent with SGMA and local future GSPs. The goal of these provisions is to continually improve the groundwater pumping program and minimize associated environmental impacts.

MPG Monitoring Program

The MPG Monitoring Program has been revised under the Proposed Action and Alternative 2 to provide Reclamation with more frequent reporting among other things (Table 4). Specifically, field measurements of the location, flow volume and EC for each MPG discharge point to the

[24] Construction and use of these laterals is not analyzed in this document as the location, timing and size of such interties is unknown and would therefore undergo separate environmental review by Westlands pursuant to CEQA.

Mendota Pool would be provided to Reclamation in tabular format on a monthly basis during periods of exchange. This is in comparison to the previous Monitoring Program where this data is provided annually. The data and results of the monitoring program would continue to be summarized in an annual report prepared by the MPG, the Exchange Contractors, and Wonderful Orchards. The results of the monitoring program would inform the design of the subsequent year's pumping program.

MPG would continue to monitor well pumpage and water levels to determine effects of groundwater pumping on groundwater levels and flow direction on the same frequency as under the previous Monitoring Program, and evaluate the data from available extensometers, which measure compaction (subsidence) that may occur from groundwater withdrawals. Well water quality sampling results would be used to assess changes in groundwater quality. Surface water quality would also continue to be monitored for EC, TDS, major cations and anions, and trace elements (boron, selenium, arsenic, molybdenum, copper, iron, manganese, and zinc); sediment quality would be monitored with sediment sampling. The proposed monitoring program under the Proposed Action consists of the following components: sampling and data collection, measuring and monitoring, and results and evaluation (as listed in Table 3).

Monitoring data would be provided to Reclamation at the specified frequency for each parameter to verify pumping and monitoring plan implementation. In addition, monitoring data would also be provided to the USFWS and CDFW, among others, if requested, at the same intervals the data is provided to Reclamation. The Monitoring Program would continue to involve the participation of MPG and voluntary participation of several entities around the Mendota Pool, including the Exchange Contractors, Wonderful Orchards, SLDMWA, the City of Mendota, the United States Geological Survey (USGS), the DWR, and others.

Proposed Design Constraints Design constraints are management strategies to minimize impacts of groundwater pumping that were started under the Existing Exchange Agreements in 2001. Design constraints from these agreements would be continued, with modifications, under the Proposed Action. The modifications made to the previous design constraints when compared to those required under the Existing Exchange Agreements and Proposed Action can be made by reviewing the design constraints in Table 2. The two most substantial modifications to design constraints include a reduction in the maximum allowable TDS concentration in groundwater being discharged into the Mendota Pool, and more frequent reporting of collected data for better adaptive management. The design constraints apply to the annual pumping programs, pumping from the deep and shallow zones and to triggers based on the results of the annual monitoring program. The Proposed Action would include the design constraints listed in Table 4.

Based on the results of the surface water and groundwater monitoring program, the pumping program would be modified to reduce surface water quality impacts, particularly with respect to salinity and trace elements, and to minimize groundwater quality impacts and groundwater level variations associated with MPG exchange activities. The modifications would include measures such as reductions in total pumping, adjustments to timing of pumping, reduction or discontinuation of pumping from specific discharge points to the Mendota Pool and complete cessation of pumping and the exchange and/or conveyance of pumped groundwater. Such complete cessation of pumping and exchange or conveyance would occur only after Reclamation and MPG have reviewed the applicable monitoring or other relevant information and reasonably determined that such cessation is necessary to address the identified impacts.

Table 3: Proposed Monitoring Program Components

Category	Pumping and Monitoring Program Action	Responsible Agency and Task
Sampling and Data Collection	Sample groundwater from MPG wells on an annual basis for EC and TDS, and every other year for general minerals and trace elements (arsenic, boron, barium, copper, iron, manganese, molybdenum, selenium, and zinc).	Groundwater would be sampled by MPG and various non-MPG agencies (CCID, CCC, Wonderful Orchards, Covanta, Meyers Water Bank, Spreckels Sugar Company, City of Mendota). Groundwater sampling frequency by MPG would be every year for TDS and EC and biennially for general mineral and trace elements. Sampling frequency for non-MPG agencies could continue to vary in frequency. Both MPG and non-MPG data would be collected and compiled by MPG and reported to Reclamation annually by MPG in the Annual Report.
	Conduct monthly surface water quality monitoring during periods of exchange.	Grab sampling of surface water samples would be collected by MPG once a month. The data would be reported to Reclamation annually by MPG in the Annual Report.
	Conduct sediment sampling every 3 years – in the fall of the sampling year.	Sediment sampling would be completed by MPG every 3 years in the fall. The most recent data would be reported to Reclamation annually by MPG in the Annual Report.
Measuring and Monitoring	During periods of exchange, monitor with field measurements the location, flow volume and EC for each MPG discharge point to the Mendota Pool on at least a monthly basis.	Flow volume at discharge points would be monitored monthly by SLDMWA. EC would be measured at MPG discharge points by the MPG or SLDMWA. The data would be tabulated and provided to Reclamation every month by MPG in a tabular format during periods of exchange.
	Measure groundwater levels on a bi-monthly basis (at a minimum of six times a year).	Groundwater levels would be monitored by MPG on a bi-monthly basis. This data would be summarized and provided to Reclamation annually by MPG in the Annual Report.
	Conduct monitoring of compaction to estimate land subsidence in the vicinity of the Mendota Dam.	Subsidence occurring in the upper aquifer would be monitored continuously by MPG at the Fordel extensometer and the Yearout extensometer. The data would be summarized and provided to Reclamation annually by MPG in the Annual Report.
	Conduct flow meter calibration in accordance with manufacturer specifications.	Flow meters are calibrated by SLDMWA at least twice per year. The calibration results would be made available to MPG and provided to Reclamation annually in the Annual Report.
Results and Evaluation	Evaluate data from continuous EC recorders located at the DMC, the Exchange Contractors' intakes, MPG discharge points to the Mendota Pool, and the MWA at the intervals described in the right column (refer to Figure 35 in Section 3.3, *Surface Water Quality*, for location of recorders).	DMC EC would be monitored continuously by Reclamation at DMC Check 21 and by the Exchange Contractors' at their canal intakes. The EC levels would be monitored by MPG at MWA Sampling Location No. 9 by on a daily basis. The data from MWA would be summarized and provided to Reclamation annually by MPG in the Annual Report. Flow and EC measurements at MPG discharge points to the Mendota Pool would be reported at least once a month during periods of exchange to Reclamation by MPG to Reclamation.

Table 4: Proposed Design Constraints

#	Category	Design Constraint
1	Annual Exchange Program	By March 1st of each Year, the MPG shall declare its intent to conduct exchange pumping for that year and to provide a schedule and amounts for that year based on the expected CVP water allocation to be available to members of MPG that year.
2	Surface Water Rights	Restoration Flows entering Mendota Pool will be determined by measurement at the San Joaquin River gauge downstream from the Chowchilla Bifurcation structure (SJB). Restoration Flows will be subject to a 5% loss factor between SJB and Sack Dam, then will continue downstream and out of the Project Area. The 5% loss factor may be revised after the SJRRP's Mendota Pool Bypass and Reach 2B Improvement project is constructed. Restoration Flows are protected under Reclamation's San Joaquin River water rights, and will be tracked and reported pursuant to conditions of said water rights. In accordance with Paragraphs 13(f) and 13(h) of the Stipulation of Settlement, Reclamation will identify surface or underground diversions and causes of any seepage losses above those assumed in Exhibit B of the Settlement and take steps to prevent or redress any unlawful diversions of or interference with Restoration Flows.
3	Groundwater Pumping	Groundwater pumping for exchange will be subject to a 5% leave in the Mendota Pool. Total exchange pumping shall not exceed 26,316 AFY (which is 25,000 AFY exchanged). Total exchange pumping over the life of the project shall not exceed 421,053 AF (which is 400,000 AF exchanged).[1]
4		Exchange pumping from the deep zone (of the upper aquifer) shall be conducted primarily during March, April, and May, and from September through November. No exchange pumping from the deep zone (of the upper aquifer) shall be conducted during June, July, and August of any year unless expressly permitted by the Exchange Contractors, Wonderful Orchards, and Reclamation.[2]
5		Exchange pumping from the deep zone (of the upper aquifer) shall not exceed 12,000 AFY during any one year.[2]
6		Exchange pumping shall not be conducted more than 10 months of any year.
7		Shallow zone pumping (of the upper aquifer) may be limited due to: 1) the quality of water pumped from these wells, 2) potential impacts to deep zone (of the upper aquifer) groundwater (e.g., a decline in groundwater level or groundwater quality), and 3) a potential decline in groundwater levels of the shallow zone (of the upper aquifer). Shallow zone pumping may also be limited due to San Joaquin River surface water flows as described in Design Constraint No. 2 above, as determined by Reclamation.
8		During exchange years, the amount of groundwater pumped for use on Adjacent Overlying Lands shall not be greater than 12,000 AF in any year unless there is a corresponding reduction in the amount of exchange pumping that year.
9	Subsidence	Exchange pumping from the deep zone (of the upper aquifer) shall not exceed an amount that will cause subsidence at the Mendota Dam from data collected from the Yearout Ranch and Fordel Extensometers due to exchange pumping to average more than 0.005 feet per year.[2,3]
10		Before the end of the 20-year period of the Proposed Action, MPG would no longer withdraw water from the lower aquifer, having either successfully sealed the lower aquifer portion of the remaining composite wells or discontinuing production due to potential subsidence impacts.[2]
11	Groundwater Quality	Exchange pumping from the shallow zone (of the upper aquifer) shall be reduced if it is determined that exchange pumping from the shallow zone significantly affects the quality of water in the deep zone (of the upper aquifer) in the Exchange Contractor and Wonderful Orchard service areas due to the interception of good quality water that would otherwise reach the deep zone in the Exchange Contractor and Wonderful Orchards service areas.[2]
12		Minimize groundwater quality degradation by modifying the pumping program, based on the results of predictive modeling of the effects of the pumping program and the results of the groundwater monitoring program, and by minimizing drawdowns.

Table 4: Proposed Design Constraints (Continued)

#	Category	Design Constraint
13	Surface Water Quality	Pump MPG wells along the west side of the Fresno Slough only when flow in the Fresno Slough is to the south. Wells in FWD could pump irrespective of flow direction in the Mendota Pool.
14		Curtail MPG discharge into the Mendota Pool west of the Fresno Slough if EC measurements at the Exchange Contractors' canal intakes exceed that of the DMC by 90 µmhos/cm for a period of three consecutive days or more. If the MPG wells were shut off for this reason, they would not be turned back on until the EC at the canal intakes returns to a level that is no more than 30 µmhos/cm above the DMC inflow.[4]
15		Implement annual pumping programs to comply with monthly and annual surface water quality criteria for water flowing into the MWA and measured at Sample Location 9 (refer to Section 3.3, *Surface Water Quality* and design constraints 16–18 immediately below). The goal is to minimize overall surface water quality degradation, particularly with respect to salinity (TDS or EC) entering the MWA.
16		The quality of water flowing into the MWA and measured at Sample Location 9 (see Figure 36 for this location) shall not exceed a monthly average of 600 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.
17		During the Fall (September, October, and November) pumping period when water quality at the MWA is most critical, the quality of water flowing into the MWA and measured at Sample Location 9 shall not exceed a monthly average of 450 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.
18		The average quality of water flowing into the MWA and measured at Sample Location 9 in any given year shall not exceed an annual average of 450 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.
19		Shut off wells with selenium concentrations equal to or greater than the water quality criterion of 2 µg/L.
20		Shut off wells with boron concentrations equal to or greater than the water quality criterion of 800 µg /L.
21		Modify the pumping program based on the results of the surface water monitoring program to reduce overall surface water quality degradation, particularly with respect to salinity (TDS or EC). This will ensure that the quality of water supplied to the MWA and other users in the southern portion of the pool will meet applicable water quality criteria. MPG discharge points into the Mendota Pool with TDS concentrations greater than 1,600 mg/L will not be pumped for exchange into the Pool (or greater than 1,200 mg/L during September, October, and November).

[1] Design constraint No. 3 requires five percent of the MPG groundwater pumped into the Mendota Pool for exchange to be left in the Pool to compensate for conveyance losses and seepage that occurs from the Pool. Separately, Design Constraint No. 2 establishes a five percent loss factor for Restoration Flows in the San Joaquin River between SJB and Sack Dam to account for seepage into the river bed.

[2] The deep zone of the upper aquifer is defined as those perforated intervals below the A-clay layer and above the Corcoran Clay layer within the upper aquifer, while shallow wells are defined as those perforated intervals above the A-Clay layer or equivalent.

[3] Compaction data collected from the extensometers are used along with model results to estimate the proportion of compaction that is attributed to MPG deep zone transfer pumping each year.

[4] If the MPG wells were shut off for this season, they would not be turned back on until the EC at the canal intakes returns to a level that is less than 90 µmhos/cm above the DMC inflow.

Adaptive Management Under the Proposed Action, the adaptive management program would be continued with revisions aimed at better reducing potential adverse effects to water quality in the Mendota Pool. Exchange Agreements with Reclamation would be issued either on an annual or multi-year basis subject to annual review and concurrence of the Exchange Contractors and

Wonderful Orchards. Further, similar to the process under the Existing Exchange Agreements, a pumping program would be developed by MPG on an annual basis and reviewed by the Exchange Contractors, Wonderful Orchards, and Reclamation to allow for year-to-year variations in hydrologic conditions. Each exchange agreement under the Proposed Action would be based on consideration of several factors, including the design constraints listed in Table 4 (e.g., water quality at Exchange Contractor's canal intakes, MPG discharge points, or MWA) and the results of the monthly TDS data and the annual reporting program. As with the Existing Exchange Agreements, the annual pumping program negotiated with Reclamation, Westlands, and other stakeholders at the beginning of each irrigation season (March 1st) would take into consideration the monitoring results of previous exchange years and design that specific year's exchange program based on those results.

In addition to the existing adaptive management program, the Proposed Action would include collaboration between water users in the Mendota Pool area, with the goal of reducing possible adverse impacts to surface and groundwater conditions in the area related to pump-ins and withdrawals from the Mendota Pool and groundwater for other uses, including municipal, industrial, and agricultural use. Collaboration activities would include compilation of available data and establishing regular and varied communications so that water users can coordinate activities in the Mendota Pool and Fresno Slough area. Reclamation and the MPG would collaborate with the Exchange Contractors, City of Mendota, Tranquillity Irrigation District, James Irrigation District, Reclamation, Westlands, CDFW, and Meyers Groundwater Bank.

As discussed above, MPG members may also become part of one or more GSAs for the southern portion of the Delta-Mendota Groundwater Subbasin, within which MPG's activities occur. The GSAs for these groundwater management agencies are expected to submit GSPs by 2020 and demonstrate sustainable management of groundwater resources by 2040.

Storage and Conveyance of Non-CVP Water in Federal Facilities

As noted above, the Proposed Action includes the potential for storage and conveyance of non-CVP water in federal facilities pursuant to the Warren Act of 1911. The MPG proposes the temporary storage of up to 25,000 AF of non-CVP water in the San Luis Reservoir for periods up to 12 months. The non-CVP water stored in the San Luis Reservoir would subsequently be released upon request from the MPG and conveyed via the SLC to MPG lands in Westlands.

Groundwater Recharge

The Proposed Action includes a new groundwater recharge component that would facilitate the percolation of surface water to increase the amount of recharge occurring in the groundwater basin. The purpose of the groundwater recharge component is to lessen potential effects of groundwater pumping under the exchange program in the region.

Groundwater recharge facilities under the Proposed Action would include activation of a recharge canal on Terra Linda Farms' River Ranch, to the west of the Fresno Slough, referred to as the Terra Linda Farms Recharge Canal (Figure 8), and MPG contributions to four existing recharge ponds on NCR, referred to as the NCR Recharge Ponds (Figure 6) when there is not conflicting use by Wonderful Orchards. The Terra Linda Farms Recharge Canal is an existing unlined canal approximately 9,000 feet in length and averaging approximately 75 feet in width. The total potential additional recharge potential above existing levels and attributable to MPG during the 20-year life of the Proposed Action is conservatively estimated to be 23,169 AF.

Groundwater recharge from the Terra Linda Recharge Canal is estimated to be 4,127 AF over the 20-year period, while MPG contributions to the existing four NCR Recharge Ponds is estimated to be 19,042 AF. MPG would maximize groundwater recharge from the available sources discussed below.

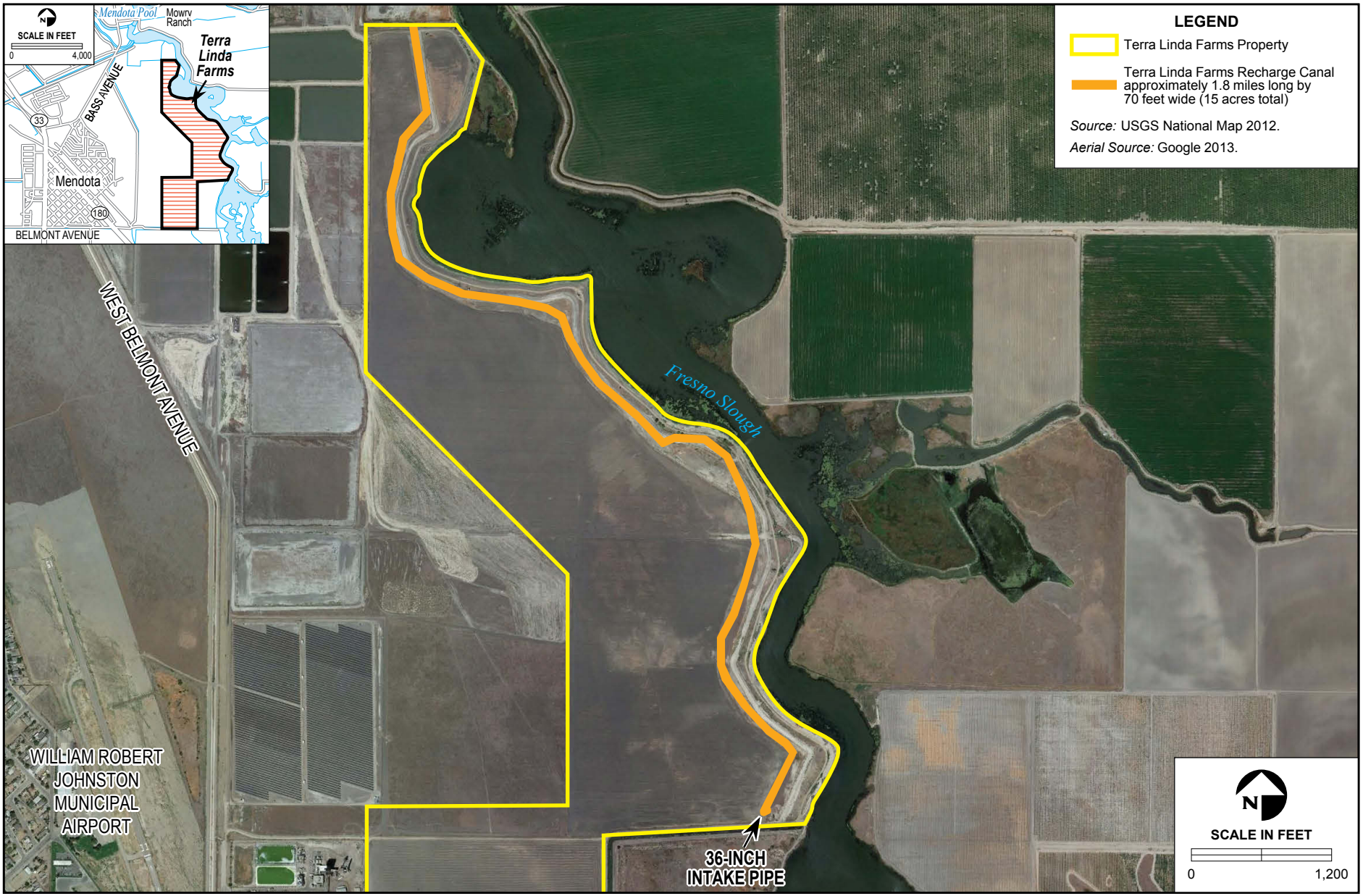
Potential Water Sources for Recharge In order to implement the recharge component of the Proposed Action, MPG would acquire supplemental water supplies that can be used for recharge. Water reaches the Mendota Pool from three different sources: flood flows from the Kings River (via Fresno Slough); the San Joaquin River; and the DMC. MPG could potentially use water from any of these sources for recharge, depending on availability, however, this analysis assumes that only flood flows from the Kings River would be available for use in the Proposed Action's groundwater recharge components because the flood flows are not contractually obligated for other uses. Based on a review of flood flow data, flood flows from the Kings River are predicted to be available for recharge at the Terra Linda Recharge Canal in up to eight years of the 20-year exchange period and up to four years at the existing four NCR Recharge Ponds.

Additional sources may include spot market water purchases and Section 215 surplus CVP water, potentially including surplus water for South of Delta Contractors from the Delta, however, these sources are not included in this analysis. These additional sources are not expected to be as available as flows from the Kings River, but may be periodically available in the future due to the changing water supplies in the area. If and when such potential additional future water sources become available for this project, MPG would comply with all appropriate regulatory review and compliance measures prior to use of such sources. The analysis also assumes that no San Joaquin River flows, including Restoration Flows, would be available as a source of water for groundwater recharge at any of the recharge facilities planned the Proposed Action.

Replacement Groundwater Wells

Replacement groundwater wells may be constructed as part of the Proposed Action to replace existing wells, as needed. For example, normal irrigation practices may require refurbishment or replacement of existing groundwater wells and some wells may be taken out of service during this program due to water quality impacts or declines in production. As implemented under the Existing Exchange Agreements, MPG may replace these wells with others as necessary. In addition, an unknown number of MPG wells along the San Joaquin River may be affected, relocated, or removed from service due to the changes associated with the SJRRP or poor groundwater quality. Any potential replacement wells would only be constructed in the shallow and deep zones of the upper aquifer.

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Terra Linda Farms Recharge Canal

FIGURE 8

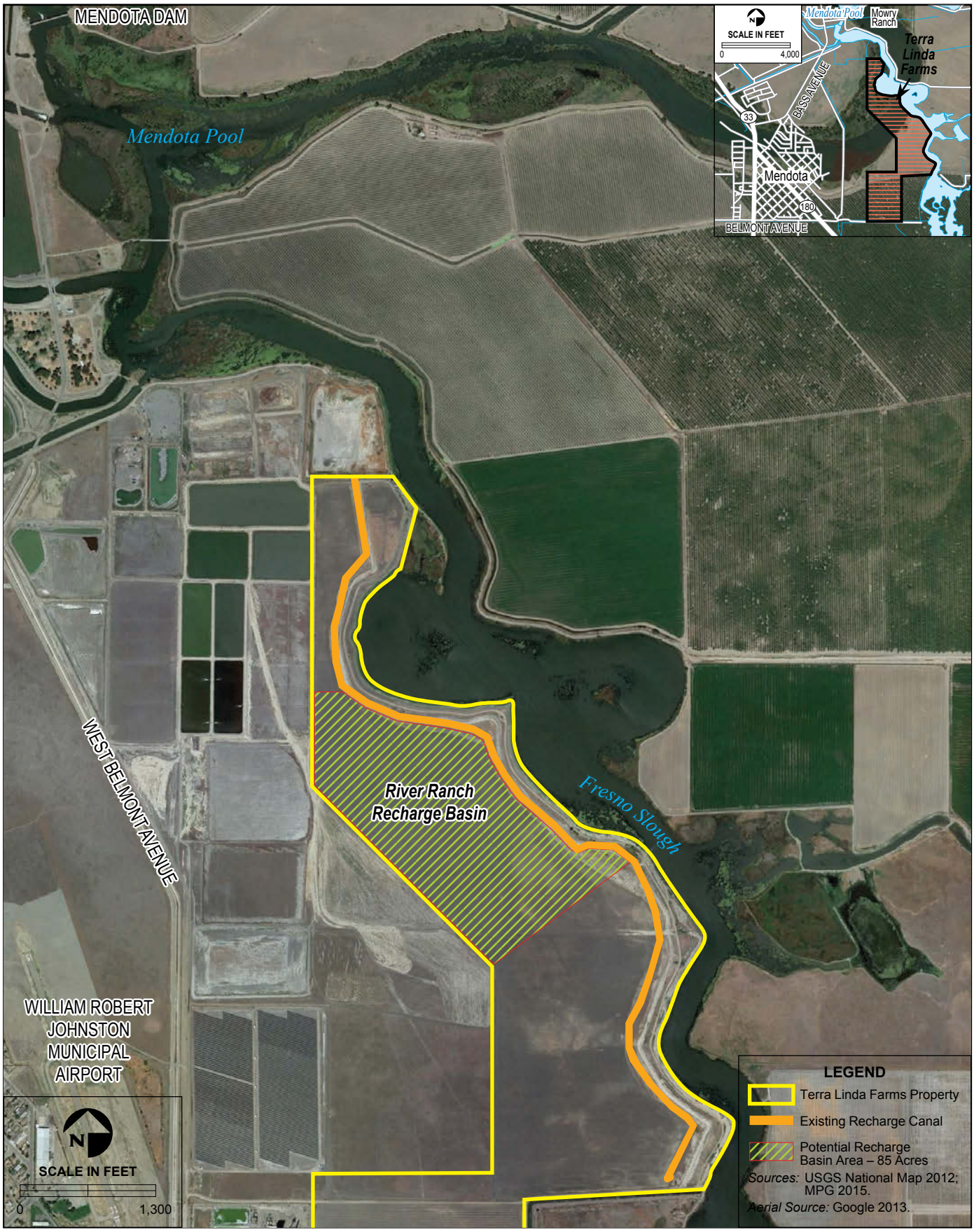
2.2.2 Alternative 2: 20-Year Exchange Program and Additional Groundwater Recharge Facilities

Similar to the Proposed Action, this alternative would include a 20-Year MPG Exchange Program as described in Section 2.2.1, but in addition to utilizing the existing Terra Linda Farms Recharge Canal and four existing NCR Recharge Ponds for groundwater recharge, MPG would also construct and operate a groundwater recharge basin adjacent the Terra Linda Farms Recharge Canal. The proposed recharge basin, referred to as the River Ranch Recharge Basin, would replenish underlying local groundwater aquifers. This analysis assumes that flood flows from the Kings River would also be the source of water for River Ranch Recharge Basin and that flows would be available for the same eight years (over the 20-year period) that they're available to the Terra Linda Farms Recharge Canal under the Proposed Action. By providing an additional recharge facility, this alternative would offset drawdown of local groundwater aquifers to a greater extent than under the Proposed Action and, in doing so, reduce the potential for undesirable effects such as groundwater level declines and migration of the naturally-occurring saline groundwater front west of the Fresno Slough.[25] The River Ranch Recharge Basin under this alternative would function solely for the purpose of recharging the local groundwater aquifer and would not be used as a water bank (e.g., Meyer's Water Bank) wherein water is contractually recharged, banked and extracted for later use. Under this alternative, the MPG would maximize recharge with the goal of achieving over 43,000 AF of recharge over the 20-year exchange period by constructing the River Ranch Recharge Basin, activating the Terra Linda Farm Recharge Canal, and contributing to the existing four NCR Recharge Ponds, dependent upon the availability of water supplies and capacity of recharge facilities.

Design of River Ranch Recharge Basin (Alternative 2 Only) The River Ranch Recharge Basin would be located in the northern portion of the Terra Linda Farms' River Ranch property near the west bank of the Fresno Slough, immediately adjacent to the Terra Linda Farms Recharge Canal (Figure 9).

The conceptual design of the River Ranch Recharge Basin would consist of a single large basin that is approximately 85 acres in size (Figure 10). This acreage estimate allows for at least a 25-foot-wide setback from the toe of the outer wall of the recharge basin from the property lines and roadways, allowing suitable access for maintenance activities and minimizing any potential erosion impacts on adjacent properties. The recharge basin would be constructed through excavation, and the excavated material would be uses to construct 5-foot-tall berms surrounding the basin. Excavation and fill would be balanced onsite.

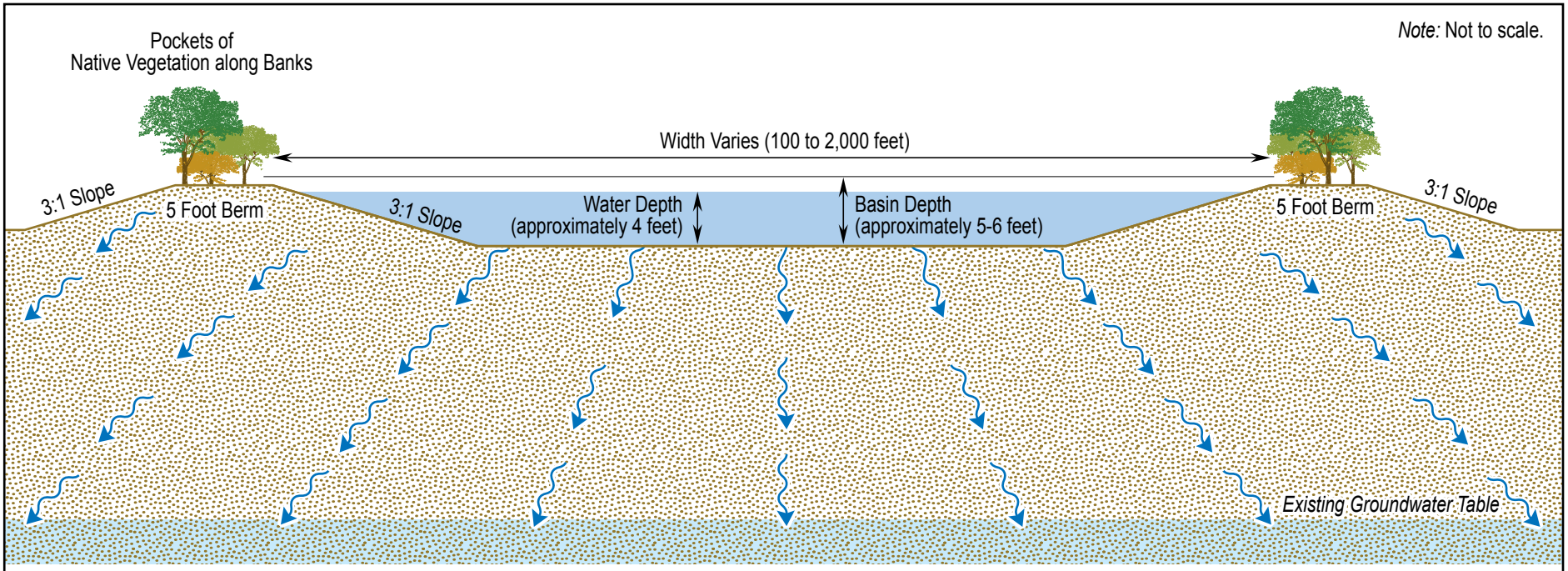
[25] In the Primary Study Area, regional groundwater flows in the upper aquifer are northeast towards concentrated areas of lower groundwater levels (i.e., a cone of depression) in Madera County, with poorer quality (high salinity) groundwater drawn east by these cones of depression and toward the Fresno Slough. The northeastern movement of this naturally-occurring "saline front" over the last several decades has impacted groundwater quality west of the Fresno Slough.



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River Ranch Recharge Basin Location

FIGURE 9



River Ranch Recharge Basin Properties	
Potential Recharge [1] over 20-year Life of Program	20,000 acre feet (based on 85-acre basin)
Water table depth below ground surface	25 feet (average) – acceptable space for recharge water
Soil conditions in upper 10 feet	Dense soils in top 6 feet in some areas require excavation, boring, or ripping required
Soil conditions from 10 feet below to water table	Very porous with minimal clay layers
Proximity to the Fresno Slough	Adjacent – could provide new habitat for giant garter snake

1. Total recharge over the 20-year life of the program is based on a 4-foot depth capacity, historic availability of Kings River flood flows, and historic recharge rates in the surrounding area. Average area recharge rate of 0.3 AF per acre per day was used; however, soil conditions indicate recharge may be higher.

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River Ranch Recharge Basin Conceptual Section

FIGURE 10

The River Ranch Recharge Basin would have a total depth of approximately 5 feet 3 inches, with 5 feet of this depth comprised of berms that surround the basin and the remaining 3 inches comprised of the excavated area below the existing ground surface. This height would allow for a 4-foot water depth with 1 foot 3 inches of freeboard to the top of the berm. The side slopes would be approximately 3:1 for both the inside and outside slopes (i.e., 3 feet of horizontal distance for every 1 foot of vertical distance), with an approximately 5-foot wide plateau at the peak of the berm. Therefore, the unsubmerged portions of the basin (i.e., the outside slopes, top of the berm, and freeboard on the inside slope) would comprise approximately 4 acres of the 85-acre basin area. Recharge would occur along the submerged portions of the interior side slopes as well as across the floor of the basin. The submerged portion of the side slopes would comprise approximately 2 acres of the basin's area and the floor area of the basin would be approximately 79 acres, for a total of 81 acres of submerged land.

The River Ranch Recharge Basin site has moderately to highly permeable sandy soils that are well suited for recharge; however, limited areas of dense soils or clays in the upper 6 feet would require initial basin design elements and regular maintenance to ensure adequate percolation. The three methods that would be used to increase percolation through areas with these clay layers include:

1. During the initial construction, areas where the clay layer is entirely within the top 2 feet of soil, this layer would be excavated and reused as fill for berm construction. The pit where this material was located would then be filled with sandy soil from the area above the clay or from the surrounding area to bring the grade back up to the surrounding area, which would be graded to three inches below the existing grade.

2. In areas where there are layers of clay or dense materials below the top 2 feet of soil, gravity drains would be constructed every 300 feet to allow water to percolate down past these layers. The gravity drains would be 60-foot diameter holes that are drilled down to the bottom of the clay layer, bored out, and then filled with permeable material such as sand or gravel.

3. The entire basin would be ripped down to 6 feet to loosen the soil and break up any dense soil and clay. This deep ripping would allow water to percolate through this layer more quickly.

Recharge Basin Maintenance The River Ranch Recharge Basin would require maintenance in order to maintain projected recharge rates. Typical maintenance practices would include annual tilling to control vegetation growth and occasional deep ripping of the basin bottom and the inner banks to up to six feet in depth to maintain percolation rates; deep ripping would occur once every two to ten years, depending on recharge basin use and percolation rates. Tilling and deep ripping would require use of a tractor (tilling) or bulldozer (deep ripping) and a work crew of approximately two people, and would occur over a period of one to two days. New vegetation that grows on the inside slopes and between vegetation clusters would be regularly removed to ensure that the stability of the bank slopes is not compromised. Tilling or deep ripping activities would be timed to minimize or avoid adverse effects on wildlife (e.g., bird nesting seasons).

2.3 Alternatives Considered But Discarded

2.3.1 Reduced Pumping For Exchange Alternative

Under the Reduced Pumping for Exchange Alternative, MPG pumping for exchange would be substantially reduced from the 25,000 AFY limit.

This alternative is eliminated from further consideration as the reduced pumping limits would not fulfill the purpose and need or objectives of the MPG exchange program and local Mendota area impacts resulting from the reduced pumping are expected to be similar to the No Action Alternative. For instance, the purpose and need of the Proposed Action is to continue crop production on historically irrigated MPG farmlands. Since the Proposed Action proposes 25,000 AFY of exchange for use on farmlands within Westland, any reduction in exchange would result in either a reduction in farmland in production or a change from permanent crops to dry farming practices. This result is similar to that of the No Action Alternative and the result is that crop production in Westlands would be reduced from historical conditions, and therefore, would not meet the purpose and need of the Proposed Action. Further, similar to the No Action Alternative, this alternative would potentially have more severe impacts than the Proposed Action with regards to agriculture, groundwater and other resources within Westlands.

Anticipating the continuation of the exchange pumping program – which started as a supplemental water source for MPG farmlands in Westlands during periods of reduced CVP allocations, but has become a primary water source of water due to more frequent reductions in CVP allocations – MPG farmers have planned their agricultural operations by planting thousands of acres of long-term, high-value crops that require a reliable source of quality irrigation water. For example, one farm has recently planted 525 acres of pistachios. Adequate water supplies may not be available under this alternative to sustain long-term crops that cannot be fallowed for a growing season without permanent loss. From a practical standpoint and from the perspective of a planned business cycle, the production of these crops becomes uneconomical under a program which may significantly limit available water supplies, such as this alternative.

When considering the exchange of water for use in Westlands, it is important to note that environmental impacts in the Mendota Pool area are based primarily on the quality of water discharged into the Mendota Pool, as well as localized areas of groundwater decline and subsidence, and not the overall quantity of water discharged. In this manner, because the design constraints would remain the same as under the Proposed Action and Alternative 2, there are no environmental impacts that are reduced simply by reducing the volume of water exchanged. Further, there is the potential that any reduction in pumping for exchange would be replaced by a corresponding increase in pumping for Adjacent Overlying Use. Therefore, this alternative may ultimately not result in a reduction in MPG pumping in the Mendota Pool area.

2.3.2 Shorter Exchange Period Alternative (10 Years vs. 20 Years)

This alternative would reduce the Exchange Agreements from a 20-year period to a 10-year period. However, this alternative was discarded from further consideration as a 10-year period would not fully meet the purpose and need of the exchange program given that the planning for this program can take up to ten years to develop

Further, a 10-year period for transfer under this alternative would not allow for an in-depth tracking and assessment of possible effects on groundwater resources. The current monitoring

and modeling efforts demonstrate that groundwater resources respond slowly to Project pumping, that trends are gradual and that a reduced time period would not allow for measurement of relationship between the wet and dry season alterations, long term land use trends and even longer term climatic changes. As such, this alternative would not support a full assessment of long term impacts on groundwater resources. A longer duration for analysis is able to better depict long-term groundwater level and quality trends and associated potential for impacts.

Lastly, the continued cultivation of permanent crops (e.g., almonds, pistachios) afforded under the 20-year exchange period may not be economically feasible under a 10-year exchange period. This is because these crops take several years to reach maturity, the crops may only begin to yield maximum harvest by the cessation of a 10-year exchange period. If subsequent renewals are unavailable, then these crops may need to be removed, and the economic impact is greater than under the Proposed Action. As a result, this alternative does not fully meet the purpose and need of the Proposed Action to continue crop production on historically irrigated MPG farmlands.

2.3.3 Additional Recharge Facilities Alternative

Under this alternative, MPG would add additional facilities for increased groundwater recharge beyond the Terra Linda Farms Recharge Canal, MPG contributions to the four existing NCR Recharge Ponds, and the River Ranch Recharge Basin identified in Alternative 2. Because of the continued migration of the naturally-occurring saline front, this alternative would require any additional recharge to occur on the west side of the Fresno Slough to maintain MPG pumping in the Mendota Pool area.

To ascertain feasibility of this alternative, Cone Penetration Testing was conducted in 2013 on MPG lands west of the Fresno Slough to identify potential areas that could be utilized for artificial groundwater recharge via infiltration. The results of the testing identified the site within Terra Linda Farms – River Ranch North as suitable for a groundwater recharge basin. This resulted in the River Ranch Recharge Basin proposed under Alternative 2. Regarding soils further south along the west side of the Fresno Slough, initial soil testing for the Meyers Water Bank indicated that soils west of the Fresno Slough across from the Meyers Water Bank, contain a clay content and lower rate of permeability that prevent them from being suitable for groundwater recharge. Other sites within the southern portion of River Ranch North, and River Ranch South and Britz areas also contain extensive areas of impermeable clay layers at shallow depths that are not suitable for artificial groundwater recharge. Inclusion of additional recharge facilities on other MPG lands would also result in the loss of agricultural resources and land that is actively farmed. Therefore, this alternative was eliminated from further consideration because the reduction of existing farmland does not meet the purpose and need of the Proposed Action to maintain crop production on historically irrigated MPG farmlands.

2.3.4 Aquifer Storage and Recovery Injection Well Alternative

This alternative would involve additional groundwater recharge using injection wells as opposed to a recharge basin. Challenges for implementation of this alternative include the need for extensive water treatment, operational issues, and cost. The primary source of water for injection would be Kings River flood flows. Flood flow water injected into the wells would be required to meet strict EPA and State of California water quality regulations that include drinking water

standards among others. Treatment of the injected water also would be required to achieve a water chemistry compatible with the natural groundwater conditions so that well fouling and formation plugging does not occur from precipitates. Pre-injection water treatment would require construction of a sophisticated treatment plant in proximity to the injection wells that would have the capacity to treat large volumes of flood flows. As flood flows are projected to only occur for only up to eight years of the 20-year period, there would also need to be a storage and conveyance system to retain the flood flows for even and continuous distribution to the injection wells. Construction of the treatment plant, storage facilities and conveyance system would involve a large footprint resulting in additional environmental impacts. Such a plant would have high energy requirements and would put a strain on local supplies. In addition, the treatment plant would produce potentially toxic solid and liquid wastes that would have to be stored and transported a great distance for disposal.

Further, injection wells have a limited capacity for recharge. A well may be able to have about 100 AF a month injected if operated on a 24/7 basis; however, wells are typically not operated 24/7 due to water availability and the timing of flood events. Infrequent use of the injection wells due to the timing of flood flows results in the need for more maintenance to minimize biofouling and other issues to maintain well performance. Overall, in order to recharge 23,000 AFY over the 20-year life of the program, approximately 15 injection wells would be required, costing $2 million per well. Because of its prohibitively high cost and relatively infrequent use, this alternative the purpose of the Proposed Action to ensure the continued availability of affordable, reliable, good quality irrigation water. In summary, due to additional impacts from the construction of treatment, storage, and conveyance facilities, disposal of waste product, potentially higher impacts from operation and maintenance of facilities (compared to a groundwater recharge basin), and the cost-benefit of well injection compared to other recharge methods, this alternative is discarded from further consideration.

2.3.5 Extremely Deep Groundwater (Below Lower Aquifer) Alternative

This alternative would pump greater volumes of groundwater from the lower aquifer, which contains higher quality groundwater than the upper aquifer, for exchange with Reclamation via the Mendota Pool. While the utilization of lower aquifer groundwater may incrementally improve surface water quality, pumping from the lower aquifer would conflict with the Design Constraints and would likely result in substantially greater subsidence impacts. Therefore, this alternative is discarded from further consideration.

2.3.6 Treatment of Saline Groundwater Alternative

This alternative would involve the treatment of groundwater from wells with higher TDS values prior to entering the Mendota Pool. This would require the construction of a treatment facility such as a desalination plant west of the Fresno Slough. In addition to construction impacts associated with the construction of a treatment plant, the plant would produce waste product that would be need to be disposed. Options for wastewater disposal include deep well injection, evaporation, land disposal, and trucking. These methods of disposal would result in additional environmental impacts to water quality and biological resources. For example, evaporation techniques may result in land impairment where salts and trace elements leach into the ground, and may effect nearby wildlife. Further, a treatment or desalination plant would be very energy intensive, resulting in greater air quality and greenhouse gas (GHG) emissions. Due to the

potential for greater environmental impacts, this alternative is discarded. Further, this alternative would be costly, with water treatment estimated at $200 to $1,500 per AF of treated water.

2.3.7 Water Recycling (Non-Potable Re-Use) for Irrigation of MPG Farmlands

Under this alternative, recycled water from a nearby municipality would be conveyed to MPG lands to be used for irrigation of farmlands. However, the City of Mendota wastewater treatment plant already discharges effluent into a series of settling/percolation ponds just west of the Fresno Slough and within the Primary Study Area. Because the percolation ponds are within immediate proximity of the MPG wells west of the Fresno Slough, this percolated water indirectly benefit the exchange program by helping to maintain groundwater levels near these wells. Using recycled water from the City of Fresno would require the installation of over 30 miles of conveyance infrastructure, meaning the construction and operation costs of the water line are not a cost-effective solution to irrigate a limited area of MPG farmland. The construction of a 30-mile pipeline may also result in potentially significant construction and operational environmental impacts. Because the cost to construct and operate a recycled pipeline from the City of Fresno is not justified by the amount of agricultural land that would be irrigated, this alternative does not meet the purpose to ensure the continued availability of affordable, reliable, good quality irrigation water. Therefore, this alternative is eliminated from further consideration.

2.3.8 Spot Purchase Water on the Open Market

Under this alternative, MPG would spot purchase up to 25,000 AFY on the open market. Because the water must be readily available through the growing season, this alternative assumes that all purchases on the open market would be spot purchases. Because suitable groundwater for irrigation is relatively plentiful near the Mendota Pool, this alternative assumes that all water purchased on the open market would be used to irrigate MPG lands in Westlands. Since the CVP facilitates the trading of water on the open market, MPG farmlands in Westlands would also be better positioned to utilize the CVP conveyance network. By irrigating farmlands with purchased water, MPG would no longer need to exchange groundwater with Reclamation and the 25,000 AFY of CVP water exchanged under the Proposed Action would instead be delivered rather than transferred.

In the Central Valley, the availability and cost of water on the open market is highly variable. During years when Article 215 surplus CVP water is available, MPG farmers in Westlands would be able to take advantages of these surpluses, which were priced at $125–$135 per AF in 2017. Water prices on the open market are strongly correlated with water supply availability, with the highest cost occurring during dry years when there is the highest demand for supplemental irrigation water. For example, during 2011, a wet year, spot purchases in California averaged $77 per AF. Two years later, in 2013, a drought year, the price averaged $190 per AF, representing an increase of 246 percent in just two years (WestWater Research, 2014). Taking delivery of water purchased on the market can be challenging. Since the CVP facilitates the trading of water on the open market, MPG farmlands in Westlands may be able to take delivery through the SLC, if capacity is available. However, canal conveyance and pumping capacity limitations, as well as fees and priorities for accessing the capacity, can greatly constrain the ability to take delivery, and meaningfully increase the price per AF. To hedge against the wide variation in price and potential challenges in taking delivery of water purchased on the open market, farmers would be limited in the types of crops that could be farmed, and would likely be limited to the production of lower value annual crops (e.g., alfalfa, wheat, barley) as they are

more readily fallowed in dry years when there isn't sufficient water supply to meet demand. Because water purchased on the open market is typically more expensive than CVP water and/or groundwater, the price of open market water can vary substantially, and is more susceptible to capacity constraints in the conveyance system, it offers no economic or environmental benefit to MPG farmers, who are well served by the CVP system and groundwater wells. Therefore, this alternative does not meet the purpose to provide affordable, reliable, and good quality water in order to maintain production on historically irrigated lands, and is thus, eliminated from further consideration.

2.4 References

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Section 3 Scope of Impact Analysis

3.0 Introduction to Environmental Analysis

This section provides an introduction to Sections 3.1 through 3.14, including a discussion about how the analyses are performed under both NEPA and CEQA and a review of which resource areas are analyzed in this EIS/EIR. Sections 3.1 through 3.14 summarize the environmental and regulatory setting for 14 resource areas, as well as other additional environmental considerations, and analyze potential environmental effects related to each of these resource areas. The analyses include descriptions of methodology, significance criteria, environmental impacts, and mitigation measures for direct and indirect impacts.

3.0.1 Environmental Review under National Environmental Policy Act and California Environmental Quality Act

Requirements for the environmental analysis under NEPA and CEQA are similar, but differ in how the analysis is performed and presented. This section presents the requirements under each Act, as well as the methodology and general assumptions used to performing the environmental analysis contained in this EIS/EIR. Specific assumptions, methodology, and significance criteria (or "thresholds of significance") used in the analyses for each resource area are contained in the individual technical sections.

Under NEPA, an EIS must consider the effects of a proposed action and its alternatives on the environment; including effects on ecological, aesthetic, historical, and cultural resources and economic, social, and health effects. Environmental effects are categorized as direct, indirect, and cumulative effects.[26] An EIS must also discuss possible conflicts with the objectives of Federal, State, regional, and local land use plans, policies, and controls for the area concerned; energy requirements and conservation potential; urban quality; the relationship between short-term uses of the environment and long-term productivity; and irreversible or irretrievable commitments of resources. An EIS must identify relevant, reasonable mitigation measures that are not already included in the proposed action or alternatives to the proposed action that could avoid, minimize, rectify, reduce, eliminate, or compensate for the project's adverse environmental effects (40 Code of Federal Regulations [CFR] 1502.14, 1502.16, 1508.8). An EIS must also give appropriate consideration to presently unquantifiable environmental amenities and include every recommendation or report affecting the quality of the human environment, in an effort to provide a detailed statement on the environmental impact of the proposed action, adverse environmental effects which cannot be avoided, alternatives to the

[26] Direct impacts are caused by an action and occur at the same time and place; indirect impacts are caused by an action but occur later in time or at a distance that is removed from the study area; and cumulative impacts result from the incremental impact of an action when taken together with other past, present, and probable future projects.

Proposed Action, the relationship between short- and long-term impacts, and any irreversible and irretrievable commitments of resources (42 USC 4332).

CEQA requires that an EIR evaluate impacts associated with a project, identify mitigation for potentially significant impacts and include alternatives that are capable of reducing or avoiding impacts. All phases of a proposed project, including development and operation, are evaluated in the analysis. An EIR must also discuss inconsistencies between the proposed project and applicable general plans and regional plans (State CEQA Guidelines Section 15125(d)). An EIR must describe any feasible measures that could minimize significant adverse impacts, and the measures are to be fully enforceable through permit conditions, agreements, or other legally binding instruments (State CEQA Guidelines Section 15126.4(a)). Mitigation measures are not required for effects that are found to be less than significant. For Sections 3.1 through 3.14, an "Impact Analysis/Environmental Consequences" subsection is provided. This subsection describes the methods, processes, procedures, and/or assumptions used to formulate and conduct the impact analysis for each specific resource topic.

Determination of Impact Significance

One of the primary differences between NEPA and CEQA is the way significance is determined in environmental documents. Under NEPA, significance is used to determine the type of environmental analysis required. NEPA requires that an EIS be prepared when the proposed federal action as a whole has the potential to "significantly affect the quality of the human environment." The determination of significance is based on context and the intensity level (CFR §1508.27). Under NEPA, once a decision to do an EIS is made, it is the magnitude of the impact that is evaluated and no judgment of its significance is necessary for the text. NEPA does not require that a determination of significance for individual resource areas be stated in the environmental documents. Once the proposal itself is considered as a whole to have significant effects, all of its specific effects on the environment (whether or not "significant") must be considered, and mitigation measures must be developed where it is feasible to do so (§1502.14(f), 1502.16(h), 1508.14 and Council on Environmental Quality's (CEQ's) 40 most asked questions #19a). (NEPA, Public Law 91-190, 42 USC 4231-4347, January 1, 1970, as amended; CEQ Regulations, 40 CFR 1500-1508, 43 FR 55990, November 28, 1978; CEQ Forty Most Asked Questions, 46 FR No. 55, 18026-18038, March 23, 1981 [Reclamation 2012a]).

CEQA requires an identification of each "significant effect on the environment" resulting from the project and ways to mitigate each significant effect. A significant effect on any environmental resource triggers the preparation of an EIR. Each and every significant effect on the environment must be disclosed in the EIR and mitigated, if feasible. Some impacts determined to be significant under CEQA may not be of sufficient magnitude to be determined significant under NEPA. In addition, the CEQA Guidelines list a number of mandatory findings of significance, which also require the preparation of an EIR. No types of actions under NEPA parallel the findings of mandatory significance in CEQA.

Baseline for Comparison

Baseline conditions are the set of conditions (or setting) in the study area that is used to compare each alternative when determining potential effects to the environment. The baseline conditions used for environmental analysis differ between NEPA and CEQA, as follows:

Baseline for Comparison under NEPA

Under NEPA, the effects of the alternatives under consideration are determined by comparing effects between alternatives and against effects from the No Action Alternative. The No Action Alternative (i.e., expected future conditions without the project) is the baseline to which the action alternatives are compared.

For the Proposed Action analyzed in this EIS/EIR, the No Action Alternative is based on a cessation of the existing Exchange Agreements. The potential impacts under the Proposed Action and Alternative 2 will be compared to impacts associated with the No Action Alternative. Additionally, because this document is being prepared as a joint EIS/EIR where the No Action Alternative would end a nearly 30-year history of water exchanges that continue to the present, the No Action Alternative is also compared to the existing conditions to provide full disclosure of the potential impacts.

Baseline for Comparison under CEQA

Under CEQA, the environmental baseline is generally defined as the existing physical conditions that are in place at the time of issuance of the NOP, which formally initiates the development of a CEQA-compliant document. The Lead Agency is generally granted broad discretion in determining the appropriate environmental baseline, which has been addressed by the Courts in a number of cases. As allowed under Section 15125(a) of the State CEQA Guidelines, and reaffirmed in *Communities for a Better Environment v. South Coast Air Quality Management District (2010),* the Lead Agency "enjoys the discretion to decide," in the first instance, exactly how the "existing physical conditions without the project can most realistically be measured" (*Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 328.).

In the case of the setting of MPG pumping groundwater into the Mendota Pool for the purpose of transfer under the Proposed Action, it requires authorization by both Reclamation and Westlands (due to potential use of Westlands Facilities), with Westlands acting as the Lead Agency under CEQA. MPG has been pumping groundwater in the Mendota Pool area and exchanging it for CVP water from the SLC for 29 years since 1989, with the last 13 years of this activity occurring under the 2004 Final EIS, Settlement Agreement No. 2, and the subsequent 3-Year extensions. Given that this exchange has been taking place for the last 29 years and that it has continued to occur on the date the NOP was issued (April 8, 2013), Westlands has determined that accounting for existing groundwater pumping most accurately represents the existing and long-term historic physical setting for CEQA purposes.

Existing conditions for this analysis are defined in the Environmental Setting/Affected Environment section for each resource area and may represent the state of the environment over more than 1 year, including conditions prior to April 2013, to reflect best available information. Since the quantity of water exchanged through the Exchange Agreements and the hydrologic setting varies from year to year and contributes to long-term hydrologic trends, this analysis considers the existing setting over the course of the Exchange Agreements for the following resource areas: groundwater levels, groundwater quality, surface water quality, and subsidence. The existing conditions for these resource areas were primarily obtained from MPG Pumping and Monitoring Program Annual Reports (Annual Reports).

Based on these particular facts, failure to utilize the existing physical setting as the environmental baseline would deprive the public of a meaningful opportunity to understand and comment on the reasonably foreseeable consequences of terminating the Exchange Agreements and would not facilitate informed decision-making on the Proposed Action, contrary to the basic purposes of CEQA as defined in Section 15002 of the State CEQA Guidelines. In fact, "[a] departure from this norm can be justified [only] by substantial evidence that an analysis based on existing conditions would tend to be misleading or without informational value to the EIR users" (*Neighbors for Smart Rail v. Exposition Metro Line Const. Authority* (2013) 57 Cal.4th 439, 445). For the Proposed Action, an analysis based on anything other than existing conditions would be misleading. Although the Exchange Agreements are set to expire, resulting in the discontinuation of exchange agreements for this program, this activity is currently occurring, has been occurring for 29 years since 1989, and has become the long-term environmental baseline. The courts have consistently ruled that existing physical conditions presented by existing operations, even if those operations are unauthorized or would need authorization in order to continue, are properly included as elements of the existing baseline (*Citizens for Eastshore Parks v. California State Lands Commission* [2011] 202 Cal.App.4th 549, 560). Therefore, Westlands has determined that use of this baseline provides the public and decision-makers with the most accurate representation of the Proposed Action's likely impacts.

Significance Criteria

Significance criteria (or "thresholds of significance") are used to define the level at which an impact would be considered significant in accordance with CEQA. The thresholds applied in this joint NEPA/CEQA document encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and intensity of its effects, and also meet the more specific requirements of CEQA for significance thresholds.

Thresholds may be quantitative or qualitative; they may be based on agency or professional standards or on legislative or regulatory requirements that are relevant to the impact analysis. Generally, however, thresholds of significance are derived from Appendix G of the State CEQA Guidelines, as amended, and NEPA, where defined. Significance criteria used in this EIS/EIR are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; potential project-specific effects identified by stakeholders and technical experts; and regulatory standards of Federal, State, regional, and local agencies. These thresholds also include the factors taken into account under NEPA to determine the significance of the action in terms of the context and the intensity of its effects. An environmental document prepared to comply with CEQA must identify the significance of the environmental effects of a proposed project. Therefore, for each effect (impact), a conclusion is provided regarding its significance. A "'significant effect on the environment' means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines, Section 15382).

Each impact analysis is based on the requirements of both NEPA and CEQA (Table 5). Because baseline conditions used for environmental analysis differ between NEPA and CEQA, two separate conclusions are reached for each impact analysis; specifically, comparisons of the Proposed Action and Alternative 2 to the No Action Alternative explains the effect without making a significance determination, consistent with Reclamation's implementation of NEPA.

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Significance determinations are made for comparisons of the No Action Alternative, Proposed Action, and Alternative 2 to existing conditions as required for an EIR prepared under CEQA.

Table 5: Baseline and Significance Determinations under NEPA and CEQA

Alternatives		NEPA		CEQA	
		Baseline	**Significance Determination**	**Baseline**	**Significance Determination**
No Action	No Action Alternative	No Comparison Required[1]	Not Required	Existing Conditions	Required[2]
Action	Proposed Action	No Action	Not Required	Existing Conditions	Required
	Alternative 2				

[1] Although not required by NEPA, because this document is being prepared as a joint EIS/EIR where the No Action Alternative would end a nearly 30-year history of water exchanges that continued to occur on the date the CEQA NOP was issued (April 8, 2013), and to the present, the No Action Alternative is also compared against the existing conditions baseline to provide a full disclosure of the potential impacts.

[2] While NEPA does not require a significance determination to be made for any Alternative, including the No Action Alternative, Section 15126.6(e)(1) of the State CEQA Guidelines require that the specific alternative of "no project" shall also be evaluated under CEQA, along with its impact.

Other Required Disclosures

NEPA and CEQA each have additional requirements for environmental review. NEPA requires that an EIS include a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity as well as irreversible and irretrievable commitments of resources that may be involved if the project is implemented. Similarly, CEQA requires a discussion of the significant and irreversible environmental changes that would be involved if a project is implemented. The irreversible and irretrievable commitment of resources is the permanent loss of resources for future or alternative purposes, and occurs when resources cannot be recovered or recycled or when resources are consumed or reduced to unrecoverable forms. CEQA also requires a discussion of growth-inducing effects. These discussions are all included in Section 4.0, *Other Required Disclosures*. This section also includes an assessment of the environmentally preferred/superior alternative.

Terminology for Impacts and Effects

As described previously, the regulations for implementing NEPA do not require significance determinations and therefore the NEPA conclusions consider only the "context" of the action and the "intensity" (severity) of its effects in accordance with NEPA guidance (40 CFR 1508.27)

In contrast, pursuant to CEQA, the following terminology is used to denote the significance of each environmental effect (impact) utilized in the CEQA impact conclusions:

- **Significant and Unavoidable Impact:** an impact that has the potential to cause "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project (CEQA Section 21068)." Levels of significance can vary by alternative, based on the setting and the nature of the change in the existing physical condition. Under CEQA, mitigation measures or alternatives to the proposed

action must be provided, where necessary and applicable, to avoid or reduce the magnitude of significant impacts.

- **Potentially Significant:** an impact that, if it were to occur, would be considered a significant impact as described above; however, the occurrence of the impact cannot be immediately determined with certainty. Under CEQA, mitigation measures or alternatives to the proposed action must be provided, where applicable, to avoid or reduce the magnitude of potentially significant impacts.

- **Less than Significant:** an impact that would not result in a substantial or potentially substantial adverse change in the physical environment. This impact level does not require mitigation, even if applicable measures are available, under CEQA.

- **No Impact:** construction, operation, and maintenance of the action alternatives would not have any direct or indirect impacts on the environment, and no change from existing conditions would result. This impact level does not require mitigation.

- **Beneficial Impact:** an impact that would result in a beneficial change in the physical environment. This impact level does not require mitigation.

Mitigation Measures

Mitigation measures are presented, where feasible, to avoid, minimize, rectify, reduce, or compensate for significant and potentially significant impacts of the action alternatives, in accordance with the State CEQA Guidelines Section 15126.4 and NEPA regulations (40 CFR 1508.20). Mitigation measures are not required for impacts identified under the No Action Alternative because approving agencies would not be required to obtain permits or agreements if the agencies chose not to approve the Action Alternatives. For these reasons, mitigation measures are not provided for the No Action Alternative even if significant impacts may result. Furthermore, no mitigation measures are proposed when an impact conclusion is "less than significant," "no impact," or "beneficial." Mitigation measures are presented in their entirety for significant and potentially significant impacts, in accordance with Section 15126.4 of the CEQA Guidelines, and are fully enforceable through permit conditions, agreements, or other legally binding instruments.

Mitigation measures in this EIS/EIR are formulated consistent with the strategy as set forth in Section 15370 of the CEQA Guidelines and Section 1508.20 of the NEPA CEQ Guidelines as follows:

- Avoiding the impact altogether by not taking a certain action or parts of an action.

- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

- Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.

- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

- Compensating for the impact by replacing or providing substitute resources or environments.

For each significant and potentially significant impact, following the presentation of proposed mitigation measures, the significance of the impact after mitigation is stated. Where sufficient feasible mitigation is not available to reduce impacts to a less-than-significant level, the impacts are identified as "significant and unavoidable." Under CEQA, a project with significant and unavoidable impacts could proceed, but the CEQA lead agency would be required to:
1) conclude in findings that there are no feasible means of substantially lessening or avoiding the significant impact in accordance with State CEQA Guidelines Section 15091(a)(3), and
2) prepare a statement of overriding considerations, in accordance with State CEQA Guidelines Section 15093, explaining why the CEQA lead agency would proceed with the project in spite of the potential for significant impacts.

In accordance with State CEQA Guidelines Section 15091(d) and 15097, if a State agency approves the proposed project's actions, that agency would adopt a Mitigation Monitoring and Reporting Program at the time that it certifies the EIR. The purpose of the Mitigation Monitoring and Reporting Program is to ensure that the mitigation measures adopted as part of project approval would be complied with during project construction and implementation. The Mitigation Monitoring and Reporting Program would identify each of the mitigation measures for project-level actions, and describe the party responsible for monitoring (Reclamation, Westlands, MPG, or other, as appropriate), the time frame for implementation, and the program for monitoring compliance. Reclamation would be responsible for ensuring that the mitigation of impacts resulting from the MPG's proposed groundwater pumping program is complied with.

3.0.2 Resources Areas Considered for Analysis

Resource Areas to Be Evaluated

Sections 3.1 through 3.14 present analyses of the resources or environmental concerns that could be affected by the No Action Alternative, Proposed Action, and Alternative 2. This EIS/EIR assesses all of the resource areas analyzed in the 2004 Final EIS, as well as additional resource areas determined to be potentially affected. The resources listed below were determined to require analysis based on public scoping comments and the judgment of Reclamation's and Westlands' NEPA/CEQA practitioners. Their location in the EIS/EIR is as follows:

Section 3.1	Groundwater Levels
Section 3.2	Groundwater Quality
Section 3.3	Surface Water Quality
Section 3.4	Biological Resources
Section 3.5	Sediment Quality
Section 3.6	Land Subsidence
Section 3.7	Land Use and Agricultural Resources
Section 3.8	Noise
Section 3.9	Traffic
Section 3.10	Air Quality
Section 3.11	Climate Change/Greenhouse Gases

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Section 3.12	Environmental Justice and Socioeconomics
Section 3.13	Water Conveyance Infrastructure and Central Valley Project Operations
Section 3.14	Archeological, Cultural, and Paleontological Resources

This EIS/EIR includes a full evaluation of all resource areas listed above, including additional emphasis and analysis for the following six primary resources areas expected to have potentially significant impacts: groundwater levels, groundwater quality, surface water quality, biological resources, sediment quality, and land subsidence. As part of this analysis, a Hydrogeologic Technical Analysis (Appendix E) was developed and evaluated to quantify the project's potential impacts related to these six primary resource areas.

Resource Areas Not Evaluated

The following resources were determined to be unlikely to be affected by the Proposed Action or Alternatives and are not evaluated in detail in this EIS/EIR:

Energy

The proposed groundwater pumping and surface water conveyance activities would not result in substantial use of energy resources. Groundwater pumping and surface water distribution would rely on existing or replacement electric pumps, and would not require additional new electrical infrastructure. The greatest amount of water pumped under the Proposed Action or Alternative 2 would be 421,053 AF over the 20-year term of the program. Temporary crop idling in FWD under the Proposed Action or Alternative 2 would require soil management practices (such as disking) with similar farm equipment used for crop planting and harvesting.

Geology and Soils

Implementation of the Proposed Action would not involve construction or operation of new facilities that would be located on unstable soils or subject to geologic or seismic hazards. While Alternative 2 would involve a moderate amount of grading for recharge basin construction, all grading and construction activities would be regulated by the County of Fresno and conform with grading requirements in Title 15 (Section 15.28) of the Fresno County Ordinance Code. This would ensure that there are no significant impacts to geology and soils associated with this activity. Groundwater pumping and conveyance of water would be accomplished with existing facilities and would not increase the exposure of people or structures to geologic or seismic hazards. For the approximately 2,284 acres of farmland that are fallowed or idled in the Mendota Pool area as part of the Proposed Action, substantial soil erosion would be avoided with disking and/or planting of a cover crop; however, cover crops would not be irrigated during the transfer years. Fallow and idled lands would be rotated and brought back into production. Geology and soil composition as it relates to subsidence is discussed in Section 3.6, *Land Subsidence*.

Hazardous Materials

The Proposed Action and Alternative 2 would not increase the use of hazardous materials or create a significant hazard to the public or the environment. Existing agricultural operations may involve the use of pesticides regulated by the California Department of Pesticide Regulation. Production would remain similar to existing conditions under the Proposed Action or Alternative 2. Use of pesticides would occur on existing agricultural lands commensurate with the level of production and would not have significant environmental effects.

Mineral Resources

The pumping and exchange of groundwater for agricultural use would not result in the loss of availability of a known mineral resource. Agricultural lands would remain in agricultural use, including lands that are currently idle. Agricultural lands owned by the MPG would not be converted to other land uses; therefore, nothing associated with the Proposed Action or alternatives would preclude exploration for mineral resources should conditions support such an endeavor in the future.

Recreation

The Proposed Action or alternatives would not result in the loss or reduction in availability of a recreation resource. Additionally, it would not result in an increase in population which could lead to substantial overuse or deterioration of a recreational facility.

Unique Geologic Features

No unique geologic resources or features are located on or within the immediate vicinity of MPG farmlands, and thus, the Proposed Action or alternatives would not directly or indirectly destroy or alter a unique geologic feature.

Utilities and Public Services

The management of agricultural water occurs separately from municipal and industrial water supply, wastewater, solid waste, and other public services and utilities. Any exchange with Reclamation or Westlands under the Proposed Action or Alternative 2 would be subject to limitations as defined in this EIS/EIR and would not result in an exceedance of CVP contract amounts. Consequently, the Proposed Action and Alternative 2 do not have the potential to place additional demand on existing infrastructure other than CVP facilities and Westlands' conveyance system. Additionally, the Proposed Action or Alternatives do not introduce sufficient new jobs as to attract permanent residents to an area and indirectly affect other public services or the need for services in local communities.

Indian Trust Assets

Indian trust assets (ITA) are legal interests in assets that are held in trust by the United States Government for federally recognized Indian tribes or individuals. The trust relationship usually stems from a treaty, executive order, or act of Congress. The Secretary of the Interior is the trustee for the United States on behalf of federally recognized Indian tribes. "Assets" are anything owned that holds monetary value. "Legal interests" means there is a property interest for which there is a legal remedy, such a compensation or injunction, if there is improper interference. Assets can be real property, physical assets, or intangible property rights, such as a lease, or right to use something. ITA cannot be sold, leased or otherwise alienated without United States' approval. Trust assets may include lands, minerals, and natural resources, as well as hunting, fishing, and water rights. Indian reservations, rancherias, and public domain allotments are examples of lands that are often considered trust assets. In some cases, ITA may be located off trust land.

Reclamation shares the Indian trust responsibility with all other agencies of the Executive Branch to protect and maintain ITA reserved by or granted to Indian tribes, or Indian individuals by treaty, statute, or Executive Order.

The Proposed Action would not impact ITA as there are none in the Proposed Action area.

Indian Sacred Sites

An Indian Sacred Site is defined in Executive Order 13007 "as any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian Tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the Tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site."

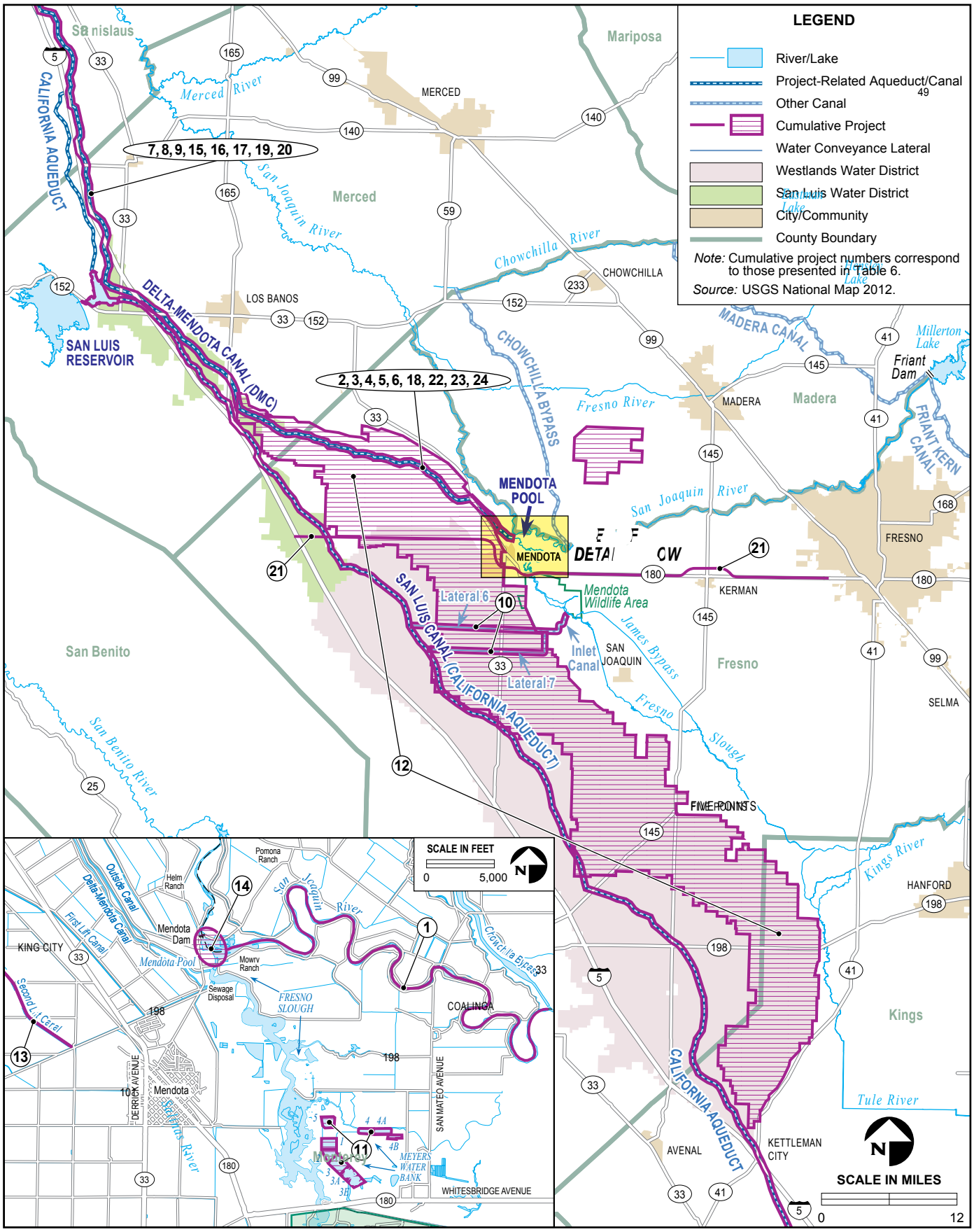
The Proposed Action would not limit access to ceremonial use of Indian Sacred Sites on federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites. Therefore, there would be no impacts to Indian Sacred Sites as a result of the Proposed Action.

3.0.3 Related Projects

The following provides a list of past, present and reasonably foreseeable projects and future actions that are not part of the Proposed Action or alternatives, but that are considered in the analysis of potential direct and indirect cumulative effects. The location of these projects is shown in Figure 11. The analysis of potential cumulative effects of the Project Action and alternatives are considered throughout this EIS/EIR in conjunction with these related projects in the Cumulative Effects subsection for each resource area.

Because surface water supplies are currently limited within the project region, most farmers are expected to continue to pump groundwater to irrigate their fields. Further, farmers utilize crop rotation and land fallowing techniques to, in part, reduce water use. The existing groundwater overdraft and crop rotation/land fallowing that currently occur within Madera County are considered part of the existing environmental setting throughout this EIS/EIR. The approved and pending projects related to the Proposed Action and alternatives are provided in the following list and summarized below (Table 6 and Figure 11). For the purposes of this analysis, approved projects are those that have received final approval by the appropriate agency with authority over the project. Approved projects are likely to be developed as approved, or with minimal or negligible design changes. In contrast, pending projects are those that are still in various stages of planning and may be revised meaningfully prior to agency approval. For pending projects, the most recent and accurate information available was used to inform the analysis of cumulative impacts. More detailed description of these projects and their related environmental documents and permitting status is provided in Section 3.0.3.1 and Section 3.0.3.2 below.

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Cumulative Projects

FIGURE 11

Table 6: Approved and Pending Projects

Approved Projects	
1.	SJRRP – Mendota Pool Bypass and Reach 2B Improvements
2.	Exchange Contractors 25-Year Water Transfer Program
3.	Donald J. Peracchi and Affiliates Exchange Program
4.	Tranquillity Irrigation District Transfer to San Luis Water District
5.	Transfers of CVP Water from CCID and from Firebaugh Canal Water
6.	Transfers from Mercy Springs and Fresno Slough Water District to Angiola Water District
7.	City of Tracy Long-term Banking in Semitropic Water Storage District
8.	DMC Groundwater Pump-in Program – Revised Design Constraints
9.	Groundwater Pumping/Water Transfer Project for 25 Consecutive Years
10.	Conveyance of Kings River Flood Flows to Westlands Water District
11.	Meyers Water Bank Expansion
12.	Drainage Service for the CVP San Luis Unit
13.	Firebaugh Canal Water District 2nd Lift Canal Lining Project
14.	Maintenance for Mendota Dam and Pool
15.	Byron-Bethany Irrigation District Long-term Exchange Agreement
16.	Warren Act Contracts for Banta-Carbona Irrigation District, Byron-Bethany Irrigation District, Patterson Irrigation District, and West Stanislaus Irrigation District
17.	Warren Act Contract for Conveyance from Turlock to Del Puerto Water District
18.	Accelerated Water Transfer and Exchange Program between CVP and South-of-Delta – Contract Years 2016–2020
19.	Long-Term Water Transfer Program Between Reclamation and the San Luis & Delta-Mendota Water Authority
20.	North Valley Regional Recycled Water Program
21.	Extension of State Route 180
22.	Re-routing of the Firebaugh Sumps from the DMC to the San Joaquin Water Quality Improvement Project
Pending Projects	
23.	SJRRP - Long-term Recapture and Recirculation of Restoration Flows
24.	Proposed Contract Assignments from Mercy Springs and Fresno Slough Water Districts to Angiola Water District

Note: List of approved and pending projects current as of October 2018.

As discussed in Chapter 2.0, *Project Description*, MPG may also become part of one or more GSAs for the southern portion of the Delta-Mendota Groundwater Subbasin. In 2014, the state of California enacted SGMA to provide a framework for sustainable management of groundwater resources by local authorities, the requirements of which are discussed in Section 3.1, *Groundwater Levels*. Because local authorities are still in the initial phases of groundwater study and the preparation of their GSPs, which are required to be approved by 2020, the effect of any specific management strategies cannot yet be quantified with certainty. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, it is also very likely that management strategies to reduce water use, such as more efficient irrigation systems and an increase in the development of groundwater recharge facilitates would be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040, so that the viability of high-value long-term crops is maintained. These strategies are becoming more likely as federal and state grant money are being made available to address groundwater sustainability in the Central Valley. In any case, it is important to note that a carefully managed exchange program with design constraints that limit pumping under certain conditions, such as the one implemented by MPG over the last 30 years, when combined with the proposed recharge facilities under the Proposed Action and Alternative 2 represents an existing example of the programs that will likely be required to achieve SGMA's goal of achieving sustainable

groundwater yield by 2040, which happens to be toward the very end of the 20-year exchange period.

3.0.3.1 Approved Projects

1. San Joaquin River Restoration Program – Mendota Pool Bypass and Reach 2B Improvements Project

As analyzed in the 2012 San Joaquin River Restoration Program (SJRRP) EIS/R (PEIS/R) and described in the 2012 SJRRP PEIS/R Record of Decision, the SJRRP is a long-term effort to restore naturally-reproducing and self-sustaining populations of salmon and other fish to the San Joaquin River from Friant Dam to the confluence of the Merced River (the Restoration Goal). Restoration efforts include a combination of channel and structural modifications along the San Joaquin River below Friant Dam, releases of water from Friant Dam to the confluence of the Merced River, and reintroduction of Chinook salmon. Water released from Millerton Lake at Friant Dam specifically for San Joaquin River restoration purposes are known as Restoration Flows, and are protected for instream flow dedication under Reclamation's San Joaquin River water rights. The Restoration allocation and default releases are determined by the unimpaired water year runoff on the San Joaquin River at Friant Dam. Six Restoration year-types are defined in the Settlement ranging from critical-low, when Millerton unimpaired runoff is below 400,000 AF, up to wet, when runoff exceeds 2,500,000 AF. Restoration Flows are designed primarily to meet the various life stage needs for spring and fall run Chinook salmon, with default releases from Friant Dam greatest in March and April, ranging from 1,500 cubic feet per second (cfs) up to 4,000 cfs.

As analyzed in the 2016 Mendota Pool Bypass and Reach 2B EIS/R and described in the 2016 Mendota Pool Bypass and Reach 2B Record of Decision as described in the next paragraph; the Mendota Pool Bypass and Reach 2B Improvements Project is a component of the SJRRP intended to: (1) create a compact bypass channel around Mendota Pool to ensure conveyance of at least 4,500 cfs from Reach 2B downstream to Reach 3; and (2) modify channel capacity (incorporating new floodplain and related riparian habitat) to ensure conveyance of at least 4,500 cfs in Reach 2B between the Chowchilla Bifurcation Structure and the new Mendota Pool bypass channel (Reclamation 2016a). The Mendota Pool Bypass and Reach 2B Project includes construction of setback levees capable of conveying flows up to 4,500 cfs with 3 feet of freeboard and breaching portions of the existing levees. This will restore floodplain habitat with an average width of approximately 4,200 feet to provide benefit to salmonids and other native fishes and construct a compact bypass channel and structures capable of conveying up to 4,500 cfs of Restoration Flows around the Mendota Pool. The Project also includes construction of the Compact Bypass bifurcation structure capable of conveying up to 2,500 cfs of contractually obligated water from Reach 2B to the Mendota Pool. This will provide upstream and downstream fish passage for adult salmonids and other native fishes, and downstream fish passage for juvenile salmonids, between Reach 2A and Reach 3.

The Reach 2B and Mendota Pool Bypass Project would likely require the relocation of several FWD deep wells and a "south levee canal" that connects FWD and the Mendota Pool that could transport MPG exchange water. As shown in Figure 6, there are six MPG deep wells in located adjacent to the San Joaquin River in FWD. It is anticipated that all six of these deep wells would need to be relocated further away from the river to accommodate the floodplain channel and

setback levees. Based on the proposed location of the setback levees, it is estimated that each of the wells would need to be relocated at least 300 feet away from their current location to be outside of the proposed levees. Continuing the long-standing requirement of a 1957 contract between Reclamation and FWD, any future wells constructed within the FWD—including those to replace existing deep wells in FWD and affected by the Mendota Pool Bypass and Reach 2B Project—would be constructed and operated in the deep zone of the upper aquifer, below a minimum depth of 70 feet bgs.[27] Furthermore, approximately 1,080 acres of land in FWD would be removed from agriculture production as a result of levee setbacks that are part of the SJRRP Mendota Pool Bypass & Reach 2B Improvements Project.

2. Exchange Contractors 25-Year Water Transfer Program

Reclamation approved a 25-year CVP water transfer program with the Exchange Contractors. The 25-year program extends and expands a previous 10-year transfer program (which allows for 130,000 AFY of exchange) and involve the annual development and transfer and/or exchange of up to 150,000 AF of substitute CVP water. The sources of water developed by the Exchange Contractors would include a maximum of 100,000 AFY of conserved water and 50,000 AFY from temporary voluntary land fallowing (San Joaquin River Exchange Contractors Water Authority 2012).

3. Donald J. Peracchi and Affiliates Exchange Program

Under this project, Reclamation executed a series of one-year exchange agreements with Donald J. Peracchi and his affiliates through February 2015 (coterminous with the 10-year MPG exchange program) for the exchange of up to 3,600 AFY available for irrigation purposes to Donald J. Peracchi and affiliates' lands in Westlands via the SLC. Groundwater pumped under this project is the same amount of water previously included under the MPG exchange program; therefore, no additional groundwater was pumped for this project (Reclamation 2012b).

4. Tranquillity Irrigation District Transfer to San Luis Water District

Reclamation will approve a series of annual exchanges at the Mendota Pool of up to 7,500 AFY of groundwater pumped from Tranquillity Irrigation District's well field between Contract Years 2014 through 2018 (ending February 28, 2019). Under the project, Tranquillity ID will pump groundwater into their distribution systems connected to either the Fresno Slough Main Canal or the Tranquillity Main Canal, and then into the Fresno Slough (Reclamation 2014a).

5. Transfers of CVP Water from CCID and from Firebaugh Canal Water District

Under these two projects, CCID and Firebaugh Canal Water District (FCWD) will transfer up to 28,000 AFY of their Exchange Contractors CVP Contract water supplies to other water districts in the period from 2014 to 2018 (Reclamation 2010). Reclamation is currently evaluating an additional 5-year transfer program for FCWD.

6. Transfers from Mercy Springs and Fresno Slough Water District to Angiola Water District

Under this project, Reclamation will approve a series of annual transfers of up to 1,300 AFY of Mercy Springs' CVP water and up to 4,000 AFY of Fresno Slough's CVP water to Angiola

[27] Contract No. 14-06-200-6221: Contract Between the United States and Farmers Water District. August 28, 1957.

Water District over a nine-year period (2012-2020). For the transfer, Mercy Springs' and Fresno Sloughs' CVP water will be released by Reclamation from the Federal share of the San Luis reservoir and made available to DWR at O'Neill Forebay. DWR will then deliver the transferred water to Angiola under Article 55 of Tulare Lake Basin Water Storage District's (TLBWSD's) SWP contract (Reclamation 2012c). Reclamation is currently evaluating proposed contract assignments from Fresno Slough and Mercy Springs to Angiola Water District that would replace the 9-year transfer program if approved.

7. City of Tracy Long-term Banking in Semitropic Water Storage District

Under this project, Reclamation approved the City of Tracy's long-term (through contract year 2035) groundwater banking of up to 10,500 AFY of their available CVP surface water supplies with Semitropic Water Storage District (Semitropic). As part of this banking program, Reclamation approves iterative transfers, exchanges and related actions for delivery of water to Semitropic for banking and return of up to 3,500 AFY of the banked water to the City of Tracy. Both of these locations are outside of the secondary study area for the Proposed Action and Alternative 2; however, the City of Tracy project may affect CVP operation through the Proposed Action area (Reclamation 2011).

8. Delta-Mendota Canal Groundwater Pump-in Program Revised Design Constraints

Under this project, participating CVP contractors within the Delta Division and San Luis Unit of the CVP can pump a cumulative total of up to 50,000 AFY of groundwater into the DMC (Reclamation 2013a). Reclamation analyzed the proposed execution of two 5-year Warren Act Contracts for this program over a 10-year period. The first 5-year Warren Act contracts expired in February 2018. Based on the recent drought and increased trends in subsidence near the DMC, Reclamation determined that additional environmental review and design constraints were needed to address the potential contribution of the DMC Groundwater Pump-in Program to groundwater level impacts and subsidence prior to executing the new Warren Act Contracts. Revised design constraints were put in place for the program in 2018 that require water quality monitoring, groundwater monitoring, and reporting requirements. Introduction of groundwater is also limited by CVP allocations. Reclamation completed an EA (18-007) and issued a Finding of No Significant Impact (FONSI-18-007) in May 2018 (Reclamation 2018a).

9. Groundwater Pumping/Water Transfer Project for 25 Consecutive Years

Under this project, CCID and FCWD operate a program to alleviate drainage impacts to approximately 28,000 acres of land in the two districts. The program relies on a combination of strategies to manage drain water production, including: groundwater pumping, water conservation, and temporary land fallowing. The groundwater supply and demand reductions developed by the program frees up commensurate surface water supplies that are used for transfer to other CVP contractors in the San Luis Unit and San Felipe Division (Reclamation 2008).

10. Conveyance of Kings River Flood Flows to Westlands

Under this project, Reclamation issued Westlands a Warren Act contract allowing Westlands to convey up to 50,000 AF of Kings River flood flows in the SLC from 2017 through 2022 when excess capacity exists; this would occur in Kings River flood years. Water would be pumped

from the Fresno Slough through Laterals 6 and 7, and delivered to the SLC for use in Westlands and Pleasant Valley (Reclamation 2012d; Reclamation 2017a).

11. Meyers Water Bank Expansion

Meyers Water Bank facilities and operations are privately funded by Meyers Farm. Key components of Meyers Bank include a series of existing ponds, an intake pump, existing and proposed extraction wells, a solar field to power electrical pumps, and diversion channel on the east side of the Fresno Slough. CVP and non-CVP water is diverted and stored in the bank when available. Under the banking program, water to be banked is pumped from the Mendota Pool into five recharge ponds totaling 91 acres during the fall, winter, and spring and is allowed to infiltrate to the shallow aquifer for underground storage. Depending on need, returned water is extracted from up to seven extraction wells located west and north of the recharge ponds and pumped into Mendota Pool. The water is then exchanged via agreement with Reclamation for CVP water delivered via the SLC for irrigation of lands farmed by Meyers Farm in SLWD. Reclamation amended the long-term exchange agreement with Meyers Bank to increase the rate of extraction from the bank from 6,316 AFY to 10,525 AFY, to amend the cumulative total amount of CVP water banked from 35,000 AF to 60,000 AF at any given time, to increase the amount of Banta Carbona Irrigation Districts' non-CVP water conveyed in the DMC for banking from 5,000 AFY to 10,000 AFY, to approve the annual transfer of up to 10,000 AFY of Banta Carbona Irrigation Districts' CVP water in-lieu of their non-CVP water for banking at Meyers Bank, and to deliver banked water via exchange to other areas within the service area of SLWD (Reclamation 2013b).

12. Drainage Service for the CVP San Luis Unit

Reclamation prepared the San Luis Drainage Feature Re-Evaluation Feasibility Report (Feasibility Report) to evaluate the feasibility of particular actions intended to address drainage in the San Luis Unit. As part of the Feasibility Report, Reclamation proposed to construct a Demonstration Treatment Facility near Firebaugh, California (Reclamation 2012e). In 2015, the United States Department of Justice and Westlands approved a settlement ending a dispute over Reclamation's responsibility to provide drainage for the farmland within Westlands. As part of the settlement, a minimum of 100,000 acres in Westlands are required to be permanently retired, the District will assume responsibility for managing drainage within Westlands, and CVP deliveries will be capped at 75 percent of its contract quantity (Westlands 2017). The Westlands Drainage Settlement did not receive Congressional legislation and the partial stay expired on January 15th, 2018. Reclamation has submitted a revised control schedule (April 2018 Revised Control Schedule) to the court and has resumed drainage activities within Westlands.

13. Firebaugh Canal Water District 2nd Lift Canal Lining Project

Under this project, Reclamation provided grant funding to FCWD to support raising the canal banks and concrete lining along 2.2 miles of FCWD's 2nd lift canal, eliminating an existing booster station, and constructing a new check structure to improve water management (Reclamation 2012f).

14. Maintenance for Mendota Dam and Pool

CCID owns and operates Mendota Dam, and is responsible for maintenance of the dam and Mendota Pool. Historically, CCID drained the Mendota Pool on a biannual basis in order to perform maintenance; however, after improvements were made to Mendota Dam during the

winter 2011-2012 dewatering and maintenance activities, ongoing maintenance events may not need to occur as frequently. In 2011-2012, CCID replaced all 6 of the existing Calco rectangular cast iron gates on the dam with heavy duty Waterman Gates (Model S 5000 FY), eliminating the need to refurbish the gates every other year; the old gates tended to stick, come off the guides, or otherwise malfunction. The new gates have improved reliability and allowed CCID to be able to work more quickly in response to SJRRP Interim and Restoration flow deliveries through the dam. CCID drained the pool to perform a maintenance check in spring 2015, and anticipates that future maintenance checks will only be needed once every ten years (White 2014).

15. Byron-Bethany Irrigation District Long-term Exchange Agreement

Under this project, Reclamation executed a long-term (up to 40-year) exchange contract and a long-term (up to 40-year) license with Byron-Bethany ID for introduction of up to 4,500 AFY into the DMC for exchange, plus up to an additional 225 AFY to cover conveyance losses, of its non-CVP water between March and October to meet Tracy Hills Development demand (Reclamation 2013c).

16. Warren Act Contracts for Banta-Carbona Irrigation District, Byron-Bethany Irrigation District, Patterson Irrigation District, and West Stanislaus Irrigation District

Under this project, Reclamation allows the annual introduction and conveyance of up to 5,000 AF of Byron-Bethany ID's and up to 10,000 AF of Banta Carbona ID's non-CVP surface water in federal facilities through a series of 5-year Warren Act contracts ending on December 31, 2045. Reclamation also allows the annual introduction of up to 10,000 AF of Patterson ID's non-CVP surface water through August 31, 2046. A portion of the contractors' non-CVP water may be transferred to other CVP contractors. Any transfer would use existing facilities and would also be dependent on available capacity (Reclamation 2015a).

17. Warren Act Contract for Conveyance from Turlock to Del Puerto Water District

Reclamation proposed to execute a series of Warren Act Contracts for conveyance of up to 13,400 AFY of recycled, treated water from the City of Turlock to Del Puerto Water District (Reclamation 2016b). However, this program has been superseded by the North Valley Regional Recycled Program (see number 20 below).

18. Accelerated Water Transfer and Exchange Program between CVP and South-of-Delta Contractors – Contract Years 2016–2020

This program allows an accelerated process for water transfers or exchanges between South-of-Delta and CVP Contractors for a period extending from March 1, 2016 to February 28, 2021, to occur without any additional environmental analysis for the period. This project continues the accelerated transfer or exchange of water under the previous program, from March 1, 2011 to February 16, 2016 (EA-10-051). The cumulative amount of water transferred or exchanged is limited to 150,000 AFY (Reclamation 2016c).

19. Long-Term Water Transfer Program Between Reclamation and the San Luis & Delta-Mendota Water Authority

This program between Reclamation and the SLDMWA permits the transfer of water through the Delta and CVP facilities, including storage in reservoirs (such as Shasta, Folsom, and Trinity reservoirs), to help address CVP water supply shortages, for the period between 2015 and 2024.

Water transfers are only to meet existing demands and would not serve any new demands in the buyers' service areas. The transfers are conveyed through the Delta using CVP or State Water Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area. The maximum potential transfer is estimated to be 511,094 AFY (Reclamation 2015b). A recent court decision (*AquAlliance v. United States Bureau of Reclamation*, Case 1:15-cv-00754-LJO-BAM, filed 2/15/2018) regarding this 10-year transfer EIS/EIR was found to be inadequate on a very narrow range of NEPA and CEQA issues, specifically that cumulative effects relating to reductions to Delta Outflow was inadequate under CEQA because the document did not describe why the flows hadn't changed, and the effects of climate change on the project were inexcusably dismissed, though climate change analysis for CEQA was adequate. Reclamation and the SLDMWA are currently preparing a supplemental EIS/EIR to address the outstanding issues noted by the Court.

20. North Valley Regional Recycled Water Program

Under this project, Reclamation exchanges up to 59,000 AFY of tertiary-treated recycled water produced by the Cities of Modesto, Turlock, and Ceres with Del Puerto Water District, a CVP agricultural water district located primarily in western Stanislaus County. The water is used to meet refuge water supplies and a like amount of CVP water is provided to Del Puerto (Reclamation 2016d).

21. Extension of State Route 180

The California Department of Transportation (Caltrans) is proposing a new segment of SR-180 which would traverse through or directly adjacent to MPG lands in the Mendota Pool area, but does not traverse any existing MPG land in Westlands (Caltrans 2015).

22. Re-routing of the Firebaugh Sumps from the DMC to the San Joaquin Water Quality Improvements Project

Reclamation issued a perpetual land use authorization to the Panoche Drainage District to access Reclamation rights-of-way to install, operate, and maintain pipelines to re-route drainage from six Firebaugh Sumps away from the DMC to the San Joaquin Water Quality Improvement Project. Under this action, water high in selenium and other trace elements from the sumps is released to ditches within the San Joaquin Water Quality Improvement Project and recirculated and reused in the same manner as existing drainage water. Approximately 1,200 AFY of drainage water from the sumps is re-routed to the San Joaquin Water Quality Improvement Project, removing approximately 760 pounds of selenium and 8,300 tons of salts from the DMC (Reclamation 2014b).

3.0.3.2 Pending Projects

23. San Joaquin River Restoration Program - Long-term Recapture and Recirculation of Restoration Flows

The SJRRP is in the process of developing a long-term plan for recapture and recirculation, reuse, exchange, or transfer of Restoration Flows. Releasing Restoration Flows from Friant Dam affects water agencies that have contracts for delivery of this water. The SJRRP Restoration Flow Guidelines estimate a long-term annual average reduction in water deliveries to Friant Contractors of 185,000 AF, with reductions to individual contractors applied proportional to contractors' contract totals. Under this project, a portion of Restoration Flows that reach the

Merced River confluence can be recaptured in the lower San Joaquin River and/or the Delta then recirculated, transferred or exchanged to reduce or avoid impacts to Friant contractors from release of Restoration Flows (Reclamation 2017b).

24. Proposed Contract Assignments from Mercy Springs and Fresno Slough Water Districts to Angiola Water District

Reclamation proposes to issue a partial assignment of 1,300 AFY of Mercy Springs Water District's CVP contract allocation and a full assignment of 4,000 AFY of Fresno Slough Water District's CVP contract allocation to Angiola Water District. In turn, Reclamation would amend Mercy Springs Water District's CVP water service contract to reflect Mercy Springs Water District's CVP contract quantity to be 1,542 AFY. Reclamation would also amend Fresno Sough Water District's CVP contract quantity to be 0 AFY. Fresno Slough would continue to retain their pre-1914 water rights water supply of 866 AFY pursuant to the terms of their CVP contract. No new infrastructure, modifications of facilities, or ground disturbing activities would be needed for movement of this water. No native or untilled land (fallow for three years or more) would be cultivated with water involved with these actions. Reclamation prepared a Draft FONSI (FONSI-16-030) and EA (EA-16-030) to the public for review in July 2018 (Reclamation 2018b).

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3.1 Groundwater Levels

This section evaluates potential for the Proposed Action and Alternatives to impact the groundwater level of aquifers in the Primary Study Area and Westlands. This section draws on the 2015 Hydrogeologic Technical Analysis developed for this EIS/EIR (Appendix E), which incorporates sampling information from the Annual Reports in years 2002 through 2014 (see Appendix D for the 2014 Annual Report), as well as Westlands Deep Groundwater Conditions Report (2014).[28] Where relevant to the discussion, information from the 2015 and 2016 Annual Reports is also used in the analysis of impacts to groundwater levels. Impacts and analysis relating to groundwater quality and land subsidence are provided in Section 3.2, *Groundwater Quality*, and Section 3.6, *Land Subsidence*, respectively.

3.1.1 Environmental Setting/Affected Environment

Background

Groundwater resources are the water stored below ground surface (bgs) within soil pore spaces or fractured rock that can be utilized for beneficial purposes. Groundwater is a key component of available water supplies in California and the Central Valley and has historically been utilized to meet a substantial percentage of water demand for domestic and agricultural uses (USGS 2009). As such, it has sometimes been subject to excessive demand, with subsequent adverse effects on groundwater resources.

Long-term declines in groundwater levels are caused by groundwater pumping that exceeds the natural recharge or replenishment rate of groundwater. Groundwater recharge or replenishment occurs through percolation of water from precipitation, streams, agricultural irrigation on overlying lands, or subsurface inflows from other groundwater subbasins into the underlying groundwater basin. More recently, man-made recharge basins have become an additional source of groundwater recharge. Long-term declines in groundwater levels may result in adverse impacts to a groundwater basin such as the depletion of groundwater supply and storage, degraded groundwater quality, and impacts to the beneficial uses of groundwater (e.g., agricultural, municipal). Land subsidence caused by declining groundwater levels can also impact subsurface storage capacity and compact porous soil areas so that these areas no longer maintain their original storage volume. Subsidence can also affect surface infrastructure such as structures, roads and canals. A long-term decline in groundwater levels can also impact natural ecosystems through dewatering of springs, creeks, and wetlands.

Groundwater levels are measured as the elevation of the water within a given well. For an unconfined aquifer, this level is generally equivalent to the water table; however, for a confined aquifer, this level is the equilibrium point in the well where water pressure from the confined aquifer balances with the elevation of the water in the well. The vertical distance between the equilibrium water level and mean sea level (msl) is referred to as the hydraulic head. When an

[28] At the time of publication of this EIS/EIR, the 2014 Annual Report represented the most recently available data at the time of release of the NOP and establishment of the environmental baseline.

aquifer becomes less saturated, the hydraulic head drops in elevation, which can adversely affect well performance and water availability.

Groundwater flows in the direction of high to low hydraulic head, and the rate of groundwater flow depends on the hydraulic gradient, or the change in hydraulic head over a given distance and the hydraulic parameters of the aquifer. Groundwater pumping in excess of recharge rates can cause a decline or drawdown of groundwater levels in the vicinity of the well. As pumping continues and groundwater levels decline, a cone of depression forms around the well(s). The cone of depression creates a localized groundwater flow gradient towards the well. The cone of depression expands outward from the well until the amount of groundwater flowing towards the well equals the amount being pumped. In areas of concentrated pumping, a large cone of depression may form (resulting from the overlap of multiple individual cones of depression) that can alter the directional flow of groundwater and lower local or even regional groundwater levels. In some cases, where physical and hydraulic conditions allow, groundwater pumping can increase the rate and volume of percolation of streamflow into the underlying groundwater system (Barlow and Leake, 2012).

Key Terms:

Aquifer (unconfined) *– an aquifer whose upper water surface (water table) is at atmospheric pressure, and thus is able to rise and fall.*

Aquifer (confined) *– soil or rock below the land surface that is saturated with water. There are layers of impermeable material above it and it is under pressure, so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer.*

Mean Sea Level (msl) *– a metric used to describe the elevation of a data point in relation to fixed sea level.*

Below Ground Surface (bgs) *– a metric used to describe the depth of a data point below area ground surfaces.*

Hydraulic Head *– the vertical distance between the liquid surface elevation in a well and a defined datum, generally msl.*

Drawdown *– the lowering in hydraulic head observed in a well penetrating an aquifer.*

Cone of Depression *– the zone around a well that becomes dewatered or unsaturated as a well is pumped, leaving an area where the water table dips to form a cone shape.*

Findings from the Previous EIS

The 2004 Final EIS identified potential impacts to groundwater levels associated with groundwater pumping, but found that the management strategies referred to as "design constraints" would reduce potential effects to groundwater levels such that they are maintained at acceptable levels. The design constraints included groundwater level monitoring, deep zone pumping limits, and cessation of pumping if there is evidence of an associated long-term decline in groundwater levels. The 2004 Final EIS concluded that groundwater withdrawal from the shallow zone of the upper aquifer would only impact local groundwater levels, while groundwater withdrawal from the deep zone of the upper aquifer and a historic cone of depression around MPG wells had the potential to generate impacts up to 3.5 miles away; therefore, the monitoring program was designed to encompass a 6-mile radius to ensure tracking of all of the potential groundwater level impacts from MPG pumping.

The ROD for the MPG's 10-Year Exchange Program approved the groundwater exchange program with the identified design constraints. Reclamation weighed the potential effects of the

pumping program on groundwater levels against the benefits of increased water supply at the Mendota Pool when making this determination. The 2004 Final EIS concluded that the mitigation and monitoring components of the exchange program would be sufficient to minimize the effects on groundwater levels and overdraft. The design constraints and monitoring components were incorporated into the Existing Exchange Agreements.

Design Constraints Addressing Groundwater Levels

Groundwater levels are currently evaluated using data gathered from MPG's Annual Monitoring Program and are addressed by implementation of the design constraints that set specific limits on groundwater withdrawals. Groundwater levels are measured for the Annual Reports as required by the Existing Exchange Agreements. These measurements track fluctuations in groundwater level and any resulting compaction, as well as provide monitoring data to ensure compliance with design constraints. Four design constraints were incorporated into the Existing Exchange Agreements, to address potential groundwater level impacts resulting from MPG pumping. These design constraints are carried over to the Proposed Action, with revisions and four additional design constraints as listed in Table 4 and noted below[29]:

1. Restoration Flows entering Mendota Pool will be determined by measurement at the San Joaquin River gauge downstream from the Chowchilla Bifurcation structure (SJB). Restoration Flows will be subject to a 5% loss factor between SJB and Sack Dam, then will continue downstream and out of the Project Area. The 5% loss factor may be revised after the SJRRP – Mendota Pool Bypass and Reach 2B Improvement project is constructed.

   Restoration Flows are protected under Reclamation's San Joaquin River water rights, and will be tracked and reported pursuant to conditions of said water rights. In accordance with Paragraphs 13(f) and 13(h) of the Stipulation of Settlement, Reclamation will identify surface or underground diversions and causes of any seepage losses above those assumed in Exhibit B of the Settlement and take steps to prevent or redress any unlawful diversions of or interference with Restoration Flows.

2. Groundwater pumping for exchange will be subject to a 5 percent leave in the Mendota Pool. Total exchange pumping shall not exceed 26,316 AFY (which is 25,000 AFY exchanged). Total exchange pumping over the life of the project shall not exceed 421,053 AF (which is 400,000 AF exchanged).

3. Exchange pumping from the deep zone (of the upper aquifer) shall be conducted primarily during March, April, and May, and from September through November. No exchange pumping from the deep zone (of the upper aquifer) shall be conducted during June, July, and August of any year unless expressly permitted by the Exchange Contractors, Wonderful Orchards, and Reclamation.

4. Exchange pumping from the deep zone (of the upper aquifer) shall not exceed 12,000 AFY during any one year unless there is a corresponding reduction in the amount of exchange pumping that year.

[29] The revised design constraints have also been included in the 2017-2018 1-year extension of the Existing Exchange Agreements.

5. Exchange pumping shall not be conducted more than 10 months of any year.

6. Shallow zone (of the upper aquifer) pumping may be limited due to: 1) the quality of water pumped from these wells, 2) potential impacts to deep zone (of the upper aquifer) groundwater (e.g., a decline in groundwater level or groundwater quality), and 3) a potential decline in groundwater levels of the shallow zone (of the upper aquifer). Shallow zone pumping may also be limited due to San Joaquin River surface water flows as described in Design Constraint No. 2 in Table 4, as determined by Reclamation.

7. During exchange years, the amount of groundwater pumped for use on Adjacent Overlying Lands shall not be greater than 12,000 AF in any year unless there is a corresponding reduction in the amount of exchange pumping that year.

8. Before the end of the 20-year period of the Proposed Action, MPG would no longer withdraw water from the lower aquifer, having either successfully sealed the lower aquifer portion of the remaining composite wells or discontinuing production due to potential subsidence impacts. It is currently anticipated the remaining composite wells would be plugged prior to the start of the 2020 irrigation season.

Study Areas

The Proposed Action and Alternatives have the potential to impact groundwater levels primarily in the area surrounding the Mendota Pool and in Westlands. The Primary Study Area includes all MPG-owned and/or operated wells in the Mendota Pool area, the potential locations of recharge facilities under the Proposed Action or Alternative 2, and potentially affected groundwater basins of both Fresno and Madera Counties.

The Secondary Study Area includes much of western Fresno County, including Westlands, as well as large areas of Madera County south of the Chowchilla River and west of SR-99 (Figure 4). This Secondary Study Area was selected to capture the potential for MPG pumping to affect groundwater levels in areas of high demand, including areas of major drawdown in Madera County. The Secondary Study Area also includes all MPG lands in Westlands that would potentially receive water from the proposed Exchange Agreements, or would turn to alternate water supplies or alternative land uses under the No Action Alternative.

3.1.2 Regional Setting

The two Study Areas for this EIS/EIR are located in two groundwater basins within the Central Valley Groundwater Basin: the San Joaquin Valley Groundwater Basin and the Tulare Lake Groundwater Basin. These groundwater basins are further divided into 16 subbasins, 5 of which underlie the Study Areas: Delta-Mendota Subbasin, Madera Subbasin, Chowchilla Subbasin, Kings Subbasin, and Westside Subbasin (Figure 12; DWR 2003). Groundwater from the San Joaquin Valley and Tulare Lake Groundwater Basins supply approximately 40 percent of agricultural and urban water demand to the lands overlying the basins. Given the considerable importance of groundwater as a water source in the San Joaquin Valley, groundwater levels and potential overdraft are of particular concern. Notable decreases in groundwater levels within these basins have occurred since 2010 and as such, as part of the California Statewide Groundwater Elevation Monitoring program initiated by SGMA, the DWR designated the subbasins within the Study Areas as high priority under SGMA (DWR 2014a).

San Joaquin Valley Groundwater Basin

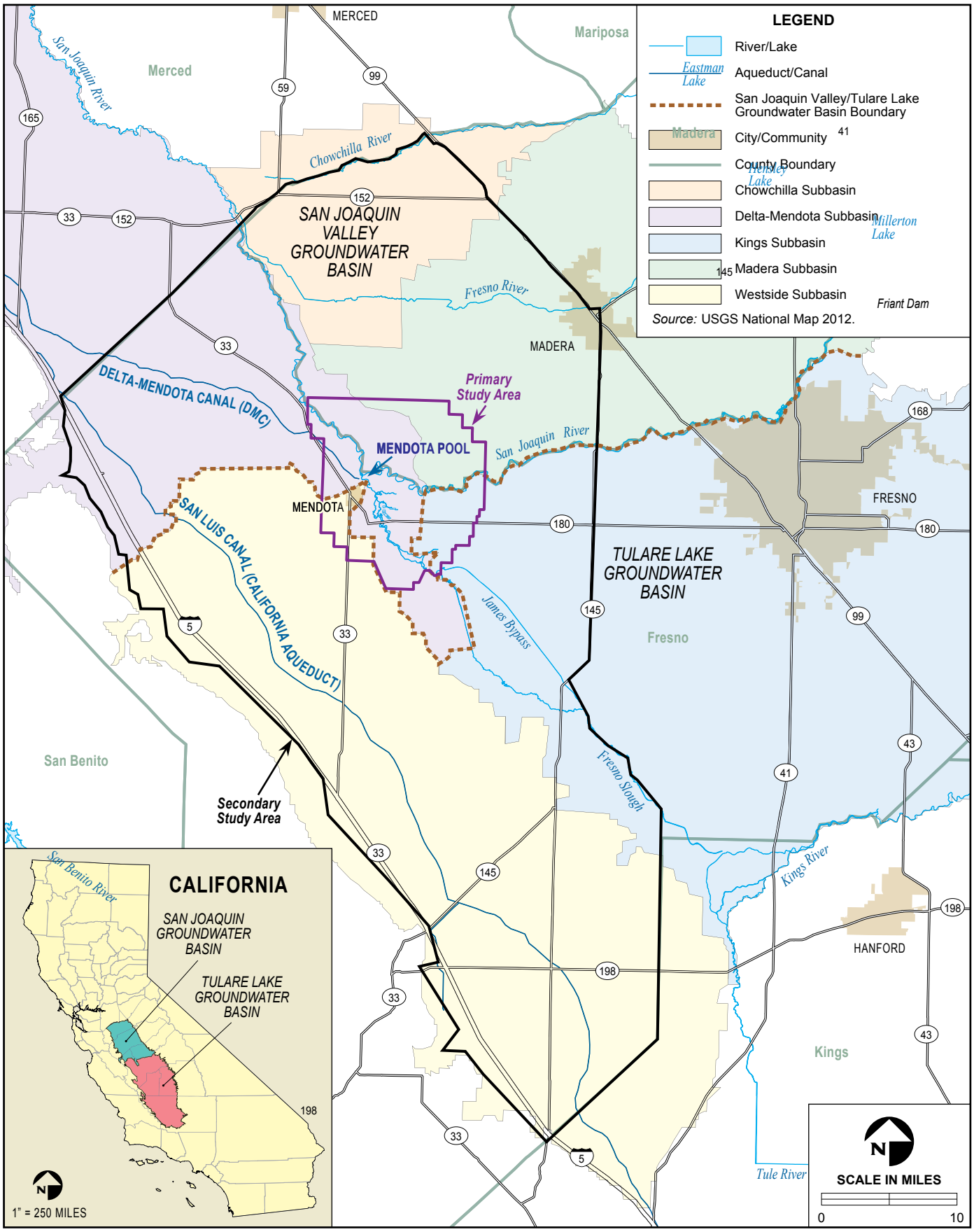
The San Joaquin Valley Groundwater Basin covers 3,935 square miles and is bounded to the west by the Coast Ranges and the east by the Sierra Nevada. The Delta borders the Groundwater Basin to the north, and the Tulare Lake Groundwater Basin lies to the south (Figure 12). A significant geological feature of the basin is the Corcoran Clay layer, formed by periodic filling and draining of ancient lakes in the San Joaquin Valley. The Corcoran Clay layer is a generally impermeable barrier that divides the water bearing layers within the basin into two distinct aquifers: the upper aquifer and the lower aquifer. As the Corcoran Clay layer is largely impermeable to groundwater movement, groundwater levels in the upper and lower aquifers are generally independent of one another and do not mix vertically. Within the Groundwater Basin, the Corcoran Clay layer is located 100 to 500 feet bgs and is up to 160 feet thick (DWR 2003).

The upper and lower aquifers were formed from deposition of permeable granitic sediments from the Sierra Nevada in the eastern portion, and less permeable marine rock, silts, and clays from the Coast Ranges in the western portion. The northern portion of the Groundwater Basin near the Delta contains marine sediment deposits that are up to six miles thick and freshwater aquifer systems averaging 2,000 feet in depth (Page 1986). Aquifers in the southern extent of the basin that underlie the Primary Study Area are shallower than in the northern extent and typically extend to depths averaging 800 feet bgs (DWR 2003).

Groundwater levels in the upper aquifer are primarily recharged by rivers and rainfall infiltration; percolation of surface agricultural irrigation or artificial groundwater recharge basins; infiltration/percolation of imported CVP water through the irrigation of farmland and subsequent percolation and direct canal recharge; and lateral inflow along the basin. In a pre-developed condition, groundwater discharged into streams, evaporated into the atmosphere or was transpired by natural vegetation. This natural recharge flowed out of the San Joaquin Valley Basin prior to agricultural development in the San Joaquin Valley and groundwater storage remained relatively constant. With extensive agricultural development in the San Joaquin Valley, aquifer storage declined and natural recharge was captured. Historically, groundwater in the Groundwater Basin flowed from the foothills of the Coast Ranges and Sierra Nevada towards the valley floor and then north towards the Delta. However, groundwater withdrawals throughout the Central Valley modified the natural flow direction towards cones of depression, most recently in major pumping areas in portions of central and eastern Madera County.

Groundwater levels also generally fluctuate where levels are typically higher during wetter years and lower in dry years. Natural fluctuations are less in the shallow zone due to the unconfined nature of this aquifer zone as compared to the deep zone which exhibits seasonal and climatic variations due to this aquifer's semi-confined nature. In addition to natural sources of recharge, other sources of recharge in the Primary Study Area occurs from the irrigation of farmland with imported CVP water, from artificial recharge projects and water banks, and from unlined canals that convey surface water for irrigation. The deep zone continues to be affected by wet/dry cycles, as the aquifer is semi-confined and seepage from surface water sources of recharge generally do not percolate to the deep zone to the same degree as the shallow zone of the upper aquifer. Recharge of the lower aquifer (below the Corcoran Clay layer) is mostly from lateral inflow from the Sierra Nevada and Coast Ranges beyond the extent of the Corcoran Clay layer (USGS 2009).

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Groundwater Subbasins in the Study Areas

FIGURE 12

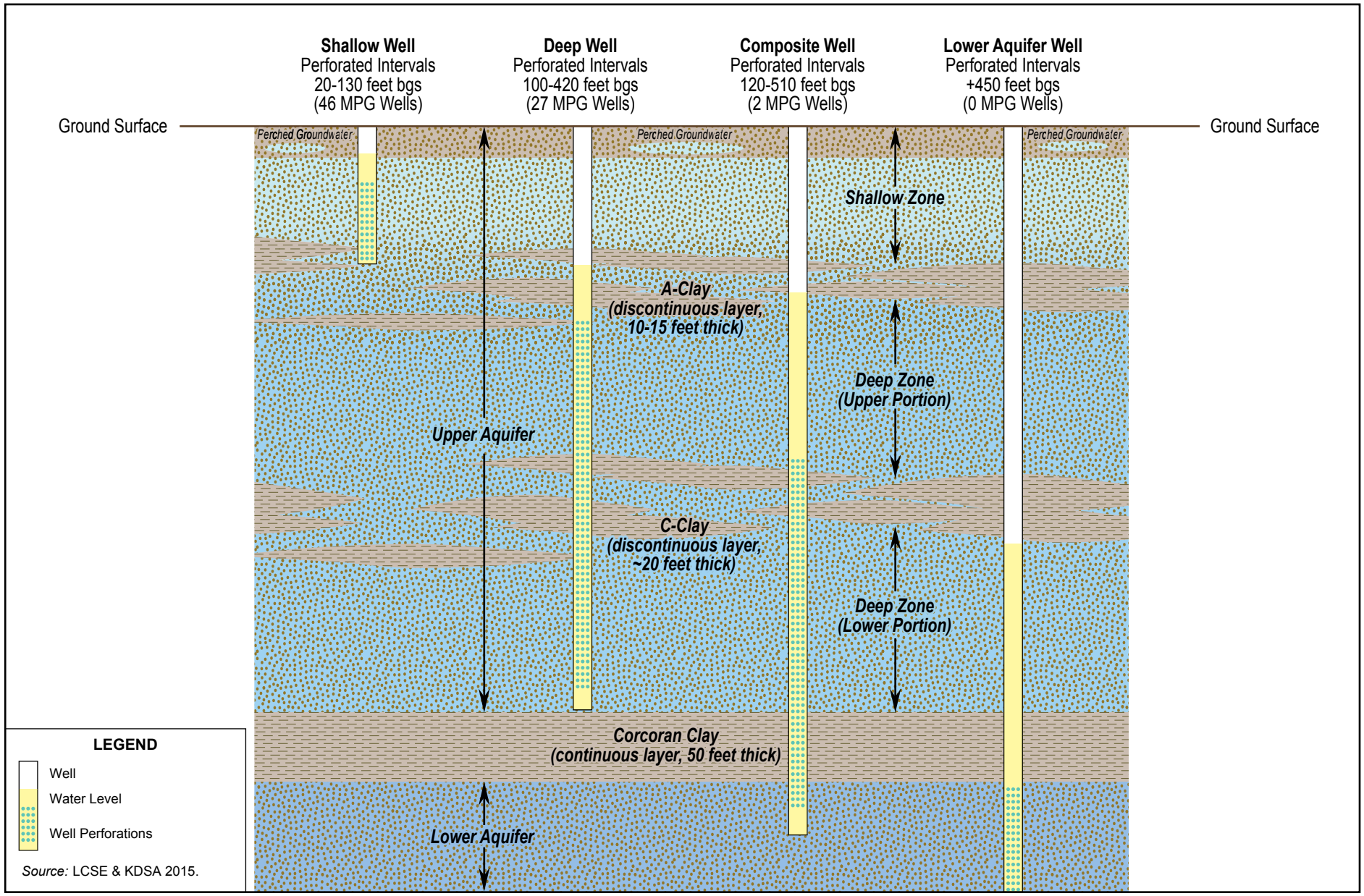
In the southern extent of this basin, within the Delta-Mendota Subbasin which underlies the Mendota Pool and all MPG owned farmland in the Primary Study Area (Figure 12), the three water bearing zones are present: the shallow zone and deep zone located within the upper aquifer (overlies the Corcoran Clay layer), and the lower aquifer below the Corcoran Clay layer (Figure 13). The shallow and deep zones of the upper aquifer are divided by the A-Clay, a fine-grained (predominately composed of clay and silt) layer located 70 to 130 feet bgs. Groundwater in the shallow zone is generally encountered at depths ranging from 25 to 60 feet bgs, and the deep zone of the upper aquifer underlies the A-Clay (or equivalent depth) and extends downward to the Corcoran Clay layer. MPG's Annual Monitoring Program collects data in the shallow zone at the operational depth of MPG's wells (30–125 feet bgs). Data from shallower intervals that may include perched water conditions are not included in the Annual Monitoring Program. This is because there are a limited number of very shallow monitoring wells (less than 30 feet in depth) and the available data appear to show perched groundwater much closer to the ground surface than could provide meaningful data for the wells in the majority of the shallow zone. Perched water can be separated from the shallow zone groundwater table by the presence of very shallow clay lenses located above the shallow zone water table. Percolating groundwater from the ground surface can collect on top of these clay lenses forming a localized saturated condition in the aquifer (Figure 13).

The Delta-Mendota Subbasin has an estimated storage capacity of 81.1 million AF, however the amount of water stored declined to about 51 million AF by 1961 after a prolonged period of high withdrawals (DWR 2003). Groundwater levels in this subbasin have risen 150 feet after implementation of CVP water deliveries beginning in the 1960s. However, dry years observed in 1992, 2007, and 2009 saw relative declines in groundwater levels and subsidence impacts (DWR 2014a).

The Madera Subbasin, which has a capacity of 40.9 million AF, has also seen severe declines in capacity. In 1961, the estimated amount of water stored in this subbasin was 24 million AF. Levels in this subbasin have continued to decline, even after implementation of CVP water deliveries, with 40-foot residual declines between 1970 and present. Declines have been more severe in the eastern portion of this subbasin (see 7; DWR 2003, 2014a) and are substantial enough to meaningfully affect groundwater levels. The Delta-Mendota Subbasin, particularly in the deep zone of the upper aquifer is influenced by groundwater conditions in the Madera subbasin.

Tulare Lake Groundwater Basin

The Tulare Lake Groundwater Basin covers 8,074 square miles in the southern portion of the Central Valley and is bounded roughly by the San Joaquin River to the north, the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Ranges to the west (Figure 12). As with the San Joaquin Valley Groundwater Basin to the north, the Corcoran Clay layer extends across most of this basin at 200 to 500 feet bgs and ranges from 20 to 200 feet in thickness (Westlands 2014). Although the Corcoran Clay layer separates the upper and lower aquifer in the majority of the basin, it is not continuous within the Westside Subbasin and diminishes in the southwestern area of the subbasin (Westlands 1996, 2014). Recharge sources in the Tulare Lake Groundwater Basin includes runoff and percolation from several rivers, subsurface flows, Coast Range seepage and streams, and percolation from surface irrigation, or artificial groundwater recharge basins.



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Conceptual Representation of Well Types and Underlying Aquifers

FIGURE 13

Table 7: Status of Groundwater Subbasins Underlying the Study Areas

Basin	Subbasin	Surface Area (square miles)	Surface Area (acres)	Estimated Capacity[1] (AF)	Available Yield[2] (%)	DWR Subbasin Designation[3]	Reason for Designation
San Joaquin Valley	Delta-Mendota	1,170	747,000	81.1 million	11.8	High Priority	Critical overdraft, agricultural importance
	Madera	614	394,000	40.9 million	10.4	High Priority	Subsidence, critical overdraft, water quality degradation
	Chowchilla	248	159,000	13.9 million	8.6	High Priority	Subsidence, critical overdraft, water quality degradation
Tulare Lake	Kings	1,530	976,000	93.0 million	Unknown	High Priority	Critical overdraft, high population dependency, agricultural importance
	Westside	972	622,000	101.5 million[4]	9.0	High Priority	Subsidence, critical overdraft, high TDS concentrations, agricultural importance

[1] Estimates of total groundwater storage reflect all water stored in a groundwater basin.
[2] Available yield (water available to wells) is that of suitable quality for municipal or agricultural uses and which can be withdrawn without damage to the aquifer (e.g., subsidence), thus heavy pumping prior to arrival of CVP water may have drawn on lower quality water with associated degradation of cropland and yields and potentially resulted in damage to the subbasin through subsidence.
[3] DWR basin prioritization is a statewide ranking of groundwater basin importance based on groundwater reliance, population, overdraft conditions and groundwater quality. Basins of high and medium priority are subject to the 2014 SGMA legislation requiring a GSP by 2020 for high priority basins.
[4] Represents the sum total of estimated storage in the upper and lower aquifer. Sources: DWR 2003; DWR 2014b.

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As with the San Joaquin Valley Groundwater Basin, prior to importation of CVP water in the early 1960s, sustained historic pumping caused dramatic declines in groundwater levels and storage, with water levels falling from 300 to 400 feet in the Westside Subbasin (USGS 2009). Although water levels recovered in the northern portion when pumping decreased, groundwater levels have not recovered in portions of the southern San Joaquin Valley (USGS 2009). Approximately 57 percent of groundwater pumping within the Central Valley Groundwater Basin is from the Tulare Lake Groundwater Basin, where an estimated 6.3 million AFY was pumped between 2005 and 2010; the most heavily pumped subbasins are Kings and Westside (DWR 2013b). The Tulare Lake Groundwater Basin continues to show dramatic declines in groundwater levels and accompanying increased depletion of groundwater storage (DWR 2014b).

Existing Conditions in the Primary Study Area

Groundwater Withdrawals in the Primary Study Area The Primary Study Area overlies approximately 6.58 percent of the Delta-Mendota Subbasin, 1.45 percent of the Kings Subbasin, and 5.06 percent of the Madera Subbasin, while the Secondary Study Area encompasses approximately 78 percent of the Westside Subbasin.

All MPG wells used under the existing Exchange Agreements are located in the Delta-Mendota Subbasin of the Groundwater Basin. MPG pumps groundwater for Adjacent Overlying Use in all years, but pumps groundwater for exchange generally only in normal and dry years, or when needed. MPG and other pumpers in the area withdraw water from both the shallow and deep zones of the upper aquifer; other pumpers and to a far lesser extent MPG as well, also withdraw water from the lower aquifer below the Corcoran Clay layer. Over the 2001–2014 period, MPG has pumped an average of 24,400 AFY for both exchange and Adjacent Overlying Use from this subbasin. In years when an exchange took place (2002, 2007–2010, and 2012–2014), MPG pumped an average of 20,642 AFY for exchange. Across all monitoring years, MPG pumped an average of 11,546 AFY for Adjacent Overlying Use. The most recent data used in the modeling efforts for the 2015 Hydrogeologic Technical Analysis (i.e., the 2014 Annual Report), which was an exchange year, showed that MPG pumped a total of 32,328 AF for both exchange and Adjacent Overlying Use (LSCE & KDSA 2015).

Multiple known and unknown public and private groundwater pumpers also withdraw water from the Delta-Mendota and Madera Subbasins in the Primary Study Area (Table 8). From 2001 through 2014, non-MPG users pumped between 86,700 and 162,000 AFY, mostly from the deep zone of the upper aquifer, with an estimated average withdrawal of 110,023 AFY. The most recent data used in the modeling efforts for the 2015 Hydrogeologic Technical Analysis (i.e., the 2014 Annual Report) shows non-MPG pumpage was estimated at 161,700 AFY (LSCE & KDSA 2015). Including pumpage from MPG, total groundwater pumped within the Primary Study Area from 2001 through 2014 averaged around 134,423 AFY, with maximums exceeding 150,000 AFY. MPG pumpage accounts for an average of 18.2 percent of the total groundwater withdrawals in the Primary Study Area (Table 9).

Table 8: Non-MPG Pumpage within the Primary Study Area

Entity	Average Pumpage (AFY)[1]
Aliso Water District (West of Chowchilla Bypass)[2]	19,695
Aliso Water District (East of Chowchilla Bypass)[2,3]	55,500
Central California Irrigation District	7,000
Columbia Canal Company[2]	6,749
City of Mendota	3,243
Locke Ranch	1,750
Spreckels Sugar Company	1,621
Covanta	579
Unknown entities in Fresno County east of Chowchilla Bypass[3]	38,300
Unknown entities in Madera County east of Chowchilla Bypass[3]	11,200
Total	**145,637**

[1] The majority of this pumpage is from the deep zone of the upper aquifer.
[2] Includes pumping within Wonderful Orchards
[3] Only includes pumpage above the Corcoran Clay based on estimates made for the 2014 Annual Report.
Source: Table 3-6 and 3-7 of the 2014 Annual Report. LSCE & KDSA 2015.

Table 9: Annual Pumpage within the Primary Study Area

Year	MPG Pumpage (AFY)	Non- MPG Pumpage (AFY)	Total Pumpage (AFY)	MPG Percentage of Total Pumpage
2002	28,420	121,400	149,820	19.0%
2003	14,239	120,000	134,239	10.6%
2004	12,927	138,000	150,927	8.6%
2005	10,009	102,000	112,009	8.9%
2006	6,364	100,600	106,964	5.9%
2007	38,019	106,000	144,019	26.4%
2008	35,809	92,500	128,309	27.9%
2009	36,879	101,400	138,279	26.9%
2010	19,936	100,600	120,536	16.5%
2011[a]	8,564	86,700	95,264	9.0%
2012[a]	39,184	87,700	126,882	30.9%
2013	34,534	111,700	146,234	23.6%
2014	32,328	161,700	194,028	16.7%
Average	**24,400**	**110,023**	**134,423**	**18.2%**
Cumulative	**317,212 AF**	**1,430,300 AF**	**1,747,510 AF**	**18.2%**

[a] MPG pumping has been relatively consistent, however regional activities that lower overall pumping in the Primary Study Area affect MPG's contribution to that overall pumping. For instance, in 2011 and 2012, several farmers within the Primary Study Area planted new crops, which temporarily reduced the overall demand for groundwater as the smaller trees within these new orchards had lower water demand than mature orchards.
Sources. LSCE & KDSA 2003-2015; water withdrawn from Delta Mendota and Madera Subbasins.

MPG obtains almost all of its groundwater from the upper aquifer above the Corcoran Clay layer. MPG wells draw water from both the shallow and deep zones of the upper aquifer, with shallow zone pumping ranging from 1,573 to 17,673 AFY between 1997 and 2014, with an average withdrawal of 10,910 AFY (LSCE & KDSA 2015). Other known entities that pump from the shallow zone within the Primary Study Area include the City of Mendota and Meyers Water Bank. Specific pumping data in the shallow zone for these entities is not available; however, the City of Mendota has historically pumped between 1,000 to 2,600 AFY west of the Fresno Slough from both the shallow and deep zones. MPG pumpage in the deep zone of the upper aquifer over the 18-year period from 1997 to 2014 ranged from 4,664 to 24,678 AFY, and

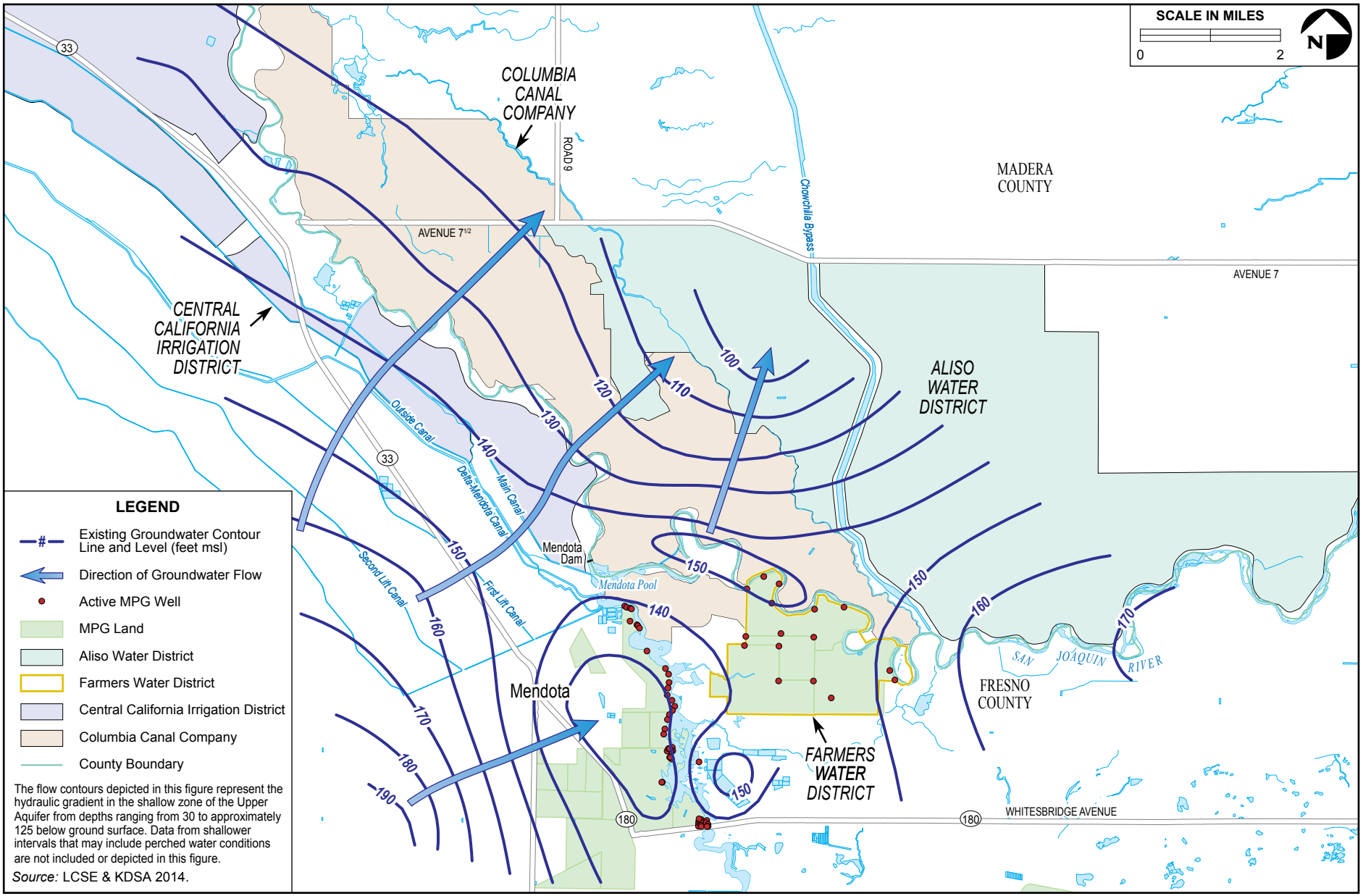
averaged 15,232 AFY. Many other farms, ranches and public agencies draw water from the deep zone (Table 8). MPG deep zone withdrawals account for an average of 11.3 percent of the total average pumpage of 134,423 AFY within the Primary Study Area. The majority of groundwater pumpage in the Primary Study Area is from the deep zone and related groundwater declines in the deep zone have coincided with patterns of deep zone pumping by other pumpers, as well as MPG (LSCE & KDSA 2015).

Groundwater Levels in the Primary Study Area The Primary Study Area mostly overlies the Delta-Mendota Subbasin but also includes portions of the Madera, Westside, and Kings Subbasins. The depth to groundwater in the shallow zone in this area is generally 25 feet bgs or lower. The water column in the shallow zone averages 60 feet from the A-Clay layer up to the water table. The water column in the deep zone averages 350 feet from the base of the aquifer at the Corcoran Clay layer to the top of the deep zone water column. The lower aquifer contains a water column averaging 1,070 feet from confining sediments at the base of the lower aquifer to the top of the water column (LSCE 2015; Figure 13).

Groundwater levels from a large network of wells in the Mendota Pool area have been monitored since 1999 under various MPG Pumping and Monitoring Programs. This monitoring data shows seasonal and year-to-year fluctuations in groundwater levels in the vicinity of MPG wells. Levels are generally lower in summer and fall when recharge is low and entities pump the greatest amounts and are higher in winter and spring when pumping rates decline and recharge is greater. Groundwater levels also reflect climatic conditions, with water levels falling during droughts due to decreased recharge and increased pumping. Whereas in wet years, water levels rise due to greater recharge and decreased pumping. These natural fluctuations are less in the shallow zone due to the unconfined nature of the aquifer as compared to the deep zone which exhibits seasonal and climatic variations due to the semi-confined nature of this aquifer.

Historically, the San Joaquin River and its tributaries were considered to be “gaining” streams or streams that had a net gain of water from groundwater discharging into the river. This was particularly true in certain areas of the Central Valley floor, especially in the Sacramento-San Joaquin Delta region. However, in areas of substantial pumping, this condition has reversed causing some reaches of the San Joaquin River and its tributaries to become sources of groundwater recharge, or “losing” streams. Agricultural development and associated groundwater pumping within the Central Valley have resulted in a decline in groundwater storage and levels, causing the majority of rivers and streams in the San Joaquin and Tulare Lake Groundwater Basins to transition from “gaining” streams to “losing” streams (Reclamation 2015).

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Groundwater Flow Direction in the Shallow Zone (Summer 2015)

FIGURE 14

In recent years, the hydraulic connections between surface water and groundwater at the San Joaquin River have resulted in groundwater recharge from Restoration Flows, partially as a result of infiltration of water into the underlying aquifer (losing stream conditions). Restoration Flows are required under the San Joaquin River Restoration Settlement and a protected water right as in-stream flows under California State Code 1707. SJRRP interim flows began in 2009 and were released through December 2013. SJRRP full Restoration Flows of 200 to 1,050 cfs began in January 2014, resulting in some incidental recharge near the Mendota Pool. However, due to a critical low water year in 2014, Restoration Flows began to be reduced in February 2014 and continued to be reduced until Restoration Flows were stopped in March 2014 (SJRRP 2016).[30] Surface water within the Mendota Pool and Fresno Slough also recharges of groundwater in the upper aquifer, although the accumulation of silts and sediments in the Mendota Pool and the shallow A-Clay layer under the Fresno Slough limit seepage in this area.

Under existing conditions, groundwater levels in the Primary Study Area are also affected by banked water from Meyers Water Bank recharge ponds, which can comprise as much as 60,000 AF. This facility captures surface water when it is available and stores it as groundwater for later use during dry and critically-dry years (Reclamation 2012b). East of the Fresno Slough, a groundwater mound forms during recharge to the Meyers Water Bank resulting in a groundwater gradient that radiates outward from Meyers Water Bank.

The Terra Linda Farms Recharge Canal was constructed by Terra Linda Farms in 2010. The four NCR Recharge Ponds are a currently operational recharge facility. Records indicate that two of the four NCR ponds were used as early as March 2008. The other two ponds began to be utilized in November of 2010 and January 2011. While the approximately 9,000-foot-long Terra Linda Farms Recharge Canal was constructed in 2010 just west of the Fresno Slough, the recharge canal was not routinely utilized between 2011–-2014 due to drought conditions. Therefore, the Terra Linda Farms Recharge Canal is not considered operational under existing conditions and is not assumed to affect groundwater levels during the study period.

Shallow Zone Groundwater Levels (Above A-Clay layer) As discussed above, the groundwater level of the shallow zone is generally 25 feet bgs or lower in the Primary Study Area, with the height of the water column from the A-Clay layer up to the water table averaging approximately 60 feet. Shallow zone groundwater levels vary throughout the Primary Study Area. Historically, shallow zone groundwater levels in the Primary Study Area vary in response to dry and wet years and resultant changes in pumping and recharge, declining as much as 69 feet during major droughts (e.g., 1986-1994) and rising by up to 56 feet during wet years (1993-2007). Shallow zone groundwater flow directions and levels are influenced by areas where pumping occurs. Groundwater flow in the shallow zone in the vicinity of the Mendota Pool is generally towards the MPG well field located west of the Mendota Pool and northeast towards major drawdown areas in Madera County.

MPG's wells in the shallow zone of the upper aquifer operate at a depth of approximately 30-125 feet bgs and are located west of the Mendota Pool/Fresno Slough and the San Joaquin River where it enters the Mendota Pool. While 6 MPG shallow zone wells west of the Mendota Pool are located with 0.25- to 0.5-mile of the San Joaquin River, a majority of the shallow zone wells are located 2.5 to 3.5 miles from the San Joaquin River. MPG wells in the deep zone of the upper

[30] Restoration Flows were restored in February 2016 and continue to be released.

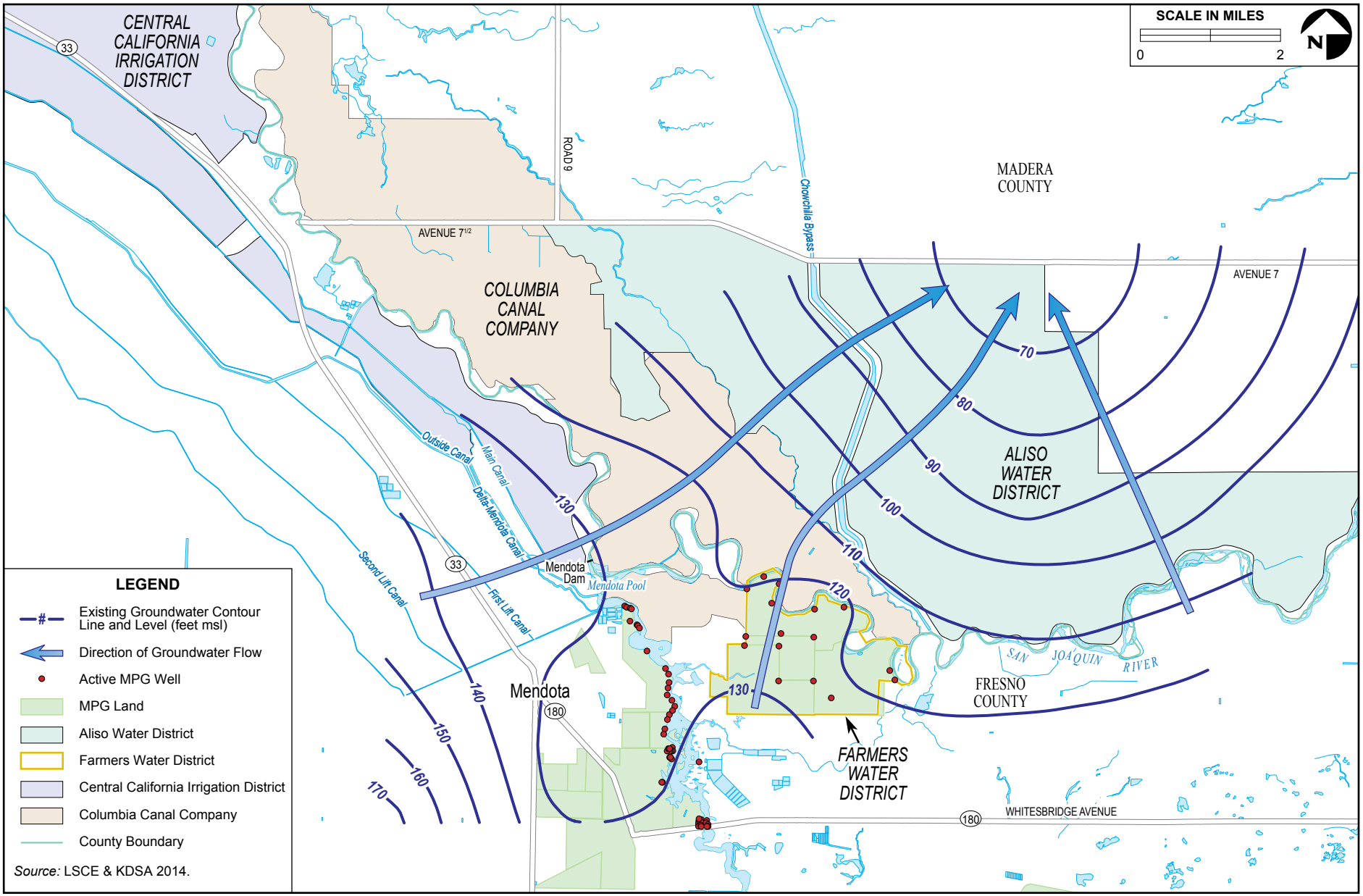
aquifer operate at depths from about 120 to 400 feet and are primarily overlain by the A-Clay layer. The MPG wells generally have a mix of direct (shallow zone wells) and indirect (primarily deep zone wells) connection to the Mendota Pool. The amount of surface water seepage from the Mendota Pool and San Joaquin River between San Mateo Avenue and where it enters the Mendota Pool has been previously measured at 285-AF per day over the 1,300-acre extent of these surface water features (KDSA and LSCE 2000). Seepage losses from operation of the Pool have been accounted for by the MPG program by leaving behind 5 percent of the groundwater pumped for exchange, or an average of 1,220 AFY from 2002 to 2014.

The presence, depth, and extent of a cone of depression around MPG wells west of the Fresno Slough is affected by groundwater pumping and recharge from subsurface inflows, Meyers Water Bank, and nearby surface water features such as the Mendota Pool (refer to *Groundwater / Surface Water Connectivity* discussion below), with groundwater elevations fluctuating about 10 feet in summer and winter (LSCE & KDSA 2002-2015). On this more localized level, groundwater levels near the San Joaquin River branch of the Mendota Pool were about 15 feet lower in January 2015 than when groundwater measurements began in 2000 (LSCE & KDSA 2015). However, this is not necessarily representative of long-term trends because it includes the extreme drought conditions that began in 2012 and corresponded with regional declines in shallow groundwater levels due to declines in recharge coupled with ongoing groundwater pumping. For instance, at the monitoring well west of the Mendota Airport, groundwater levels declined about 5 feet per year from February 2012 to January 2015 (LSCE & KDSA 2015).

Deep Zone Groundwater Levels (Below A-Clay layer) Deep zone groundwater levels vary significantly within the Primary Study Area and deep zone flows are strongly northeast towards a 40-foot deep cone of depression east of the Chowchilla Bypass in Madera County. Long-term overdraft and groundwater drawdown in Madera County has significantly affected both the direction of deep zone flows and water levels (see Figure 15; LSCE & KDSA 2015; LSCE 2011). Long-term groundwater level declines in this area due to ongoing overdraft are evidenced by approximately 95 feet declines in two wells in this area since the 1950s, averaging about 2 feet decline per year. Extensive deep zone pumping in Madera County and to a lesser extent Fresno County, which have resulted in large groundwater level depressions, contribute to declining groundwater levels in the Mendota Pool Area and groundwater flows towards these cones of depression. Within the Primary Study Area, water pumped from deep wells intercepts groundwater which would otherwise flow towards these cones of depression in Madera County (LSCE & KDSA 2015). Water levels in deep zone wells around the Fresno Slough have declined from 50 to 130 feet during dry periods, but recovered to historic levels of 20-30 feet bgs during wet periods.

Lower Aquifer (Below the Corcoran Clay Layer) The lower aquifer begins at about 450 feet bgs along the bottom of the Corcoran Clay layer and extends to an unknown depth within the Primary Study Area. Lower aquifer groundwater flow is to the southwest due to the declining groundwater levels in this direction. In 2014, the lower aquifer experienced residual drawdowns ranging from 10 to 15 feet. Historically, drawdowns in the lower aquifer have been measured at 100 feet from 1999 to present, resulting primarily from non-MPG pumping below the Corcoran Clay both west and northeast of the Mendota Pool. Although the majority of MPG pumping occurs in the

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Groundwater Flow Direction in the Deep Zone (Winter 2012/2013)

FIGURE 15

upper aquifer, reduced non-MPG and MPG pumping in the lower aquifer in 2004 to 2006 and 2010 to 2011 resulted in groundwater level increases during these periods (LSCE & KDSA 2015).

Groundwater / Surface Water Connectivity in the Primary Study Area Within the Primary Study Area, the interaction of groundwater and surface water is primarily limited to the shallow zone because the A-Clay layer creates a physical barrier that limits the movement of surface water to the deep zone. There is a groundwater ridge in the shallow zone underlying the San Joaquin River when there is water in the river (represented by the 150-foot msl elevation contour in Figure 14). This ridge produces a groundwater gradient where groundwater flows northeast towards Madera County and Wonderful Orchards and southwest towards MPG-owned land. The depth at which MPG shallow zone wells operate and are monitored west of the Fresno Slough ranges from approximately 30 to 125 bgs (Figure 14). The groundwater ridge resulting from water being present in the San Joaquin River largely occurs generally beneath the San Joaquin River, MPG, and CCC lands approximately 1-mile east of the Mendota Pool. The MPG wells east of the Mendota Pool and Fresno Slough, as shown in Figure 6, are all deep zone or composite wells, which pump from a depth of 100–510 feet bgs. These wells are overlain by the A-Clay layer that is present at a depth ranging from 75–125 feet bgs and inhibits percolation from the shallow zone or groundwater ridge into the deep zone; thus deep zone wells are not in direct connection with surface water infiltration. The Groundwater Model for the 2015 Hydrogeologic Technical Analysis (Appendix E) simulates infiltration that would occur from the San Joaquin River and the Mendota Pool. The seepage from all surface water features including streams and canals including the San Joaquin River are estimated to range from 49,000 AFY to 133,000 AFY over the entire Primary Study Area. Seepage induced by MPG pumping has been accounted for in the pumping program through a five percent leave behind amount for groundwater pumped into the Pool

The Mendota Pool and Fresno Slough provide for some recharge of groundwater levels in the upper aquifer. The exact amount of seepage/recharge is limited by the presence of fine-grained sediment on the bottom of the Mendota Pool. In addition, the MPG wells are located in an area west of the Pool where the bottom of the Pool is generally at a depth of about two feet and which extends eastward into the Pool for several hundred feet. Soil borings west of the Mendota Pool show that silt and clay soil horizons are present in places in the upper 10 to 20 feet of the subsurface in the southern half of the MPG shallow zone well field (Appendix F). The presence of these shallow silt and clay lenses limits seepage at the Mendota Pool and the potential for induced seepage by shallow zone pumping. As discussed in Section 3.1.4, *Impact Analysis/ Environmental Consequences*, below, the Groundwater Model in the Hydrogeologic Technical Analysis (Appendix E, page 39) estimates that groundwater recharge from the Mendota Pool and Fresno Slough is smallest source of groundwater recharge, at 31,000 AFY.

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Existing Conditions in the Secondary Study Area

Pumpage and Groundwater Levels in Westlands lies entirely within the Westside Subbasin and water is extracted by multiple users, with excessive pumping from the lower aquifer causing declining water levels. Overdraft in the form of declining water levels are exacerbated by the Corcoran Clay layer that limits percolation and recharge of the lower aquifer. The perennial or safe yield of this subbasin has been established at a maximum withdrawal of 200,000 to 225,000 AFY (Westlands 2015).[31]

Prior to 1968, before CVP water supplies were available in Westlands, 800,000 to 1,000,000 AFY of groundwater was pumped for agricultural use causing groundwater levels to reach the historic low of 156 feet below msl in 1967. This resulted in water-bearing sediment compaction and land subsidence up to 24 feet in 1970 (USGS 1988, as cited in Westlands 2015). With the arrival of CVP water in 1967, groundwater levels recovered, reaching a peak of 89 feet above msl in 1987. However, major cutbacks in CVP water deliveries to Westlands has increased Westlands' reliance on groundwater resources with groundwater pumping projected to reach 650,000 AFY in years that no CVP water is supplied. The need for additional groundwater pumping has resulted in the construction of 605 new wells in Westlands since 2000 (Westlands 2015).

Westlands currently contains 792 operational wells and 124 non-operational wells (Westlands 2015). These wells are monitored for groundwater levels under the Westlands Groundwater Management Plan. Historic pumping data from these wells show a correlation between the quantities of water pumped and estimated changes in groundwater elevations from the lower aquifer. The majority of this water is pumped from the lower aquifer due to poor water quality in the upper aquifer (see Section 3.2, *Groundwater Quality*). The results of groundwater monitoring show that in 2015, 660,000 AF of groundwater was pumped and groundwater levels in the lower aquifer decreased an average of 44 feet to an elevation of 120 feet below msl (Westlands 2015).

Pumpage and Groundwater Levels in Madera County The Delta-Mendota, Madera, and Chowchilla Subbasins of the San Joaquin Valley Basin underlie west and central Madera County. Groundwater levels in this region have been declining since the 1920s as a result of reliance on groundwater resources for agriculture, municipal, and domestic needs. Since 1980, water levels have declined between 31 and 155 feet. Between 1980 and 2011, overdraft was estimated to be an average of 143,000 AFY, and is projected to reach 259,000 AFY after 2014 due to increasing trends for conversion to more water intensive high value crop types in Madera County east of SR-99 and maturation of existing tree crops. Average groundwater declines are between 1 to 5 feet per year within central Madera County. Within the Secondary Study Area, the decline in groundwater levels tends to be the greatest near the northeastern extent, showing areas of annual declines of 5 feet within the Madera Subbasin. Levels are more stable closer to the San Joaquin River with annual declines between 0 and 1 foot (Figure 14). An area of major groundwater level declines is associated with a large cone of depression south of SR-152 and west of the Chowchilla Bypass. Another large cone of depression is located northeast of the Santa Fe railroad just east of the City of Madera. However, near the San Joaquin River along the

[31] This perennial or safe yield estimate, used to inform impact analyses throughout the Draft EIS/EIR, was estimated using macro-level data in Westlands' Deep Groundwater Conditions Report. Westlands is currently preparing a GSP to achieve sustainable yield in accordance with SGMA. Through development of the GSP, Westlands will be able to more accurately estimate sustainable yield of the Westside Subbasin.

County's southern boundary, groundwater levels have generally been stable over the past three decades due to seepage from the river.

3.1.3 Regulatory Framework

Federal Policies and Regulations

There are no federal policies or regulations pertaining to groundwater levels which would apply to the Proposed Action or Alternatives.

State Policies and Regulations

Groundwater Management Act of 1992 (Assembly Bill [AB] 3030) AB 3030 (California Water Code Section 10750 et seq.) authorizes certain local agencies to develop groundwater management plans for groundwater basins defined in DWR Bulletin 118 and provides a systematic procedure for developing these plans. The action is voluntary and no new level of government is formed. The Bill allows these agencies to raise revenue to pay for facilities to manage the basin (e.g., extraction, recharge, conveyance, and quality). Westlands developed a groundwater management plan under AB 3030 and FWD is currently their own groundwater management plan.

Sustainable Groundwater Management Act (SGMA) Enacted in 2014, SGMA encourages local agencies to work cooperatively in managing groundwater resources and is intended to increase local control and protection over groundwater basins. The intent of this legislation is to manage the use of groundwater in a manner that can be maintained long-term without causing any of the six identified undesirable results: 1) a chronic lowering of groundwater levels, 2) significant and unreasonable reduction in groundwater storage, 3) significant and unreasonable seawater intrusion, 4) significant and unreasonable degraded water quality (including the migration of contaminated plumes), 5) significant and unreasonable land subsidence that substantially interferes with surface land uses, or 6) depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

In the context of statewide concerns over mismanaged groundwater resources and poor groundwater quality, the act provides framework and guidance for developing GSPs and designates power to local GSAs. The DWR has designated groundwater subbasins within Fresno and Madera Counties as high priority basins. As such, these basins are required to adopt a GSP by 2020. Among other groundwater-basin dependent requirements, GSPs must:

- Set objectives to achieve sustainability within 20 years of plan implementation;
- Report data on groundwater levels, water quality, subsidence, and surface water interaction;
- Provide a monitoring program for managing groundwater levels, water quality, subsidence, and changes to surface flow and surface water quality;
- Provide mitigation of overdraft;
- Address migration of contaminated groundwater and provide measures for groundwater contamination cleanup;
- Provide measures addressing recharge, diversion, water recycling as necessary;

- Provide well construction policies;
- Establish efficient water management practices; and
- Address impacts on groundwater dependent ecosystems.

As of May 2017, the DWR-approved Groundwater Sustainable Agencies within the Delta-Mendota and Westside Groundwater Subbasins include the Exchange Contractors, Westlands, FWD, the County of Madera, Aliso Water District, the City of Mendota, the City of Los Banos, and the Grasslands GSA. It is important to note that the Proposed Action and Alternative 2, with specific design constraints that limit pumping and recharge components, provide examples of the programs that will likely be required to achieve SGMA's goal of sustainable groundwater yield by 2040.

Water Quality Control Plan for the Tulare Lake Basin, and for the Sacramento and San Joaquin River Basins The Proposed Action spans both the Tulare Lake Basin and the San Joaquin River Basin. These basins are covered under two different Water Quality Control Plans. The Basin Plans for both the Tulare Lake Basin and the Sacramento and San Joaquin River Basins were developed in 1975 by the Central Valley Region Water Quality Control Board (CVRWQCB) and approved by the State Water Resources Control Board (SWRCB); they have been subsequently revised and approved several times. The most recent revision for the Tulare Lake Basin Plan was in 2004 while the most recent revision for the Sacramento and San Joaquin River Basins was in October 2011. These Basin Plans perform all the functions required by the Porter-Cologne Water Quality Control Act, including identifying the designated beneficial uses for surface and groundwater resources, defining applicable water quality objectives necessary to support these beneficial uses, and establishing programs that protect water quality.

California Water Code (Water Rights) The California Water Code primarily addresses the beneficial use, diversion of surface waters through the state, and rights to groundwater to overlying users. A water right is a legally protected right, granted by law, to take control of water and to put it to beneficial use. Under the California Water Code, the SWRCB is responsible for allocating surface water rights and permitting the diversion and use of water throughout the State. Through its Division of Water Rights, the SWRCB issues permits to store and to divert water for new appropriations and it authorizes changes to existing water rights. The SWRCB attaches conditions to these permits to ensure that the water user prevents waste, conserves water, does not infringe on the rights of others, and puts the State's water resources to the most beneficial use. The California Water Code establishes various kinds of rights to surface water (e.g., riparian and appropriate) and also addresses rights to groundwater by the overlying use or land owner (overlying rights).

Under Section 1707 of the California Water Code, an applicant, permittee, or licensee who wishes to change the point of diversion, place of use, or purpose of use from that specified in an existing permit or license must petition SWRCB to amend a water right. When considering a petition for a water right amendment, SWRCB considers the same factors as those it considers when a water user applies for a new permit, such as waste prevention, water conservation, infringement on the rights of others, and public trust values.

Local Policies and Regulations

Fresno County Groundwater Management Ordinance The Fresno County Groundwater Management Ordinance (Municipal Code Chapter 14.03) requires that a permit be obtained to extract groundwater underlying lands in Fresno County for direct or indirect transfer to lands outside the County. Permits require that a groundwater management plan is adopted pursuant to the Groundwater Management Act, and that a groundwater monitoring and mitigation program is instituted where applicable. Water exchanges, short-term water transfers, groundwater banking programs, and emergency transfers are exempt from permit requirements. The Groundwater Management Ordinance aims to protect groundwater resources from overdraft and ensure continued availability of groundwater for agricultural production in Fresno County.

Westlands Water District Groundwater Management Plan Westlands developed a Groundwater Management Plan in 1996 pursuant to AB 3030 and the CVPIA. The Groundwater Management Plan contains goals to preserve groundwater resources and quality, ensure the long-term availability of high-quality groundwater, to maintain local control of groundwater resources, and to minimize the impacts of groundwater use including subsidence, overdraft, and soil productivity.

Groundwater Management Plan for the San Joaquin River Exchange Contractors The San Joaquin River Exchange Contractors, consisting of CCID, FCWD, CCC, and San Luis Canal Company (SLCC), developed the Groundwater Management Plan for the Exchange Contractors service area from Mendota to Crows Landing to the north, consistent with legislation in AB 3030. The Groundwater Management Plan provides the outline for annual monitoring, data acquisition and evaluation of regional and site-specific activities related to groundwater pumping and transfers.

Madera Groundwater Management Plan The Madera Groundwater Management Plan, updated in 2014, provides the framework and technical data with the intent of effective groundwater management in order to restore groundwater resources in Madera County. Participants in this Groundwater Management Plan include Madera Irrigation District, Chowchilla Water District, City of Chowchilla, City of Madera, Madera County, and South-East Madera County United. The Plan contains the goal of managing groundwater in a manner that can be maintained long-term without environmental and economic consequences, and to stabilize groundwater levels by 2024.

3.1.4 Impact Analysis/Environmental Consequence

Methodology for Analysis

This EIS/EIR evaluates changes in groundwater levels resulting from the Proposed Action or alternatives. Potential impacts to groundwater levels are evaluated using a Groundwater Model in the Hydrogeologic Technical Analysis (Appendix E), which is based on groundwater level monitoring data in the MPG's 2002-2014 Annual Reports, as described below in further detail.

The baselines used for this analysis are the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA to provide a full disclosure of the potential impacts. The existing setting includes the exchange of groundwater under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further

discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Groundwater Level Monitoring The 2004 Final EIS, Settlement Agreement No. 2, and Subsequent 3-Year Extension Exchange Agreements all include a groundwater level monitoring program that collects data for evaluation of changes in groundwater levels in the Primary Study Area. Water levels are monitored across a network of wells that are completed in the shallow or deep zones above and below the A-Clay layer. MPG currently performs groundwater level measurements in over 60 wells, and also compiles groundwater level information provided by Reclamation, Westlands, Wonderful Orchards, Meyers Farm, and CCID (Table 10). MPG's Annual Monitoring Program monitors groundwater levels in the shallow zone at the operational depth of MPG's wells (30–125 feet bgs). Data from shallower intervals that may include perched water conditions are not included in the Annual Monitoring Program. The MPG Annual Reports also provide details regarding specific wells, monitoring frequency, and responsibility.

Groundwater Model A numerical model of groundwater flow was developed to evaluate the hydrologic response of the Proposed Action and alternatives on groundwater conditions within the Primary Study Area. This model simulates Year 1 to Year 20 of the Proposed Action or Alternative 2. The model is calibrated to historical conditions from 1990 to 2012. The inputs to the calibrated model include:

- Groundwater extraction
- Groundwater inflows and outflows
- Recharge from Wonderful Orchards (NCR) ponds, Meyers Water Bank, and surface water bodies
- Recharge from irrigation
- Precipitation
- Land use characteristics
- Groundwater-surface water interaction
- Subsidence

The Groundwater Model for this analysis used MODFLOW-NWT; an open source, three-dimensional, finite-difference modeling code developed and maintained by the USGS that uses modularization to represent various aspects of the hydrologic system (USGS 2005).

The Model Domain includes a total of 218,880 acres in northern Fresno and southwestern Madera Counties and extends northeast beyond the Primary Study Area and into Madera County (see Figure 1-2 of the Hydrogeologic Technical Analysis in Appendix E). This extent was selected in order to include groundwater pumping from Aliso, Gravelly Ford, and Madera Irrigation Districts, water needs for 88,600 acres of irrigated cropland, and temporary water transfers to the "Red Top" area in Madera County. As groundwater levels in Madera County have experienced high degrees of decline over the past decades, the Groundwater Model has been weighted for inclusion of these factors, as they have the potential to impact groundwater levels within the Primary Study Area.

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Table 10: Groundwater Level Monitoring Well Network

	Owner		Responsible Entity	Shallow Wells	Deep Wells	Total Wells
MPG Wells	Terra Linda Farms		MPG	1	1	2
	Etchegoinberry		MPG	1	0	1
	Coelho/Fordel		MPG	0	1	1
	Meyers Farming		MPG	1	1	2
	Five Star/ Conejo Farms		MPG	1	0	1
	FWD		MPG	0	5	5
	Baker Farming Co.		MPG	0	1	1
	Panoche Creek Farms		MPG	0	1	1
	Total			**4**	**10**	**14**
Non-MPG Wells	West of Chowchilla Bypass	CCID	MPG/CCID	0	7	7
		FCWD	MPG	0	1	1
		Columbia Canal Company	MPG	2	2	4
		United States Bureau of Reclamation	MPG	0	1	1
		Wonderful Orchards	MPG/ Wonderful Orchards/ Reclamation	13	22	35
		Spreckels Sugar Company	MPG/Meyers	6	3	9
		City of Mendota	MPG	1	2	3
		United States Geological Survey	MPG/ Westlands	2	4	6
		Hansen Farms	MPG	0	1	1
		Meyers Farming	MPG/Meyers	11	0	11
	East of Chowchilla Bypass	El Pico Ranch (north of study area)	Reclamation	0	1	1
		Aliso Water District	MPG/ Reclamation	0	10	10
		Gravelly Ford Water District	MPG	0	2	2
		Various owners in Fresno County	MPG/ Reclamation	0	21	21
	Total			**35**	**77**	**112**

Source: 2014 Annual Report. LSCE & KDSA 2015.

Limitations in the Groundwater Model include a limited number of data inputs from wells outside of MPG-owned lands and the Primary Study Area. For instance, MPG does not operate or monitor data from wells located outside the general monitoring network area, such as Aliso Water District or Madera County areas. However, data from DWR and non-MPG wells indicate that shallow zone groundwater levels have declined north of the Primary Study Area, with a 40-foot residual decline occurring in the Madera Subbasin beginning in 1970 and continuing to the present (DWR 2003, 2014a). Given the shallow zone groundwater flow directions (i.e., northeast toward drawdown areas in Madera County), it is reasonable to assume that MPG shallow zone pumping is not responsible for the fluctuations in those areas. In these cases, assumptions are made using the best available data to simulate groundwater conditions in these specific affected areas. Other limitations include a short record of gauge data on Restoration Flows and the relatively high uncertainty of the calibrated numerical LSCE Groundwater Model to simulate groundwater conditions in the lower aquifer (Appendix E, page 42).

Lower aquifer groundwater levels in the model area are particularly sensitive to regional variations in pumping within the lower aquifer due to the confined nature and associated lower storage coefficient of this aquifer. Groundwater pumpage in the model includes known MPG and non-MPG pumping in the Primary Study Area. The model relies on this information as well as

estimates of groundwater pumping from virtual wells in regions north and east of the Primary Study Area where groundwater pumping data is unavailable. These estimates are based on the water need, land use, and crop type of lands within these regions; this information was derived from DWR land use survey data for Madera and Fresno Counties and land use data from the Natural Resources Conservation Service. Listed below are model assumptions, inputs, and results from model calibration of historical groundwater conditions (the assumptions used in the modeling of cumulative impacts, including flows in the San Joaquin River, can be found in Appendix E, Chapter 6):

- Total groundwater pumping in the calibrated model area ranges from 360,000 to 556,000 AFY. Total MPG groundwater pumping accounts for 7.2 to 11.1 percent of this pumpage, with MPG pumping for the Exchange Agreements accounting for 4.7 to 7.3 percent.
- Greater pumping is simulated during drier periods and less pumping in wetter years. Wetter years show a net increase in stored groundwater, whereas drier years show a net decrease in storage.
- Water use efficiency for irrigation is estimated at 80 percent, based on a large utilization of drip and micro-spray irrigation techniques within the model area (Viers et al. 2013).
- Total groundwater recharge from the existing NCR (Wonderful Orchards) recharge ponds, Meyers Water Bank, and agricultural irrigation ranges from 161,000 to 304,000 AFY; this is approximately half of the amount of groundwater pumped in a given modeling year.
- Seepage from the Mendota Pool and Fresno Slough is generally the smallest source of groundwater recharge, reaching a maximum of 31,000 AFY. This seepage is estimated over the entire Mendota Pool area stretching from San Mateo Avenue on the San Joaquin River branch of the Pool to the southern end of the Fresno Slough branch of the Pool where the James Bypass enters the Pool, an area of about 1,300 acres.
- Seepage from streams and canals including the San Joaquin River range from 49,000 AFY to 133,000 AFY during the model calibration period from 1990 through 2012. This varies depending on the type of water year, where higher seepage occurs during wetter years.[32]

[32] There is insufficient data available to parse out the portion of San Joaquin River seepage that comes from Restoration Flows. The 49,000 to 133,000 AFY seepage numbers represents an estimate over the historical calibration period from 1990–2012. During this time frame, the SJRRP began "interim flows" on October 1, 2009. Interim flows primarily occurred (in excess of 600 cfs) in 2010 and 2011 (not 2012) during the months of March through May (2010) and March through June (2011). Whatever Restoration Flows occurred were accounted for in the calibration and modeling of historical streamflow conditions in the San Joaquin River.

- The net amount of recharge from subsurface groundwater inflow ranges from 5,000 to 114,000 AFY.
- Annual subsurface groundwater inflow from general head boundaries are greater than subsurface outflows, indicating that more groundwater is flowing into the model domain than out.
- The maximum error in mass balance[33] in any time-step in the model run was less than 0.1 percent of the total mass in or out of the model at that time-step.

Further detail on the Groundwater Model is available in the Hydrogeological Technical Analysis (Appendix E).

Thresholds of Significance

The threshold of significance for impacts are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as amended. This threshold also encompasses the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action and alternatives under consideration would result in a significant impact related to groundwater levels if they would:

> Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
>
> Substantially interfere with or deplete surface water flows through groundwater drawdown.

Significance criteria for changes in groundwater extraction costs to other users was analyzed in the 2004 Final EIS; however, this significance criteria was removed for this EIS/EIR as any changes to extraction costs would not result in a physical impact to the environment.

Impact and Mitigation Measures

Impact analyses presented in this section are largely based on the results of the Groundwater Model in the Hydrogeological Technical Analysis developed for this EIS/EIR (Appendix E). The Hydrogeological Technical Report models the average groundwater level declines across the 91,769-acre Primary Study Area, as well as in areas of more localized drawdown outside of the Primary Study Area (e.g., areas of major overdraft in Madera County and to a lesser extent more limited drawdowns around the Fresno Slough) for the Proposed Action and alternatives for the 20-year timeframe of the Proposed Action. Historic and potential future incremental declines in groundwater levels can increase pumping costs, but do not necessarily correlate with environmental impacts such as long-terms declines in groundwater levels or changes in groundwater quality. Such impacts are related to long-term continuing trends and not short-term

[33] Mass balance error is defined as the calculated difference between inflows, outflows, and change in storage accrued within each model time-step generally due to instability in the numerical scheme or if the head and flux tolerances in the matrix solvers used to specify model convergence are set too high.

fluctuations. Implementation of SGMA will address longer term groundwater management and trends in groundwater levels

With enactment of SGMA in 2014, groundwater management practices are being reconsidered, and DWR will require groundwater basins designated as high priority, including those within the Study Areas, to adopt GSPs. Many of the existing and revised design constraints incorporated into the Proposed Action and Alternative 2 are in line with the required components of the GSP, such as the monitoring of groundwater levels, groundwater quality, and annual reporting (see Section 4.2.2, *Regulatory Setting*). However, because the GSAs are still in the early stages of preparing GSPs, the effect of GSP management strategies on the Study Areas cannot be quantified with certainty. However, because SGMA would likely impose additional management strategies or recharge facilities on MPG members to achieve sustainability, the results of the Hydrogeological Technical Analysis are conservative because they do not account for any additional management strategies.

Fresno County and FWD GSAs encompass the MPG member lands within the Primary Study Area. These GSAs may impose groundwater management strategies on MPG farmers to achieve sustainability, although the nature and scope of such strategies is unknown at this time. The requirements of a GSP are basin- and management area-specific and discussed above. While the area GSAs may identify a reduction in groundwater pumping as one management strategy, other management strategies may also be considered to achieve sustainability by 2040 (towards the end of the proposed exchange program). Alternative strategies that may also be imposed include adaptive management, increased efficiency in irrigation standards, additional groundwater recharge, and spot purchases. The GSPs are in the early stage of preparation and the ability to quantify the effect of the management strategies with any certainty is limited at this time. However, implementation of the GSPs is qualitatively considered in the discussion of cumulative impacts at the end of this EIS/EIR section.

Impact GWL-1: Shallow Zone Groundwater Impacts in the Primary Study Area
No Action Alternative Although the existing and revised design constraints limiting groundwater pumping would cease under the No Action Alternative, groundwater pumping by the disbanded farmers in the Primary Study Area is estimated to be reduced to 33,395 AFY (compared to 38,316 AFY permitted under the Proposed Action).

Under all Alternatives, including the No Action Alternative, the average shallow zone groundwater level throughout the Primary Study Area would experience a minor long-term decline, from approximately 135 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 130 feet msl at the end of the 20-year period (Figure 16). The reason for this decline even under the No Action Alternative is that groundwater levels are influenced by many factors external to MPG's pumping program, primarily pumping by other agencies and irrigation districts. The Groundwater Model incorporated both wet and dry year periods in each model scenario based on annual reporting from 2002–2014. Although the start of the modeled groundwater levels over the proposed 20-year exchange period coincides with a serious drought, the model represents long-term average annual hydrologic conditions. The start of the model in a dry year does not affect the results since both wet and dry periods are simulated. Although groundwater levels would approach 125 feet msl during the anticipated dry periods over the 20-year exchange period (e.g., Years 13 and 18), groundwater levels would recover during a wet period anticipated at the end of the cycle. This cycle of depletion and recovery

represents a continuation of historical conditions that began with the introduction of CVP water in 1968. Since that time groundwater levels have declined as much as 69 feet during major droughts (e.g., 1986-1994) and risen by up to 56 feet during wet years (1993–2007) (see the discussion of *Shallow Zone Groundwater Levels (Above A-Clay layer)* above).

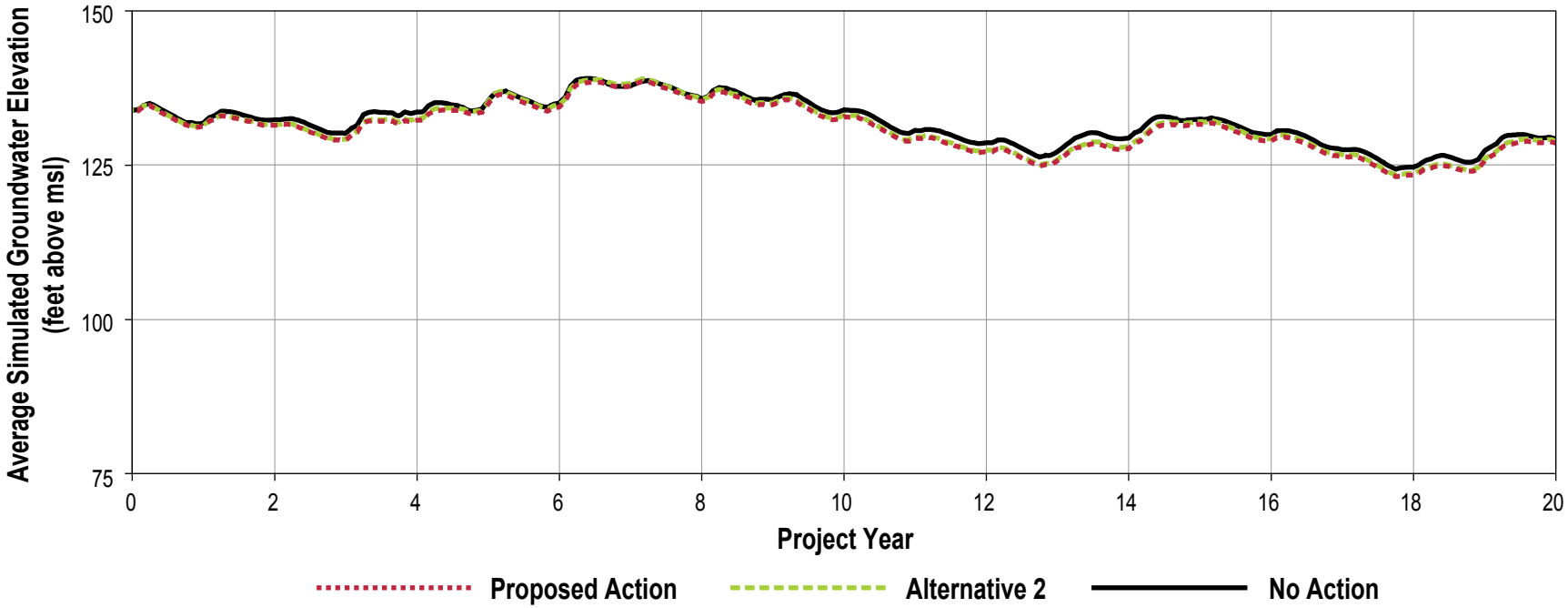
Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 16). When the declines that occur during dry conditions are considered, the average groundwater level in the shallow zone would be lower at the end of the 20-year period under all Alternatives. Specifically, even with the reduction in pumping under the No Action alternative when compared to existing conditions or the Proposed Action, the average decline in shallow zone groundwater levels within the Primary Study Area would be 5 feet lower during the fall/summer and 8 feet lower during the winter/spring (Table 11).

Table 11: Estimated Average Regional Drawdown Over the 20-Year Exchange Period

Depth Zone	Decrease in Average Groundwater Level Over the 20-Year Exchange Program[1,2]					
	No Action		Proposed Action		Alternative 2	
	Winter/ Spring	Fall/ Summer	Winter/ Spring	Fall/ Summer	Winter/ Spring	Fall/ Summer
Shallow Zone	8 ft.	5 ft.	9 ft.	5 ft.	9 ft.	5 ft.
Deep Zone	11 ft.	10 ft.	13 ft.	9 ft.	13 ft.	9 ft.
Lower Aquifer	17 ft.	16 ft.	18 ft.	16 ft.	18 ft.	16 ft.

[1] Calculated by comparing the difference between the simulated groundwater elevation throughout the Primary Study Area from the start (Year 1) and end (Year 20) of the 20-Year program. Year 1 represents the existing "baseline" conditions.
[2] The table averages the decrease in groundwater levels that would occur across six sub-regions that comprise the whole Primary Study Area (refer to Appendix E, Figure 7-1). Individual sub-areas that would experience a higher or lower change in groundwater levels are described in the body of the text.

Groundwater levels in the shallow zone would vary throughout the Primary Study Area. The decline in groundwater levels by the end of the 20-year period would be greatest in the vicinity of the City of Mendota, east of San Mateo Avenue, and in the northern extent of the Primary Study Area approaching the area of overdraft in Madera County, with all of these areas experiencing a decline in groundwater levels of approximately 10 feet (Figure 17). Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including actions in the Mendota Pool area if necessary, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels conservative.



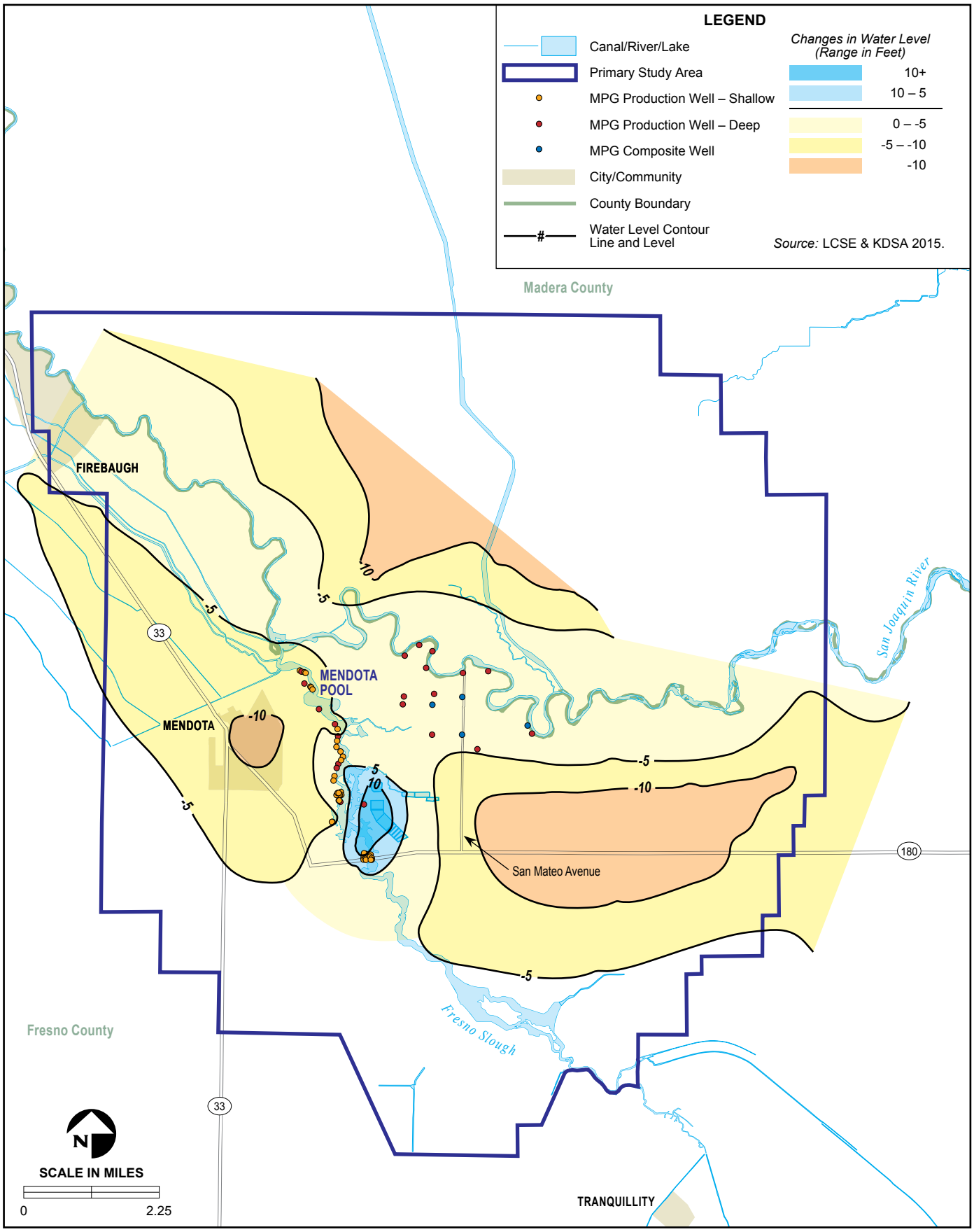
Average shallow zone groundwater levels within the Primary Study Area by the end of the proposed 20-year exchange period would average approximately 130 feet msl. Under all scenarios, changes in shallow zone groundwater levels would follow a similar trend and would result in a slight decline by the end of the 20-year exchange period. Region-wide groundwater withdrawals and recharge would result in seasonal fluctuations in shallow zone levels.

Source: LCSE & KDSA 2015.

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Average Groundwater Levels in the Primary Study Area – Shallow Zone

FIGURE 16



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Groundwater Level Changes between Year 1 and Year 20 Under the No Action Alternative: Shallow Zone

FIGURE 17

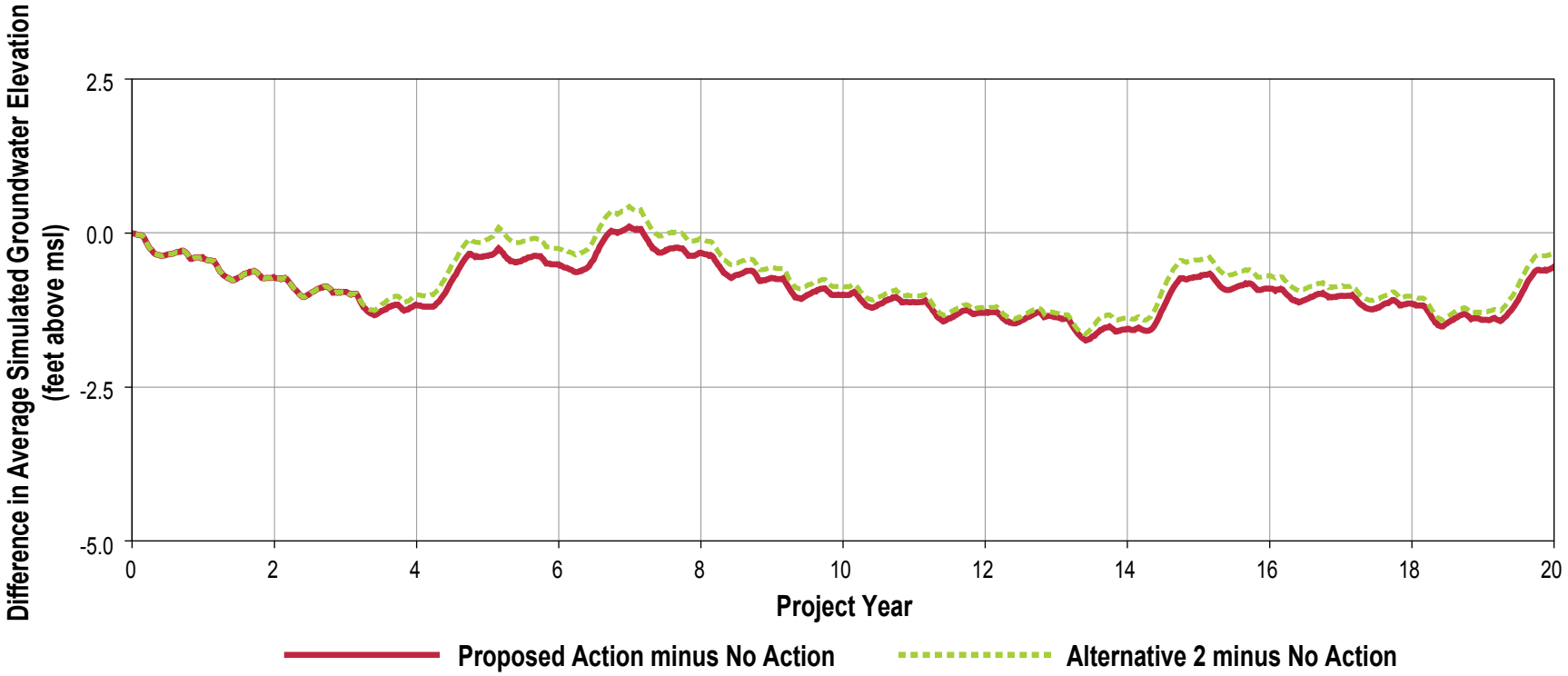
The continuation of recharge activities at the Meyers Water Bank, which is a separate entity that operates independently of MPG, would continue, resulting in an increase in groundwater levels by approximately 10 feet in the vicinity of the bank. Further, groundwater recharge at the four existing NCR Recharge Ponds would continue to occur under the No Action Alternative as it does under existing conditions. However, the additional MPG recharge that would occur under the Proposed Action and Alternative 2 would not occur under the No Action Alternative at the four NCR ponds. Similarly, due to uncertainty in the individual response of former MPG farmers once disbanded under the No Action Alternative, it is assumed that the Terra Linda Farms Recharge Canal would not become operational under the No Action Alternative or contribute to groundwater recharge.

Proposed Action As a shallow zone pumper in the Primary Study Area, MPG's withdrawals would continue to contribute to the decline in groundwater levels in the shallow zone. As with the No Action Alternative, the average shallow zone groundwater level throughout the Primary Study Area would experience a minor long-term decline, from approximately 135 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 130 feet msl at the end of the 20-year period (Figure 16). During the dry period anticipated in the Years 13 and 18 of the 20-year exchange period, average groundwater levels in the shallow zone would decline 10–15 feet, to approximately 125 feet msl. The recovery of groundwater levels in the shallow zone is aided by a wet precipitation cycle, and the operation of groundwater recharge projects in the Primary Study Area.

There is a relatively narrow difference in the amount of groundwater pumped between the Proposed Action (38,316 AFY) and the No Action Alternative (33,395 AFY) when compared to overall inflows/outflows of groundwater in the Primary Study Area. As a result, the Proposed Action would increase the decline in shallow zone groundwater levels by approximately 1 foot when compared to the No Action Alternative and impacts would be greater than under the No Action Alternative (Figure 18).

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 16). When the declines that occur during dry conditions are considered, the average groundwater level in the shallow zone over the 20-year period would be lower than the groundwater level at the start of the 20-year period. Specifically, the average decline in shallow zone groundwater levels within the Primary Study Area would be 5 feet during the fall/summer and 9 feet during the winter/spring (Table 11).

Groundwater levels in the shallow zone would vary throughout the Primary Study Area. The decline in groundwater levels by the end of the 20-year period would be greatest in the vicinity of the City of Mendota (a decline of 10 feet), east of San Mateo Avenue (a decline of 15 feet), and in the northern extent of the Primary Study Area approaching the extensive cone of depression in Madera County (a decline of 10–15 feet) (Figure 19). These declines are the result of MPG shallow zone pumping, non-MPG shallow zone pumping by Meyers and City of Mendota, and non-MPG deep zone pumping north of the San Joaquin River (Wonderful Orchards and wells in Aliso Water District). Given that MPG is the largest known shallow zone pumper in the Primary Study Area, a portion of these impacts are attributable to MPG pumping.



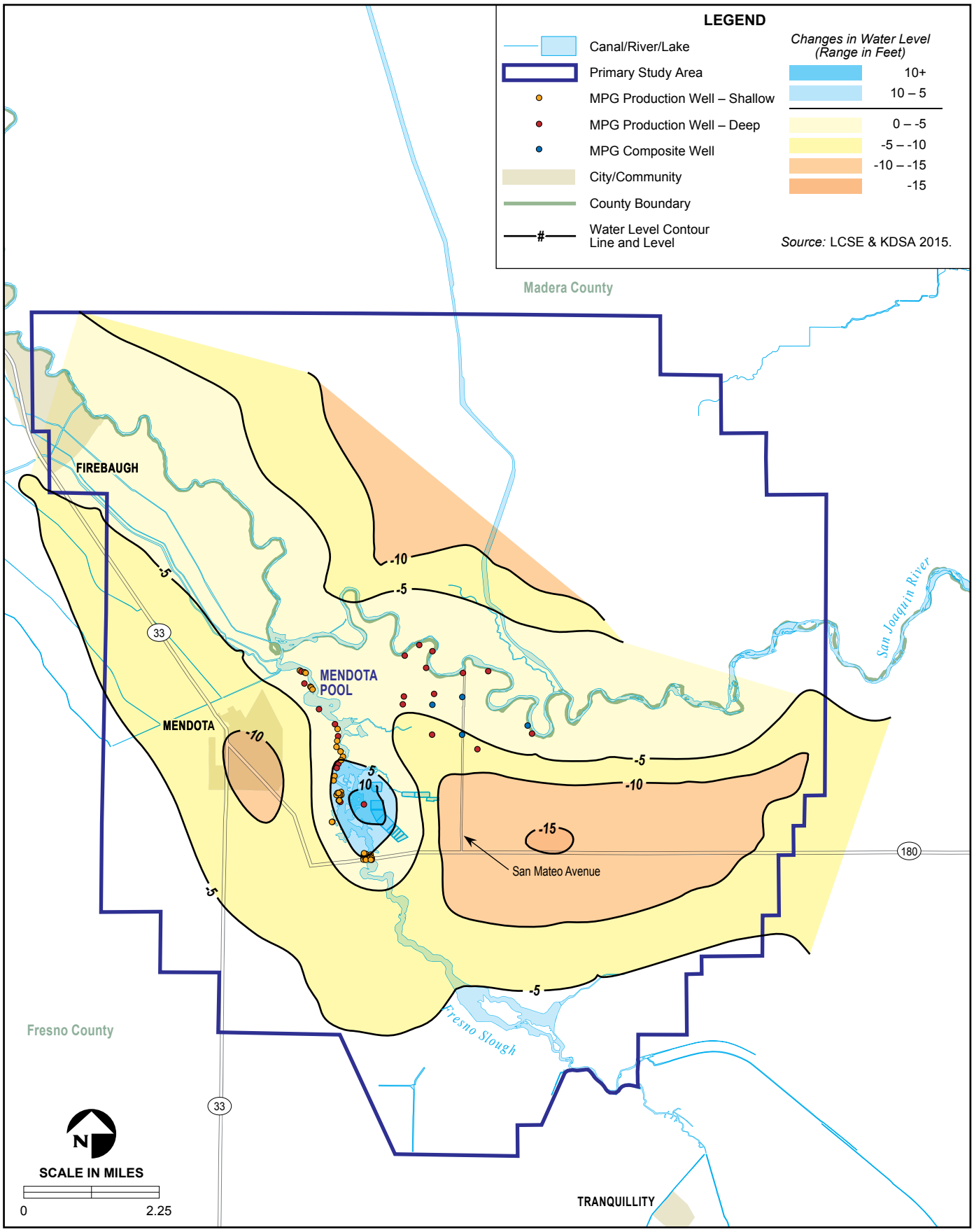
Compared to simulated changes in shallow zone groundwater level under the Proposed Action, the implementation of additional recharge facilities proposed under Alternative 2 would result in less adverse declines and improved groundwater level recovery over the 20-year exchange period. However, declines in shallow zone groundwater levels by the end of the exchange period would incrementally less adverse under Alternative 2.

Source: LCSE & KDSA 2015.

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Difference in Average Simulated Groundwater Levels in the Primary Study Area – Shallow Zone

FIGURE 18



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Groundwater Level Changes between Year 1 and Year 20 Under the Proposed Action: Shallow Zone

FIGURE 19

As discussed above, over the 20-year study period, the Proposed Action would increase the average decline in shallow zone groundwater levels in the vicinity of the Mendota Pool by approximately 1 foot when compared to the No Action Alternative. Although this decline experienced over a 20-year period would be very small, it would still constitute a measurable if incremental decline. Further, it should be noted that this incremental decline would be subject to review and regulation under SGMA and a future GSP. Although a GSP is still under development, future groundwater withdrawals would be subject to this existing regulatory program and the implementation of sustainable management practices in order to ensure that sustainable yield within the Delta-Mendota, Madera, Westside, and Kings Subbasins is attained and/or maintained. Further, although SGMA requires sustainable groundwater management, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels conservative.

It is important to note that these results incorporate the revised design constraints included in the Proposed Action, but do not account for adjustments required by Reclamation during the outset of each exchange year as described in Section 2.2.1. If groundwater levels decline more than projected, further reductions in pumping and/or cessation of pumping until groundwater levels recover may be imposed by Reclamation. Therefore, the above impacts are also conservative because the implementation of the revised design constraints would assist in minimizing greater declines in groundwater levels by altering the pumping program.

Alternative 2 As with the No Action Alternative and Proposed Action, the average shallow zone groundwater level throughout the Primary Study Area would experience a minor long-term decline under Alternative 2, from approximately 135 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 130 feet msl at the end of the 20-year period (Figure 16). During the dry period anticipated in the Years 13 and 18 of the 20-year exchange period, average groundwater levels in the shallow zone would decline 10–15 feet, to approximately 125 feet msl. The recovery of shallow zone groundwater levels at the end of the 20-year period would be aided by a projected wet precipitation cycle included within the model and expanded groundwater recharge projects in the Primary Study Area.

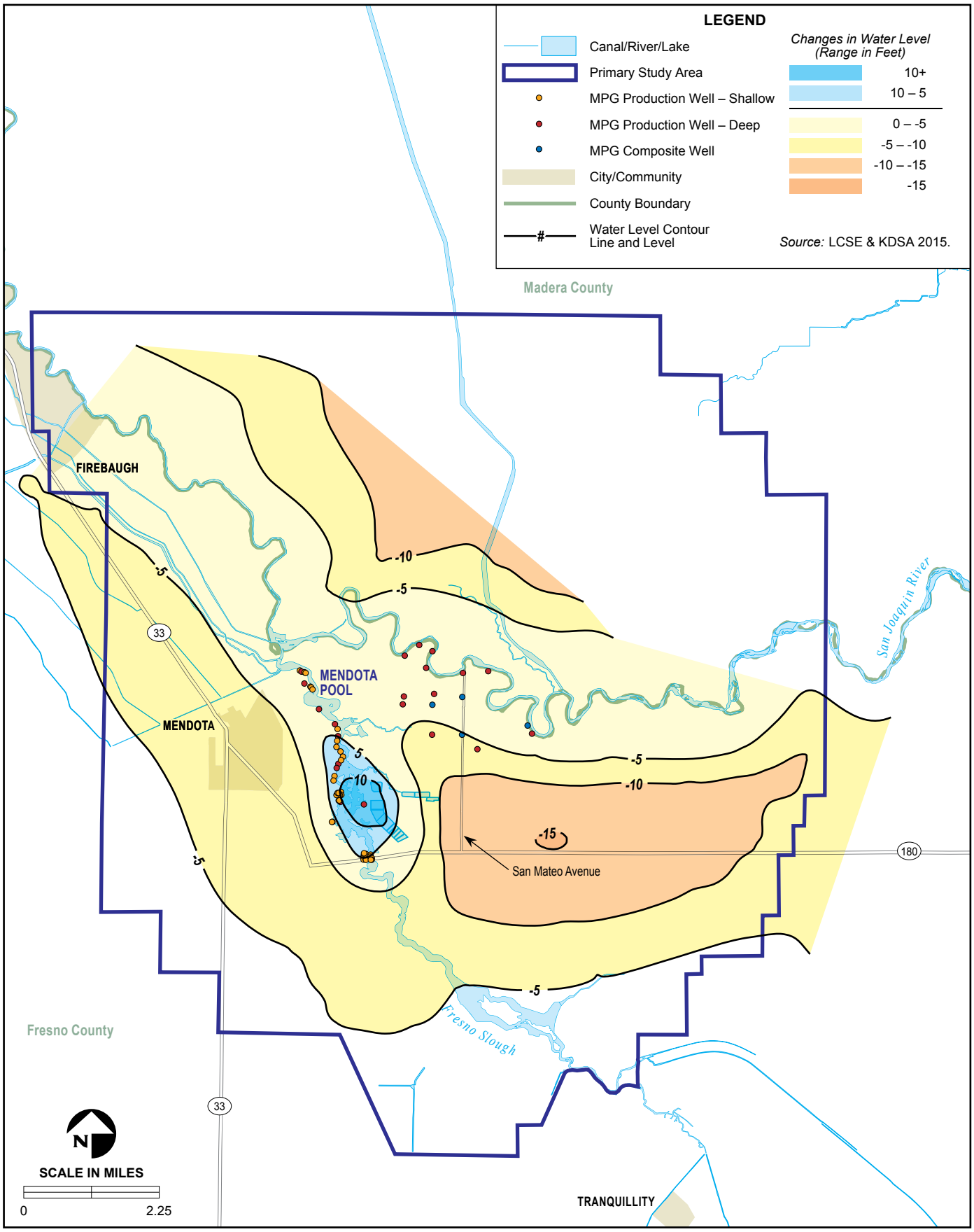
Alternative 2 proposes a further expansion of the groundwater recharge components planned under the Proposed Action (i.e., MPG contributions to the existing four NCR Recharge Ponds and activation of the Terra Linda Farms Recharge Canal) with the construction of the River Ranch Recharge Basin. As a result, the average shallow zone groundwater levels would be approximately 0.5 foot higher throughout the Primary Study Area when compared to the Proposed Action, but still approximately 1.0 foot lower than under the No Action Alternative. This is largely in part due to an overall slight reduction in the amount of groundwater pumping in the Primary Study area under the No Action Alternatives compared to the Proposed Action and Alternative 2. As with the Proposed Action, declines in groundwater levels caused by implementation of Alternative 2, along with groundwater recharge efforts at the proposed River Ranch Recharge Basin, would be subject to review and regulations under SGMA and future GSPs for the underlying subbasins. However, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under Alternative 2 conservative.

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area under Alternative 2 would be greater in the winter/spring than in the summer/fall (Figure 16). When the declines that occur during dry conditions are considered, the average groundwater level in the shallow zone over the 20-year period would be lower than the groundwater level at the start of the 20-year period. Specifically, the average decline in shallow zone groundwater levels within the Primary Study Area would be 5 feet during the fall/summer and 9 feet during the winter/spring (Table 11). This is identical to the Proposed Action, but 1 foot greater in the winter/spring than under the No Action Alternative. However, the pumping restrictions implemented as part of the design constraints and the additional groundwater recharge that would occur at the existing four NCR Recharge Ponds, at the Terra Linda Farms Recharge Canal, and at the River Ranch Recharge Basin would limit the incremental increase in the decline of groundwater levels when compared to the No Action Alternative, which may be greater than 1 foot if the features proposed under Alternative 2 were not implemented.

As with the Proposed Action, groundwater levels in the shallow zone would vary throughout the Primary Study Area. However, when groundwater recharge from the River Ranch Recharge Basin under Alternative 2 is added to the recharge that would occur from the Terra Linda Farms Recharge Canal under the Proposed Action, the decline in groundwater levels in the vicinity of the City of Mendota would be 5 feet (Figure 20), in comparison with a 10-foot decline that would occur under the No Action Alternative (Figure 17) and Proposed Action (Figure 19). Therefore, under Alternative 2, the greatest decline of approximately 15 feet would occur east of San Mateo Avenue (Figure 20) in an area where the A-Clay does not exist and the shallow and deep zones of the upper aquifer merge. As with the Proposed Action, even with the additional recharge that would occur at the four NCR recharge ponds, groundwater declines in the northern extent of the Primary Study Area would approach the extensive cone of depression in Madera County (a decline of 10–15 feet) (Figure 19). The addition of the River Ranch Recharge Basin under Alternative 2 would not incrementally decrease this decline in groundwater levels. Similar to the No Action Alternative and Proposed Action, groundwater levels in the shallow zone would increase in the vicinity of the Meyers Water Bank (a facility unrelated to the MPG and whose operations would be unaffected by Alternative 2) by approximately 10 feet, although the increase would extend further north as a result of the River Ranch Recharge Basin. The positive effect to groundwater levels is not projected to extend a great distance from these recharge facilities.

As with the Proposed Action, these results incorporate the revised design constraints, but do not account for adjustments required by Reclamation during the outset of each exchange year as described in Section 2.2.1. If groundwater levels decline more than projected, further reductions in pumping may be imposed. Therefore, the above impacts are conservative because the implementation of the existing and revised design constraints would assist in minimizing greater declines in groundwater levels by altering the pumping program. If design constraints were absent, groundwater declines would be unmonitored until the regulations required under SGMA through implementation of a GSP take affect and may be temporarily greater than under Alternative 2.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.



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Groundwater Level Changes between Year 1 and Year 20 Under Alternative 2: Shallow Zone

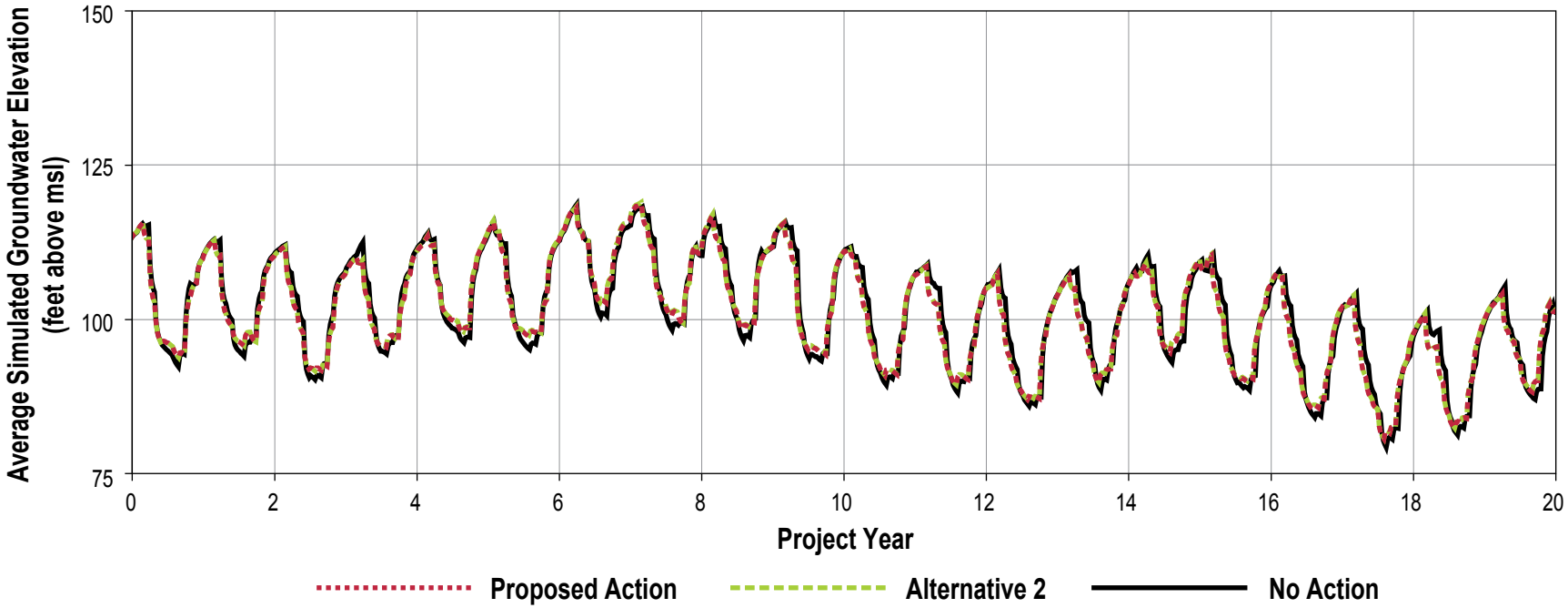
FIGURE 20

Impact GWL-2: Deep Zone Groundwater Level Impacts in the Primary Study Area
No Action Alternative The Hydrogeologic Technical Analysis concluded that all alternatives, including the No Action Alternative, would result in minor long-term decline in the average groundwater levels in the deep zone within the Primary Study Area. The No Action Alternative would result in a decline in average groundwater levels from approximately 115 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 100 feet msl at the end of the 20-year period (Figure 21). Seasonal increases and reductions in groundwater withdrawals between dry/wet conditions results in highly variable ground-water declines and recovery on an annual basis.

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 21). When the declines that occur during dry years are considered, the average groundwater level in the deep zone over the 20-year period would be lower than the groundwater level at the end of the 20-year period. Specifically, even with the anticipated reduction in pumping under the No Action Alternative when compared to existing conditions or the Proposed Action, the average decline in deep zone groundwater levels within the Primary Study Area would be 10 feet during the fall/summer and 11 feet during the winter/spring (Table 11).

Within the Primary Study Area, the decline in groundwater levels would be more pronounced in the deep zone than in the shallow zone, with the groundwater declining to up to 35 feet by the end of the 20-year period (Figure 22). However, while pumping by the individual farmers formerly associated with MPG would affect overall drawdown, the pattern of projected groundwater declines and northeastern groundwater flow indicate that deep zone impacts are largely a result of a decline in groundwater levels and pumping in Madera County. Deep zone pumping from MPG, CCID, Wonderful Orchards, and CCC influence these groundwater contours and pull them closer to the Mendota Pool area by intercepting a percentage of groundwater that would otherwise flow towards the cone of depression in Madera County. Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including a possible reduction in groundwater pumping, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under the No Action Alternative conservative.

When compared to existing conditions, the No Action Alternative would result in negligible change in the rate or level of groundwater decline outside of the Primary Study Area. This is because groundwater pumping outside of the Primary Study Area, particularly pumping in Madera County northeast of the Project site, has a greater influence on groundwater levels in the Mendota Pool area than MPG pumping itself. Because of the presence of intervening soil layers, particularly the intermittent A-Clay layer throughout the Primary Study Area, groundwater in the deep zone is largely disconnected from surface waters in the Primary Study Area as compared to the shallow zone, including seepage from the Mendota Pool and Fresno Slough, and infiltration from San Joaquin River flows. Implementation of the No Action Alternative is therefore considered not to result in a significant impact to groundwater levels in the deep zone of the upper aquifer.



Average deep zone groundwater levels within the Primary Study Area by the end of the proposed 20-year exchange period would average approximately 100 feet msl. Under all scenarios, changes in deep zone groundwater levels would follow a similar trend and would result in gradual declines over proposed 20-year exchange period. Seasonal increases and reductions in groundwater withdrawals between dry/wet conditions results in highly variable groundwater declines and recovery on an annual basis.

Source: LCSE & KDSA 2015.

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Average Groundwater Levels in the Primary Study Area – Deep Zone

FIGURE 21

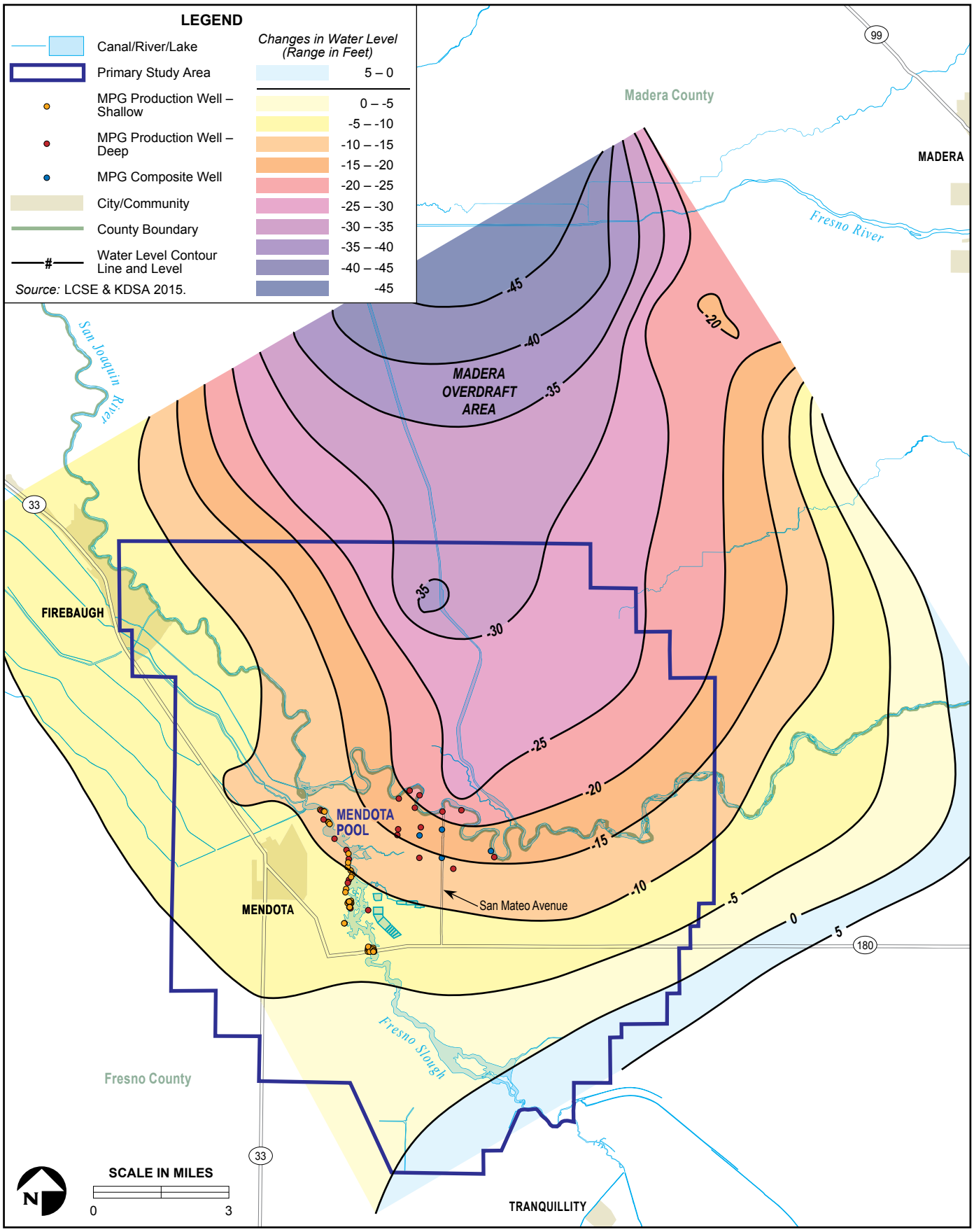
Proposed Action As a pumper in the deep zone in the Primary Study Area, MPG's withdrawals would continue to contribute to the decline in groundwater levels in the deep zone. As with the No Action Alternative, the average deep zone groundwater level throughout the Primary Study Area would experience a minor long-term decline, from approximately 115 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 100 feet msl at the end of the 20-year period (Figure 21).

There is a relatively narrow difference in the amount of groundwater pumped between the Proposed Action (38,316 AFY) and the No Action Alternative (33,395 AFY) when compared to overall inflows/outflows of groundwater in the Primary Study Area. As a result, the difference in deep zone groundwater decline when compared to the No Action Alternative is negligible (i.e., less than 1 foot difference) (Figure 23).

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 21). When the declines that occur during dry conditions are considered, the average groundwater level in the deep zone over the 20-year period would be lower than the groundwater level at the start of the 20-year period. Specifically, the average decline in deep zone groundwater levels within the Primary Study Area would be 9 feet during the fall/summer and 13 feet during the winter/spring (Table 11). When compared to the No Action Alternative, the decline is 1 foot greater during the fall/summer period and 2 feet greater during the winter/spring period. Although the GSPs would implement management strategies to achieve groundwater sustainability, including a possible reduction in groundwater pumping, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under the Proposed Action conservative.

Groundwater levels in the deep zone would vary throughout the Primary Study Area. The pattern is similar to that occurring under the No Action Alternative, with the deep zone groundwater levels declining to up to 35 feet by the end of the 20-year period (Figure 24). The increase in groundwater pumping from the deep zone, implementation of revised design constraints, and the MPG groundwater recharge operations at the four existing NCR Recharge Ponds and at the Terra Linda Farm Recharge Canal under the Proposed Action would only incrementally affect overall drawdown when compared to the No Action Alternative. This is because the quantities of groundwater that infiltrate from these recharge facilities into the deep zone through the A-Clay layer are less than the infiltration amounts into the shallow zone. More importantly, the pattern of projected groundwater declines and northeastern groundwater flow indicate that deep zone impacts are largely a result of declining groundwater levels and pumping in Madera County. Deep zone pumping from MPG, CCID, Wonderful Orchards, and CCC somewhat influence these groundwater contours and pull them closer to the Mendota Pool area by intercepting a percentage of groundwater that would otherwise flow towards the cone of depression in Madera County. As with the No Action Alternative and infiltration from the recharge facilities under the Proposed Action, because of the presence of intervening soil layers, particularly the intermittent A-Clay layer throughout the Primary Study Area, groundwater in the deep zone is largely disconnected from surface waters in the Primary Study Area as compared to the shallow zone, including seepage from the Mendota Pool and Fresno Slough, and infiltration from San Joaquin River flows. Therefore, impacts of the Proposed Action are considered less than significant.

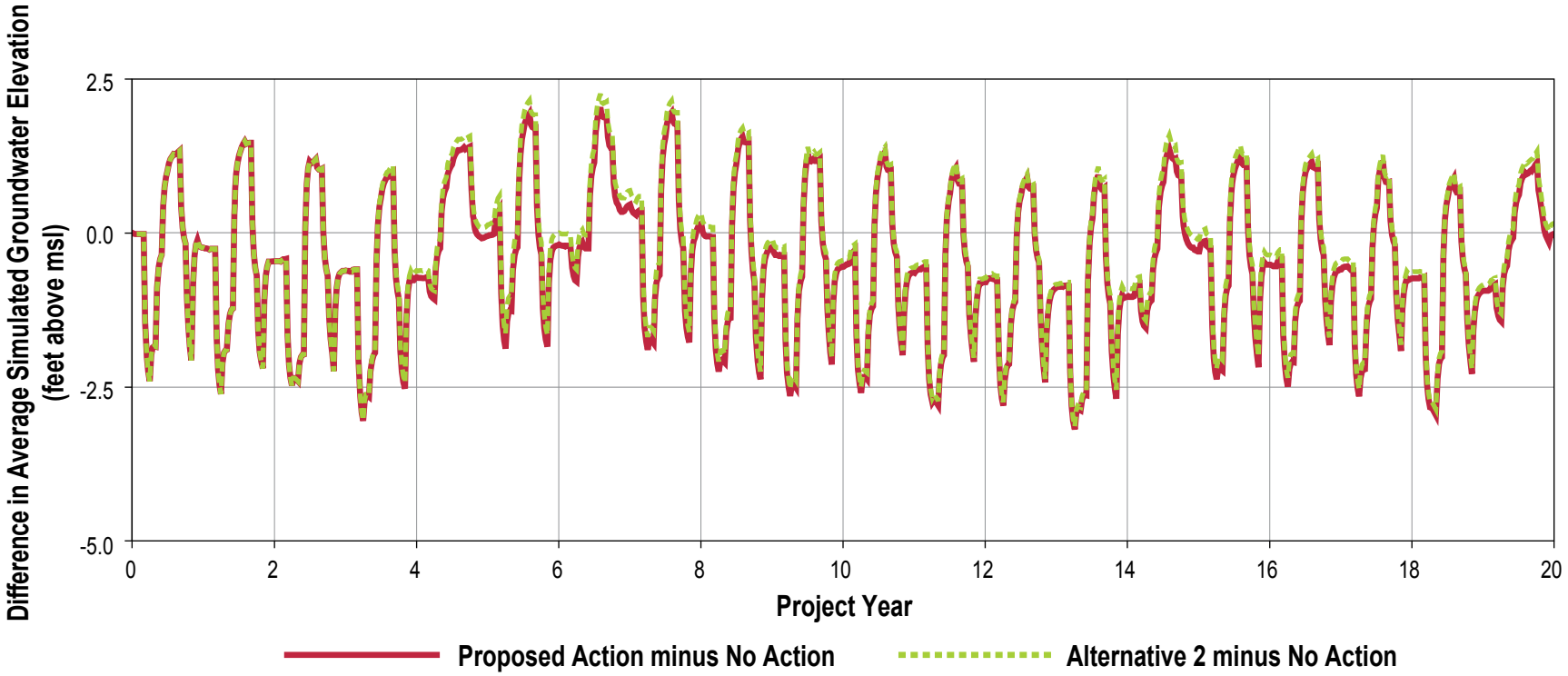
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Groundwater Level Changes between Year 1 and Year 20 Under the No Action Alternative: Deep Zone

FIGURE 22



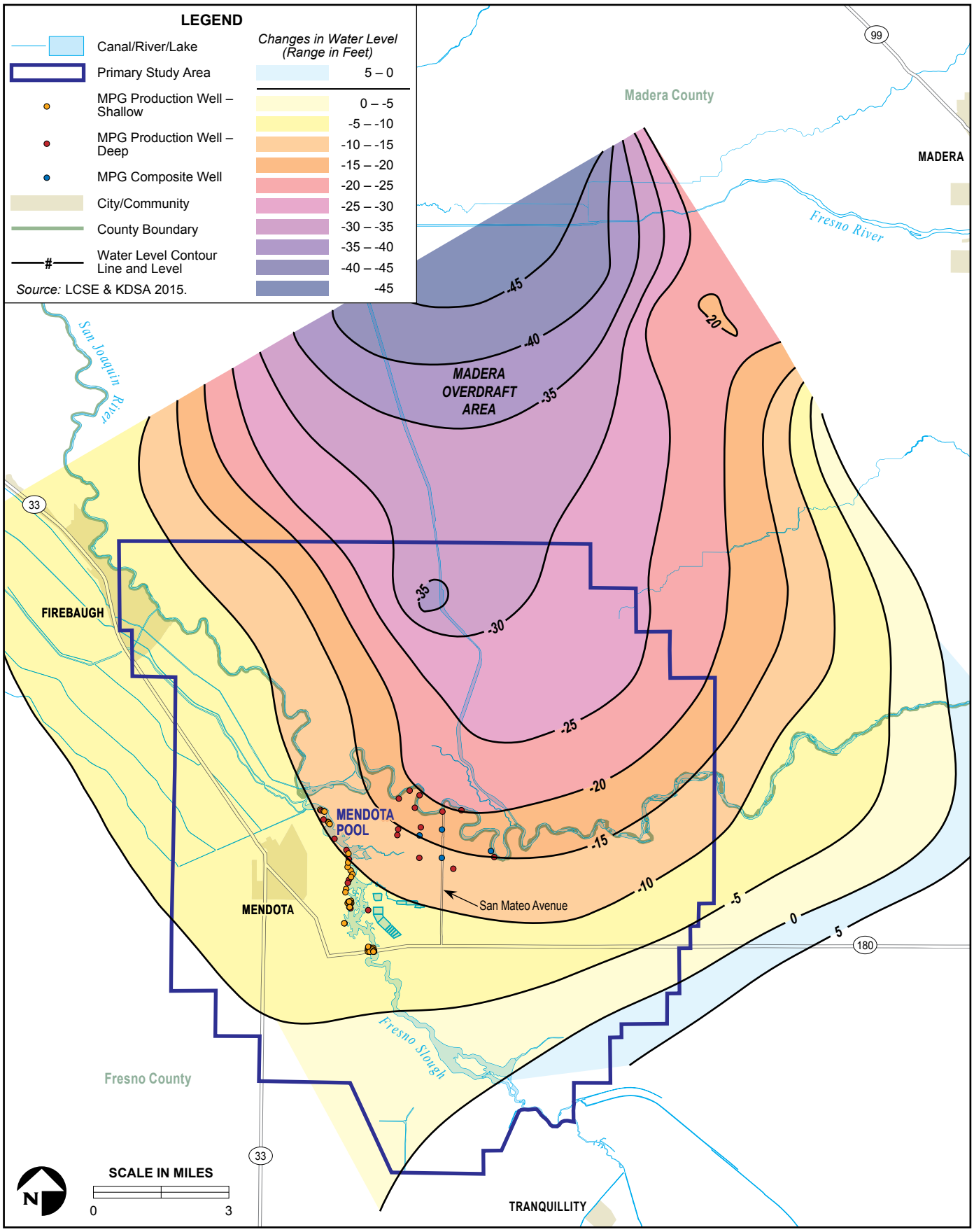
Similar to conditions observed in shallow zone groundwater levels, simulated changes in deep zone groundwater level under Alternative 2 would result in slightly less adverse deep zone declines when compared to the Proposed Action. While additional recharge would result in slight reductions in declines and increases in water level recovery, difference in deep zone groundwater levels between the Proposed Action and Alternative 2 would be negligible.

Source: LCSE & KDSA 2015.

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Difference in Average Simulated Groundwater Levels in the Primary Study Area – Deep Zone

FIGURE 23



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Groundwater Level Changes between Year 1 and Year 20 Under the Proposed Action: Deep Zone

FIGURE 24

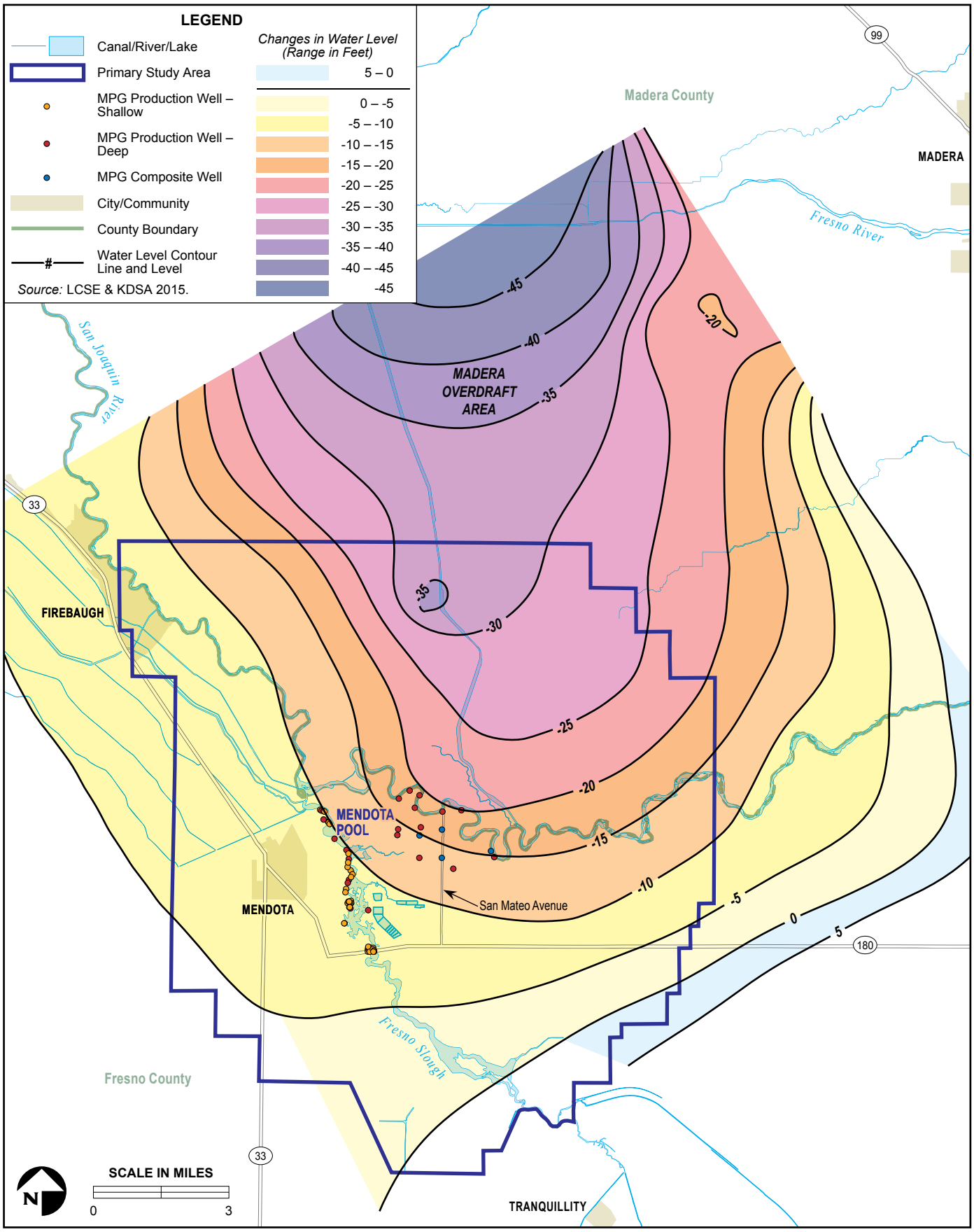
It is important to note that these results incorporate the revised design constraints included in the Proposed Action, but do not account for adjustments required by Reclamation during the outset of each exchange year. Existing and revised design constraints incorporated in the Proposed Action limit pumping from the deep zone to 12,000 AFY. However, pumping in the shallow zone also contributes to deep zone declines, as it reduces the potential for vertical flow where the A-Clay layer is only semi-confined. Therefore, higher quantities of MPG pumping partially affect groundwater levels in the deep zone. These impacts are spread out regionally across the Primary Study Area. If groundwater levels decline more than projected, further reductions in pumping may be imposed. Therefore, the above impacts are conservative because the implementation of the existing and revised design constraints would assist in minimizing greater declines in groundwater levels by altering the pumping program.

Alternative 2 As with the No Action Alternative and Proposed Action, the average deep zone groundwater level throughout the Primary Study Area would experience a minor long-term decline under Alternative 2, from approximately 115 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 100 feet msl at the end of the 20-year period (Figure 21).

In addition to the groundwater recharge facilities that would be implemented under the Proposed Action (i.e., MPG contributions to groundwater recharge at the existing four NCR Recharge Ponds, operation of the Terra Linda Farms Recharge Canal), Alternative 2 proposes a further expansion of groundwater recharge facilities with the construction of the River Ranch Recharge Basin. However, the quantities of groundwater that infiltrate from this facility through the A-Clay layer is less than the infiltration amounts into the shallow zone. Therefore, while additional recharge would result in slight reductions in declines and increases in water level recovery, the difference in deep zone groundwater levels between the Proposed Action and Alternative 2 would be negligible (Figure 23). S

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 21). When the declines that occur during dry conditions are considered, the average groundwater level in the deep zone over the 20-year period would be lower than the groundwater level at the start of the 20-year period. Specifically, the average decline in deep zone groundwater levels within the Primary Study Area would be 9 feet during the fall/summer and 13 feet during the winter/spring (Table 11). This average decline in deep zone groundwater levels is identical to the Proposed Action. When compared to the No Action Alternative, the decline is 1 foot greater during the fall/summer period and 2 feet greater during the winter/spring period.

Groundwater levels in the deep zone would vary throughout the Primary Study Area. The pattern is similar to that occurring under both the No Action Alternative and Proposed Action, with the deep zone groundwater levels declining to up to 35 feet by the end of the 20-year period (Figure 25). The increase in groundwater pumping from the deep zone, implementation of design constraints, and expansion of recharge facilities under Alternative 2 would not meaningfully affect overall drawdown when compared to the No Action Alternative and Proposed Action (Figure 23). This is because the pattern of projected groundwater declines and northeastern groundwater flow indicate that deep zone impacts are largely a result of a decline in groundwater levels and pumping in Madera County. Deep zone pumping from MPG, CCID, Wonderful Orchards, and CCC somewhat influence these groundwater contours and pull them closer to the



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Groundwater Level Changes between Year 1 and Year 20 Under Alternative 2: Deep Zone

FIGURE 25

Mendota Pool area by intercepting a percentage of groundwater that would otherwise flow towards the cone of depression in Madera County. Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including a possible reduction in groundwater pumping, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under Alternative 2 conservative. Therefore, implementation of Alternative 2 would result in less than significant impacts to groundwater levels in the deep zone of the upper aquifer.

As with the Proposed Action, it is important to note that these results incorporate the revised design constraints included in Alternative 2, but do not account for adjustments required by Reclamation during the outset of each exchange year. Existing and revised design constraints incorporated in the Proposed Action limit pumping from the deep zone to 12,000 AFY. If groundwater levels decline more than projected, further limitations to groundwater pumping may be imposed. Therefore, the above impacts are conservative because the implementation of the design constraints would assist in minimizing greater declines in groundwater levels by altering the pumping program.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact GWL-3: Groundwater Level Declines in the Lower Aquifer within the Primary Study Area
No Action Alternative The Hydrogeologic Technical Analysis concluded that all alternatives, including the No Action Alternative, would result in minor long-term decline in the average groundwater levels in the lower aquifer within the Primary Study Area. The No Action Alternative would result in a decline in average groundwater levels from approximately 45 feet msl at the beginning of the 20-year exchange period (existing conditions) to approximately 25 feet msl at the end of the 20-year period (Figure 26). Seasonal increases and reductions in groundwater withdrawals between dry/wet conditions results in highly variable ground-water declines and recovery on an annual basis.

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 26). When the declines that occur during dry years are considered, the average groundwater level in the lower aquifer over the 20-year period would be lower than the groundwater level at the end of the 20-year period. Specifically, even with the anticipated reduction in pumping under the No Action alternative when compared to existing conditions or the Proposed Action, the average decline in deep zone groundwater levels within the Primary Study Area would be 16 feet during the fall/summer and 17 feet during the winter/spring (Table 11). Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including a possible reduction in groundwater pumping, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under the No Action Alternative conservative.

When compared to existing conditions, the No Action Alternative would result in negligible change in the rate or level of groundwater decline because groundwater pumping outside of the Primary Study Area has an undue influence on groundwater levels in the Mendota Pool area. Impacts of the No Action Alternative would be less than significant.

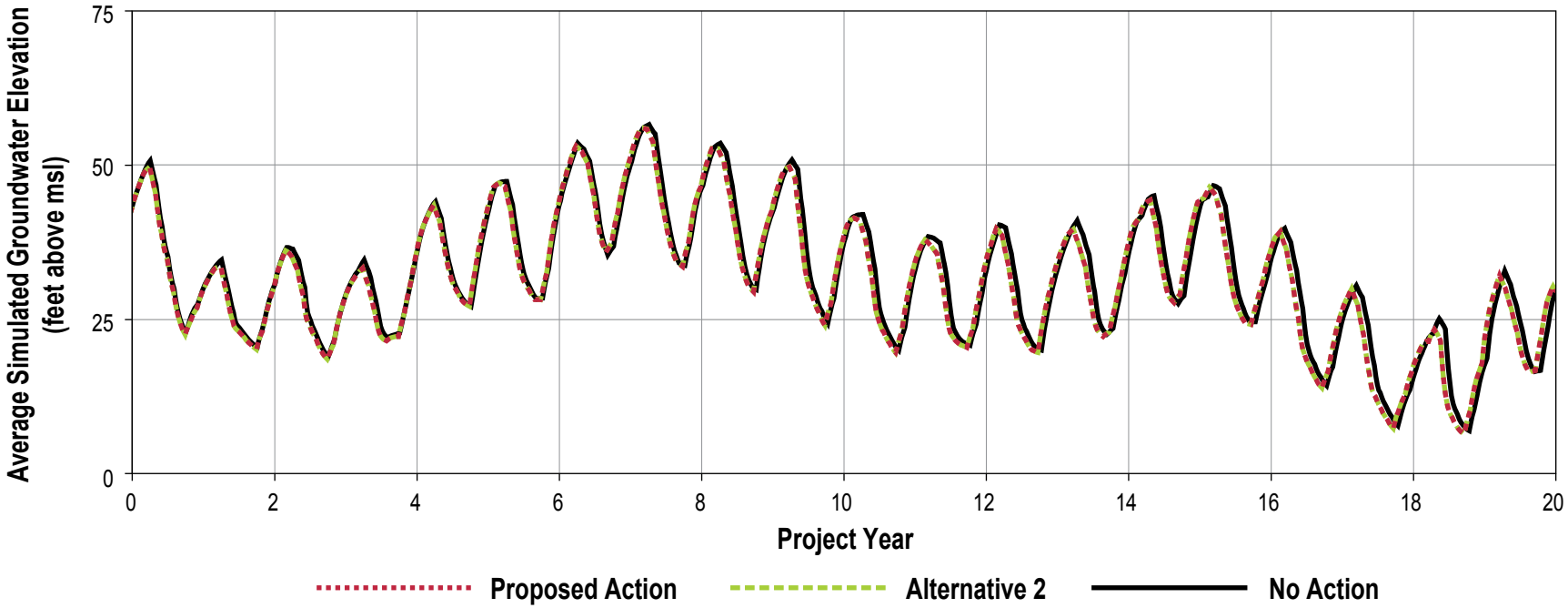
Proposed Action The majority of existing MPG pumping (97 percent) occurs in the shallow and deep zones of the upper aquifer, and MPG pumping would not substantially contribute to depletion of groundwater levels in the lower aquifer. Two of the wells in FWD are composite wells that can pump groundwater from both the upper and lower aquifers; however, due to their design, most water pumped by these wells is from the deep zone of the upper aquifer.

MPG pumping from the lower aquifer would be further reduced under the Proposed Action in response to revised design constraints and plugging of composite wells which are anticipated to be completed by the 2020 irrigation season. The decline in lower aquifer groundwater levels observed under modeled conditions (Figure 26) are primarily a result of non-MPG pumping in the lower aquifer in areas outside the Primary Study Area.

There is a relatively narrow difference in the amount of groundwater pumped between the Proposed Action (38,316 AFY) and the No Action Alternative (33,395 AFY) when compared to overall inflows/outflows of groundwater in the Primary Study Area. Further, the limited MPG pumping from the lower aquifer would cease under the Proposed Action. As a result, the difference in lower aquifer groundwater decline when compared to the No Action Alternative is negligible (i.e., less than 1-foot difference) (Figure 27). Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including a possible reduction in MPG pumping, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under the Proposed Action conservative.

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 26). The lower aquifer would experience the greatest drawdown during the 20-year period of the exchange agreements. When the declines that occur during dry conditions are considered, the average groundwater level in the lower aquifer over the 20-year period would be lower than the groundwater level at the start of the 20-year period. Specifically, the average decline in lower aquifer groundwater levels within the Primary Study Area would be 16 feet during the fall/summer and 18 feet during the winter/spring (Table 11). When compared to the No Action Alternative, the decline is equal during the fall/summer period and 1 foot greater during the winter/spring period. However, as discussed above, MPG currently pumps very little water from the lower aquifer and would cease the operation of its wells in the lower aquifer prior to the end of the 20-year exchange period.

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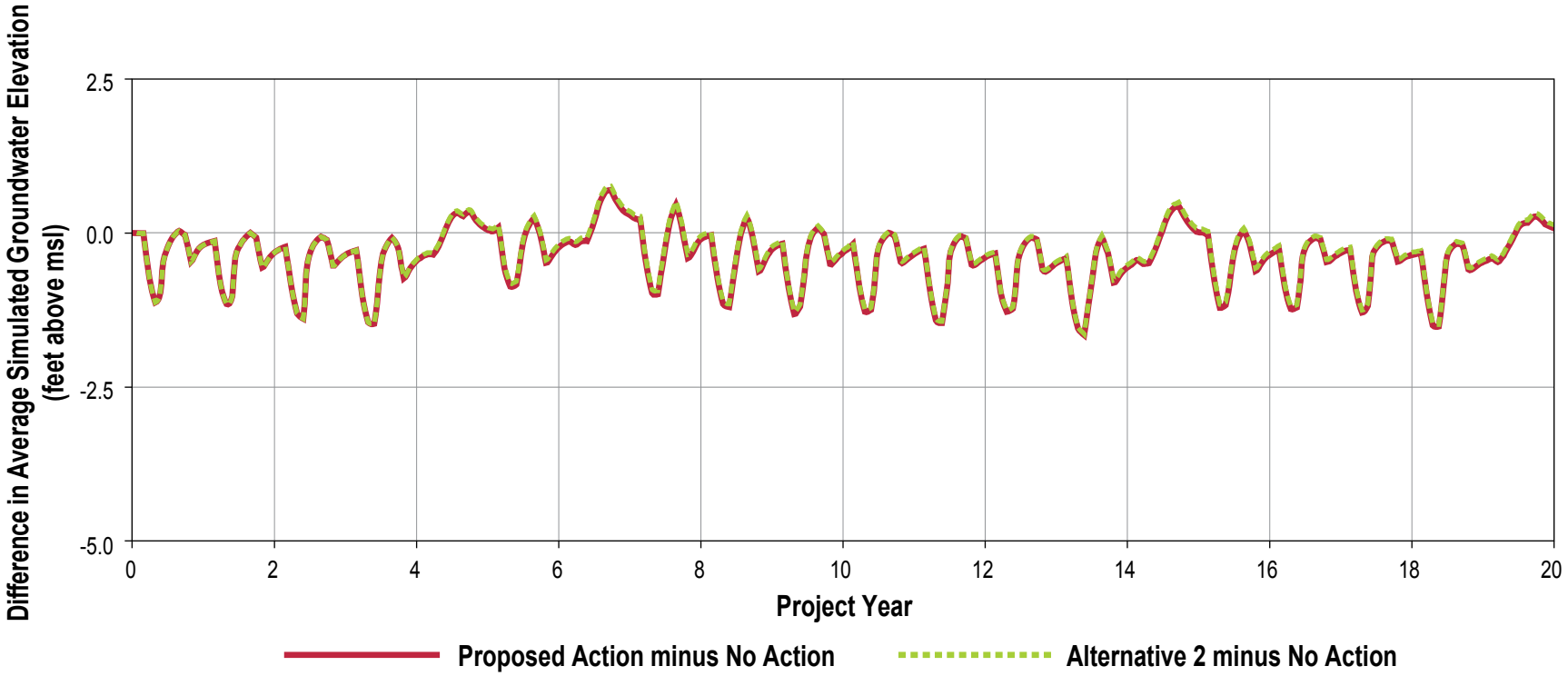
Within the lower aquifer, groundwater levels by the end of the 20-year exchange period are expected to average 30 feet msl. Under all scenarios, groundwater withdrawals from the lower aquifer would result in similar groundwater level declines over the 20-year exchange period. Implementation of the No Action alternatives would result in incrementally less adverse reductions in groundwater levels.

Source: LCSE & KDSA 2015.

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Average Groundwater Levels in the Primary Study Area – Lower Aquifer

FIGURE 26



Due to impermeability of the Corcoran clay layer and lack of hydraulic connectivity between the upper and lower aquifer, additional groundwater recharge under Alternative 2 would not affect groundwater levels in the lower aquifer. As such, declines anticipated under the Proposed Action and Alternative 2 would be identical.

Source: LCSE & KDSA 2015.

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Difference in Average Simulated Groundwater Levels in the Primary Study Area – Lower Aquifer

FIGURE 27

The Proposed Action would increase the amount of groundwater recharge by providing MPG contributions to groundwater recharge at the four NCR ponds and operation of the Terra Linda Farms Recharge Canal. However, a negligible quantity of water would infiltrate from this facility through the Corcoran Clay layer to the lower aquifer. Therefore, the difference in groundwater levels in the lower aquifer between the No Action Alterative and the Proposed Action would also be negligible. The presence of the Corcoran Clay layer in the Primary Study Area prohibits almost all movement of seepage from surface water features to the lower aquifer. The Proposed Action would therefore have a less than significant impact.

It is important to note that these results incorporate the revised design constraints included in the Proposed Action, but do not account for adjustments required by Reclamation during the outset of each exchange year. Revised design constraints require cessation of pumping from the lower aquifer by the end of the 20-year exchange period. If groundwater levels decline more than projected, further limitations to groundwater pumping may be imposed. Therefore, the above impacts are conservative because the implementation of the revised design constraints would assist in minimizing greater declines in groundwater levels by altering the pumping program.

Alternative 2 As with the No Action Alternative and Proposed Action, the average groundwater level in the lower aquifer throughout the Primary Study Area would experience a minor long-term decline under Alternative 2, from approximately 45 feet msl at the beginning of the 20-year exchange period to approximately 25 feet msl at the end of the 20-year period (Figure 26). However, as described above, MPG pumping would not substantially contribute to depletion of groundwater levels in the lower aquifer.

Similar to historic conditions, seasonal average drawdown from all pumping within the Mendota Pool area would be greater in the winter/spring than in the summer/fall (Figure 26). When the declines that occur during dry conditions are considered, the average groundwater level in the lower aquifer over the 20-year period would be lower than the groundwater level at the start of the 20-year period. Specifically, the average decline in lower aquifer groundwater levels within the Primary Study Area would be 16 feet during the fall/summer and 18 feet during the winter/spring (Table 11). This average decline in lower aquifer groundwater levels is identical to the Proposed Action. When compared to the No Action Alternative, the decline is 1 foot greater during the winter/spring period, reflecting the limited effect that MPG withdrawal and recharge has on the lower aquifer. Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including a possible reduction in groundwater pumping, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under Alternative 2 conservative.

In addition to the MPG groundwater recharge facilities that would occur under the Proposed Action (i.e., MPG contributions to groundwater recharge at the four existing NCR Recharge Ponds, operation of the Terra Linda Farms Recharge Canal), Alternative 2 proposes a further expansion of groundwater recharge facilities with the construction of the River Ranch Recharge Basin. However, a negligible quantity of water would infiltrate from this facility through the Corcoran layer to the lower aquifer. Therefore, the difference in groundwater levels in the lower aquifer between the No Action Alterative, the Proposed Action, and Alternative 2 would also be negligible. The presence of the Corcoran Clay layer in the Primary Study Area prohibits almost

all movement of seepage from surface water features to the lower aquifer. Alternative 2 is therefore considered to have a less than significant impact.

As with the Proposed Action, it is important to note that these results incorporate the revised design constraints included in Alternative 2, but do not account for adjustments required by Reclamation during the outset of each exchange year. Revised design constraints require cessation of pumping from the lower aquifer by the end of the 20-year exchange period. If groundwater levels decline more than projected, further limitations to groundwater pumping may be imposed. Therefore, the above impacts are conservative because the implementation of the revised design constraints would assist in minimizing greater declines in groundwater levels by altering the pumping program.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact GWL-4: Changes to Groundwater Levels in Westlands
No Action Alternative Under the No Action Alternative, if farmers continue the cultivation of crops currently accommodated by the availability of exchange water, there may be up to approximately 25,000 AFY of groundwater pumped from wells within Westlands to compensate for the lack of exchange water and maintain the production of high-value orchards and vineyards. In this scenario, groundwater levels in Westland would be reduced under the No Action Alternative. MPG pumping in Westlands under this alternative would likely occur in most years, unless CVP water allocations are high.

The estimated perennial groundwater yield of the Westside Subbasin for the purposes of this analysis is assumed to be 200,000 to 225,000 AFY. Between 1999 and 2015, groundwater pumping in Westlands has exceeded the estimated perennial yield in 7 of the 17 years, with significant exceedances of more than 150,000 AF in 5 of those years (Westlands 2015).[34] MPG pumping would increase groundwater withdrawals by 5- to 10-percent in years of low CVP allocations and high pumping when compared to historic pumping rates. In the near term, the Westside Subbasin may continue to experience overdraft conditions, with the rate of overdraft declining as the mechanisms of the GSP to achieve sustainable yield are fully implemented towards the end of the 20-year period. Additional MPG pumping would contribute to the exceedance of the previously estimated perennial yield in the near-term and could reduce the effectiveness of identified GSP mechanisms to achieve sustainable yield in in the long-term.

At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are not fully developed. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value, long-term crops is maintained. These strategies are becoming more likely as federal and state grant money are being made available to address groundwater sustainability in the Central Valley. However, if a reduction in groundwater pumping is required to meet

[34] As previously mentioned, Westlands is currently preparing a GSP to achieve sustainable yield in accordance with SGMA. Through development of the GSP, Westlands will be required to determine and maintain the sustainable yield of the Westside Subbasin.

pending sustainability objectives under SGMA, farmers would likely be forced to replace high-value, long-term crops with lower-value row crops, which can be more easily idled in dry years, or fallow substantial portions of their farmlands entirely in the absence of available water supplies.

Proposed Action Under the Proposed Action, no additional groundwater pumping is proposed in Westlands. MPG would be able to continue exchanging 25,000 AFY of groundwater from MPG wells near the Pool through CVP facilities. As with the No Action Alternative, the management strategies of the individual GSPs to achieve sustainable groundwater yield are still in the planning phases. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, it is also very likely that the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. However, if a reduction in groundwater pumping is required to meet pending sustainability objectives under the GSP implemented in accordance with SGMA, farmers would likely be forced to replace high-value long-term crops with lower-value row crops, which can be more easily idled in dry years, or fallow substantial portions of their farmlands entirely in the absence of exchange water.

The Proposed Action would not affect any required reductions in pumping within Westlands, although reductions in pumping may become required in the Mendota Pool Area. As a result, impacts to groundwater levels in Westlands under this alternative would be less than under the No Action Alternative and are not considered significant.

Alternative 2 Impacts under this alternative would be the same as the Proposed Action.

Significance Determination before Mitigation
CEQA Significance Determination *Significant and unavoidable* for the No Action Alternative. *Less than significant* for the Proposed Action and Alternative 2.

Impact GWL-5: Induced Seepage of Surface Waters from Groundwater Pumping
No Action Alternative Under the No Action Alternative, individual MPG farmers would be free to pump groundwater without the restrictions of the design constraints and may adjust pumping to meet individual farming practices, consistent with other existing or pending regulations, including those of SGMA. In order to supply water to existing farmlands in the vicinity of Mendota Pool, this may require an increase in groundwater pumping, which may result in an increased potential for induced seepage of surface water (e.g., Restoration Flows) depending on the location and depth of individual wells. Although the design constraints that limit pumping would no longer be in place under the No Action Alternative, for the purposes of this analysis, groundwater pumping by disbanded MPG farmers is estimated to be 33,395 AFY in the Primary Study Area (compared to 38,316 AFY permitted under the Proposed Action and 40,316 AFY occurring under existing conditions).

The quantification of potential incremental increases in seepage from the San Joaquin River associated with changes in groundwater pumping relies on numerical modeling of groundwater and surface water conditions. The accuracy of model output in estimating the amount of seepage under different flow and pumping conditions is dependent on comprehensive and complete historical surface water gauge data collected in the San Joaquin River. The model calibration is

based on best available data, including a relatively short record of gauge data, and reasonable assumptions consistent with standard practices.

The No Action Alternative would not result in a change in the physical conditions that govern seepage rates along the San Joaquin River (e.g., soil type, presence of clay layers). Although the No Action Alternative would not restrict the quantity of groundwater pumped by FWD near the San Joaquin River, FWD wells are prohibited from pumping from the shallow zone of the upper aquifer due to the Herminghouse Agreement (as included in a 1957 contract with Reclamation[35]), regardless of the MPG exchange program. The presence of the A-Clay layer in the vicinity of this segment of the river would continue to limit the movement of surface water to the deep zone as compared to the shallow zone. Since no shallow zone wells would be installed in the FWD under any of the Alternatives, seepage from the river would remain the same as under existing conditions. For this reason, the Hydrogeologic Technical Analysis assumed that no induced seepage would occur as a result of implementation of the No Action Alternative (Appendix E, Table 8-17). Generally, the groundwater ridge underlying the river would continue to be limited to its existing extent and would not extend to the western side of the Mendota Pool or Fresno Slough, even during years of high flow.

Similarly, the No Action Alternative would not result in a change to physical conditions at the Mendota Pool and Fresno Slough that would increase seepage from these surface waters. A connection would continue to exist between the Mendota Pool and the shallow zone wells west of the Mendota Pool and Fresno Slough (Figure 6), with potential for some effects from pumping MPG shallow zone wells. However, a direct connection would continue to be limited in most areas by fine-grain soil sediments at the bottom of the Mendota Pool, which limit or reduce transmissivity and percolation. Soil borings west of the Mendota Pool of the MPG shallow zone well field performed for potential recharge basin construction show fine-grained soil horizons are present in the upper 10–20 feet of the subsurface (see Appendix F). The presence of these shallow silt and clay lenses inhibits the amount of seepage from the Mendota Pool that could be potentially induced by shallow zone pumping. The Hydrogeologic Technical Analysis found that seepage from the Mendota Pool is approximately 47 cfs (or 285 AF per day over the 1,300-acre extent of the Pool and San Joaquin River Branch of the Mendota Pool, between the James Bypass to the south and San Mateo Avenue to the east, as under existing conditions (Appendix E, page 15). Although Design Constraint No. 3 requiring a five percent leave behind to account for conveyance losses would not be required under the No Action Alternative, the rate of seepage from the Mendota Pool and Fresno Slough would remain unchanged because the seepage rate at the Mendota Pool and Fresno Slough is generally made constant by the underlying soil conditions whenever the Mendota Pool is filled and has a relatively stable stage elevation (Appendix E, page 15). These physical conditions prevent increases in groundwater pumping along the Mendota Pool and Fresno Slough from resulting in a proportional increase in seepage (Appendix E, Table 8-17). The management strategies of the individual GSPs to achieve sustainable groundwater yield under SGMA are still in the planning phases, but may also require a reduction in groundwater pumping and a stabilization of groundwater levels that would even further reduce the limited potential for induced seepage. As a result, seepage impacts from the No Action Alternative would be less than significant.

[35] Contract No. 14-06-200-6221: Contract Between the United States and Farmers Water District. August 28, 1957.

Proposed Action The Proposed Action would increase MPG pumping in the Primary Study Area by 4,921 AFY over the No Action Alternative, but would reduce groundwater pumping by 2,000 AFY when compared to existing conditions due to restriction in Adjacent Overlying Use pumping to 12,000 AFY, consistent with other existing or pending regulations. As with the No Action Alternative, the Proposed Action would not alter the physical conditions underlying the San Joaquin River, or at the Mendota Pool and Fresno Slough. As discussed above, the Proposed Action would increase the average decline in shallow zone groundwater levels in the vicinity of the Mendota Pool by only an incremental amount (approximately 1 foot) when compared to the No Action Alternative. However, MPG wells in FWD closest to the San Joaquin River would continue to pump from the deep zone, with very limited or no potential to increase seepage. The Proposed Action would not result in a change in the physical conditions that govern seepage rates along the San Joaquin River (e.g., soil type, presence of clay layers). The presence of the A-Clay layer in the vicinity of the river would continue to limit connection between surface waters in the San Joaquin River and MPG deep zone wells in the FWD. Since no shallow wells exists or would be installed in the FWD under any of the Alternatives, seepage from the river would be materially the same as under the No Action Alternative with regards to pumping within FWD. For this reason, the Hydrogeologic Technical Analysis assumed that average stream and canal seepage, including that from the San Joaquin River, would be identical (111,000 AFY) under both the Proposed Action and No Action Alternative (Appendix E, Table 8-17 and Table 8-25). Generally, the groundwater ridge underlying the river would continue to be limited to its existing extent and would not extend to the western side of the Mendota Pool or Fresno Slough, even during years of high flow.

Although MPG shallow zone pumping would increase outside of FWD west of the Mendota Pool and Fresno Slough when compared to the No Action Alternative, this increase would not substantially increase the rate of seepage at the Mendota Pool or Fresno Slough. This is due to the fine-grained soils underlying the Mendota Pool and Fresno Slough, as well as the depth of the wells (30 feet bgs or lower). The Hydrogeologic Technical Analysis concluded that both the No Action Alternative and Proposed Action would result in a seepage rate of 47 cfs, or 285 AF per day over the 1,300-acre extent of the Mendota Pool and San Joaquin River Branch of the Mendota Pool, between the James Bypass to the south and San Mateo Avenue to the east, under both the No Action Alternative and Proposed Action (Appendix E, page 15). This equates to an identical annual recharge of 37,000 AF under the No Action Alternative and the Proposed Action (Appendix E, Table 8-17 and Table 8-25). To the extent that pumping does induce seepage, Design Constraint No. 3 in Table 4 would require a five percent "leave behind", as under existing conditions, to account for seepage losses in the Mendota Pool and Fresno Slough.

The management strategies of the individual GSPs to achieve sustainable groundwater yield under SGMA are still in the planning phases, but may also require a reduction in groundwater pumping and a stabilization of groundwater levels that would even further reduce the limited potential for induced seepage. Therefore, the Proposed Action would result in a less than significant impact.

Alternative 2 Construction of the River Ranch Recharge Basin would require the removal of dense soil or clay layers that prevent seepage into underlying soils. However, this would be done for the benefit of groundwater recharge and would not change physical conditions along the San Joaquin River or at the Mendota Pool and Fresno Slough. Despite the construction and operation

of an additional groundwater recharge facility under this alternative, the same fine-grained soil layers that limit the hydraulic connection between the surface water in the Mendota Pool and Fresno Slough and MPG's wells also prevents the River Ranch Recharge Basin from recharging water levels in the Mendota Pool or Fresno Slough. Design Constraint No. 3 in Table 4 would continue to require a five percent "leave behind", as under existing conditions, to account for seepage losses in the Mendota Pool and Fresno Slough. For this reason, the Hydrogeologic Technical Analysis concluded that seepage from the Mendota Pool and Fresno Slough would be identical under all Alternatives, with an annual average recharge of 37,000 AF (Appendix E, Table 8-17, Table 8-25, Table 8-29). Therefore, impacts under this alternative would be the same as the Proposed Action and less than significant.

Significance Determination before Mitigation
CEQA Findings *Less than significant* for all alternatives.

Cumulative Effects

Projects that may contribute cumulative impacts generally include those with continued or increased extraction of groundwater with the potential for adverse impacts on groundwater levels and those which result in increased recharge with neutral or beneficial impacts. In addition, ongoing unregulated changes in agricultural land use although not considered as formal related projects under NEPA or CEQA have the potential to affect long-term demand for groundwater and are discussed below.

In addition to the underlying assumptions used for non-MPG lands in the analysis of impacts from the Proposed Action, pumping and recharge over MPG lands were modified for the Cumulative Impacts Analysis to account for a reduction in farmable lands in FWD due to seepage from the SJRRP. An estimated 1,080 acres of land in FWD is planned to be taken out of production due implementation of the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project and use of lands adjacent to the San Joaquin River for river widening and seepage improvements. When fully implemented, the SJRRP is projected to result in the potential loss of thousands of acres of irrigated agricultural land along the San Joaquin River within the Primary Study Area. This agricultural land would be replaced with river channel and floodplain with associated riparian woodlands. While this change may reduce agricultural water demand within the Primary Study Area, riparian woodlands would also have water demand so the net change to groundwater is unclear. These cumulative impacts were assumed to lead to a reduction in adjacent MPG groundwater pumping for Adjacent Overlying Use under the No Action Alternative, for an average reduction of about 27,870 AFY. A reduction in groundwater pumping of approximately 11,650 AFY was assumed for the Proposed Action and Alternative 2. The impact to groundwater levels resulting from the cumulative projects are presented below.

The groundwater management strategies required under SGMA would also likely reduce the rate of groundwater decline in the Study Areas. However, the GSPs are still in the early phases of study and preparation, and the effect of their specific management strategies on groundwater levels cannot yet be quantified with certainty. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, it is also very likely that management strategies to reduce water use would be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield so that the viability of high-value long-term crops is

maintained. These strategies are becoming more likely as federal and state grant money are being made available to address groundwater sustainability in the Central Valley.

Impact GWL-6 (Cumulative): Shallow Zone Groundwater Level Declines within the Primary Study Area

Cumulatively, all scenarios result in average lower shallow zone groundwater levels within the Primary Study Area over the 20-year exchange period. Average groundwater levels would be 2 to 6 feet lower under all scenarios, representing approximately 3- to 8-percent average reduction in shallow zone groundwater levels. While projected declines attributed to cumulative conditions would be less than under the Proposed Action and Alternatives, MPG pumping under all scenarios combined with non-MPG groundwater pumping under cumulative projects in the Primary Study Area would contribute towards an average lower groundwater level in the Primary Study Area over the course of the 20-year exchange program. Even when considering implementation of the SJRRP, groundwater levels in the shallow zone would only be one foot lower during both the winter/spring and fall/summer periods under both the Proposed Action and Alternative 2 at the end of the 20-year exchange program. As a result, cumulative impacts to shallow zone groundwater levels would be less than significant. These results are made conservative by the fact that the areas of groundwater pumping outside of the Primary and Secondary Study Areas will have a reduced effect on groundwater levels in the study areas as the mechanisms to achieve sustainable yield are implemented.

Significance Determination before Mitigation

CEQA Findings *Less than significant* for all Alternatives.

Impact GWL-7 (Cumulative): Deep Zone Groundwater Level Declines within the Primary Study Area

Cumulatively, all scenarios result in lower average deep zone groundwater levels within the Primary Study Area. Average deep zone groundwater levels over the 20-year exchange period would be 2 to 7 feet lower under all scenarios, representing approximately 1- to 2-percent reductions in average groundwater levels. However, even when considering implementation of the SJRRP, the average groundwater levels in the deep zone would only be 1 to 2 feet lower during the winter/spring period–and would be 1 foot higher during the fall/summer period–under both the Proposed Action and Alternative 2 at the end of the 20-year exchange program. As a result, cumulative impacts to deep zone groundwater levels would be less than significant. These results are made conservative by the fact that the areas of groundwater pumping outside of the Primary and Secondary Study Areas will have a reduced effect on groundwater levels in the study areas as the mechanisms to achieve sustainable yield are implemented.

Significance Determination before Mitigation

CEQA Findings *Less than significant* for all Alternatives.

Impact GWL-8 (Cumulative): Lower Aquifer Groundwater Level Declines within the Primary Study Area

Cumulatively, all scenarios would result in an incremental decline in the average groundwater level over the course of the 20-year exchange program. As both the Proposed Action and Alternative 2 propose to eliminate pumping from the lower aquifer by the end of the 20-year exchange program, MPG pumping would represent a negligible contribution to the average

lower groundwater levels in the lower aquifer. Therefore, MPG's contribution to lower aquifer withdrawals under all scenarios would be negligible and are not considered to result in significantly cumulative impacts on groundwater levels of the lower aquifer. These results are made conservative by the fact that the areas of groundwater pumping outside of the Primary and Secondary Study Areas will have a reduced effect on groundwater levels in the study areas as the mechanisms to achieve sustainable yield are implemented.

Significance Determination before Mitigation
CEQA Findings *Less than significant* for all Alternatives.

Impact GWL-9 (Cumulative): Induced Seepage of Surface Waters from Increased Groundwater Withdrawals
Cumulatively, all scenarios would not substantially cause or contribute to declines in or loss of surface water supplies from increased groundwater pumping and induced seepage. Implementation of the SJRRP, including construction of the Reach 2B Improvements would further reduce potential for induced seepage losses from MPG pumping under all Alternatives. This is because existing FWD wells located along the San Joaquin River would need to be relocated further south of the river, outside of proposed levees and away from the high groundwater ridge. In addition, slurry walls would be constructed along the river to further contain Restoration Flows within the river bed. These cumulative impacts were assumed to lead to a reduction in adjacent MPG groundwater pumping to about 27,870 AFY (Appendix E, page 96) for Adjacent Overlying Use under the No Action Alternative. This would be attributed to fallowing of FWD farmland due to seepage impacts from the SJRRP Reach 2B and Mendota Pool Bypass Project. A reduction in groundwater pumping to approximately 11,650 AFY (a difference of 2,352 AFY) was assumed for the Proposed Action and Alternative 2 (Appendix E, page 96).

The groundwater ridge underlying the San Joaquin River is located approximately 2.3 miles along the San Joaquin River in extent and lies approximately 1-mile east of the Mendota Pool or Fresno Slough. Moreover, as shown in Figure 6, all MPG wells operating east of the Mendota Pool and Fresno Slough closest to the San Joaquin River (i.e., in FWD) are deep zone or composite wells, which pump from a depth of 100 to 510 feet bgs, with very limited or no potential to increase seepage as under the No Action Alternative (Appendix E, Table 9-17, Table 9-25, Table 9-29). However, if a reduction in groundwater levels increases the difference in elevation between the flow in the river (river stage) and the shallow zone groundwater elevation, it may result in increased induced seepage. The increased pumping under the Proposed Action and Alternative 2, when compared to the No Action Alternative, increases the amount of additional seepage throughout the Primary Study Area. This results in approximately 1,000 AFY of additional seepage from all surface water features in the model, from approximately 108,000 AFY to 109,000 AFY, less than one percent. It is important to note that the water budget in model rounds water inputs to the nearest 1,000 AFY, and the actual increase in seepage when compared to the No Action Alternative is less than 1,000 AFY.

The SJRRP Restoration Flow Guidelines establish flow losses for all five reaches of the San Joaquin River. These flow losses are based on existing conditions between 1995–2000, including the 1999 pilot project (SJRRP 2017). The MPG exchange program had already been operating for at least five years when the SJRRP flow losses were calculated. Thus, seepage from

the San Joaquin River, even during years of high flows, which would likely occur during years when the MPG would not have an exchange program, is already considered under the Restoration Flow Guidelines. Both the Proposed Action and Alternative 2 would continue to address any seepage from the Mendota Pool and Fresno Slough through Design Constraint No. 3, which requires five percent "leave behind" to account for seepage losses that result from groundwater pumped for exchange into the Mendota Pool. This finding does not consider the fallowing of FWD lands to accommodate the SJRRP, which will require FWD to relocate wells further away from the San Joaquin River (south and west).

Other than the SJRRP programs to facilitate Restoration Flows, none of the related projects in Table 6, *Approved and Pending Projects*, would have the potential to result in a cumulative effect on induced seepage. While the GSPs would implement management strategies to achieve sustainable groundwater yield, sustainable yield would be achieved by 2040, toward the end of the 20-year exchange program. Further, because the GSP management strategies are still in their early phases of development, the specific strategies and their effect on groundwater levels and induced seepage are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water levels under Proposed Action conservative. As a result, cumulative impacts to surface water supplies would be reduced, and would remain less than significant.

Significance Determination before Mitigation

CEQA Findings *Less than significant* for all Alternatives.

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3.2 Groundwater Quality

This section evaluates potential impacts to groundwater quality that could result from the Proposed Action or Alternatives. This section draws on sampling information and groundwater conditions recorded as part of the existing MPG Pumping and Monitoring Program. The program includes monitoring of concentrations for TDS, four trace elements (arsenic, boron, molybdenum, and selenium), and general minerals such as nitrates in the region around the Mendota Pool. This section primarily utilizes the results of the 2015 Hydrogeologic Technical Analysis included in Appendix E, developed specifically for this EIS/EIR to assist in assessing potential groundwater quality impacts that could result from implementation of the Proposed Action and alternatives.

3.2.1 Environmental Setting/Affected Environment

Background

Groundwater quality is a measure of suitability of groundwater for its identified beneficial uses, which in the Primary Study Area and Secondary Study Area includes municipal and agricultural uses. The quality of groundwater for such uses can be affected by a range of contaminants or substances, including industrial pollutants and chemicals, pesticides, fertilizers, and minerals. Because of the particular issues in the affected groundwater basin, relevant issues of concern for this analysis relate largely to salinity and trace elements. High concentrations of salinity or trace elements may limit the beneficial use of groundwater resources, or result in adverse water quality impacts if groundwater with contaminants or constituents of concern are pumped into surface waters. Salinity is a primary concern in groundwater within the San Joaquin Valley and Tulare Lake Groundwater Basins due its potential to affect crops, soils, surface water quality, aquatic habitats, and sensitive species, and is measured in either concentrations of TDS or EC. Naturally saline groundwater occurs west of the Mendota Pool in the upper aquifer, above the Corcoran Clay layer. The source of this saline groundwater is prehistoric, marine sedimentary rock formations which have high levels of naturally occurring salts. For decades, a front of this naturally-occurring saline groundwater has been migrating predominately northeastward in the upper aquifer toward the Mendota Pool, Fresno Slough and San Joaquin River.

As described in Section 3.1, *Groundwater Levels*, the upper aquifer and lower aquifer are separated by the Corcoran Clay layer, a significant geological feature consisting of a clay layer that is largely impermeable to groundwater movement. Groundwater levels in the upper and lower aquifers are generally independent of one another and do not mix vertically. Within MPG's study areas, the Corcoran Clay layer is located 100 to 500 feet bgs and is up to 160 feet thick (DWR 2003).

The upper aquifer is further divided into a shallow zone and a deep zone by a semi-permeable A-Clay layer of sediments located 70 to 130 feet bgs. Groundwater in shallow zone is generally encountered at depths up to 130 feet bgs, and the deep zone underlies the A-Clay layer (or equivalent depth where intermittently not present) and extends downward to the Corcoran Clay layer. MPG's Annual Monitoring Program collects data in the shallow zone at the operational depth of MPG's wells (30–125 feet bgs). Data from shallower intervals that may include perched

water conditions are not included in the Annual Monitoring Program or modeled in the 2015 Hydrogeologic Technical Analysis.

Findings from the Previous EIS

The 2004 Final EIS determined that groundwater quality would be negatively impacted by MPG pumping due to the northeastward movement of the naturally-occurring saline groundwater front. The 2004 Final EIS found that migration of the saline front is exacerbated by MPG pumping as pumping activities increase the hydraulic gradient and intercept a portion of the higher-quality surface water recharge, which would otherwise help reduce salinity and push back the saline front. Design constraints to reduce these impacts, including limiting the quantity and restricting the timing of MPG pumping, were recommended in the 2004 Final EIS and included in the ROD issued by Reclamation. The 2004 Final EIS concluded that the enforcement of the design constraints and monitoring components would minimize the effect on groundwater quality.

Additional design constraints beyond those identified in the 2004 Final EIS and ROD were further implemented as part of a series of Settlement Agreements with the Exchange Contractors and Newhall (which was subsequently purchased by Paramount Farming Company, who operates Wonderful Orchards) and incorporated into the Existing Exchange Agreements.

Design Constraints Addressing Groundwater Quality

Groundwater quality in the Primary Study Area is evaluated in this EIS/EIR using sampling data gathered from the MPG Pumping and Monitoring Program for the 2002 to 2014 Annual Reports. These measurements track constituents of concern in groundwater wells, as well as provide monitoring data to ensure compliance with existing design constraints. Where relevant to the discussion, information from the 2015 and 2016 Annual Reports is also used in the analysis of impacts to groundwater quality. Four design constraints from the previous monitoring program that address potential groundwater quality impacts from MPG pumping have been carried forward in the Proposed Action, with revisions, and three additional design constraints have been added. These constraints from Table 4 include:

1. Exchange pumping from the deep zone (of the upper aquifer) shall be conducted primarily during March, April, and May, and from September through November. No exchange pumping from the deep zone (of the upper aquifer) shall be conducted during June, July, and August of any year unless expressly permitted by the Exchange Contractors, Wonderful Orchards, and Reclamation.

2. Exchange pumping from the deep zone (of the upper aquifer) shall not exceed 12,000 AFY during any one year.

3. Exchange pumping shall not be conducted more than 10 months of any one year.

4. Shallow zone (of the upper aquifer) pumping may be limited due to: 1) the quality of water pumped from these wells, 2) potential impacts to deep zone (of the upper aquifer) groundwater (e.g., a decline in groundwater level or groundwater quality), and 3) a potential decline in groundwater levels of the shallow zone (of the upper aquifer). Shallow zone pumping may also be limited due to San Joaquin River surface water flows as described in Design Constraint No. 2, as determined by Reclamation.

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5. During exchange years, the amount of groundwater pumped for use on Adjacent Overlying Lands shall not be greater than 12,000 AF in any year unless there is a corresponding reduction in the amount of exchange pumping that year.

6. Exchange pumping from the shallow zone (of the upper aquifer) shall be reduced if it is determined that exchange pumping from the shallow zone (of the upper aquifer) significantly affects the quality of water in the deep zone (of the upper aquifer) in the Exchange Contractor and Wonderful Orchard service areas due to the interception of good quality water that would otherwise reach the deep zone (of the upper aquifer) in the Exchange Contractor and Wonderful Orchards service areas.

7. Minimize groundwater quality degradation by modifying the pumping program, based on the results the groundwater monitoring program, and by minimizing drawdowns.

Study Areas

The Proposed Action and alternatives have the potential to impact groundwater quality in the Primary Study Area, especially west of the Fresno Slough in the vicinity of the MPG well fields (Figure 6). The Secondary Study Area includes all MPG lands that overlie the Westside Subbasin. In the Secondary Study Area, high salinity in the upper aquifer and the subsidence-prone lower aquifer are of particular concern.

3.2.2 Regional Setting

The Central Valley Groundwater Basin contains prehistoric marine sediment deposits that contribute to high TDS concentrations in groundwater supplies. This Groundwater Basin stores approximately 800 million AF of freshwater within the upper 1,000 feet of sediments and an unquantified amount of generally unusable saline water within marine sedimentary rock layers with concentrations of TDS above 2,000 mg/L. In some places, deeper saline groundwater has migrated vertically into shallower freshwater zones. Saline groundwater may also migrate horizontally with the direction of groundwater flow; this groundwater directional flow is often influenced by groundwater pumping (Faunt 2009).

The Study Areas are located on the border of two groundwater basins within the Central Valley Groundwater Basin: the San Joaquin Valley and Tulare Lake Groundwater Basins. The Study Areas also overlie five groundwater subbasins: Delta-Mendota, Madera, Chowchilla, Westside, and Kings Subbasins (Figure 12). Refer to Section 3.1, *Groundwater Levels* for further information on the regional aquifer system.

San Joaquin Valley Groundwater Basin

Groundwater throughout this groundwater basin is suitable for agricultural and municipal use with some local impairments. Primary constituents of concern are TDS, boron, chloride, and localized areas of high nitrates concentrations. Much of the San Joaquin Valley Groundwater Basin is a closed basin that drains internally, resulting in buildup of salts and trace elements in the soil and groundwater. TDS, boron and chloride levels are likely concentrated from high evaporation rates on the Valley floor, while TDS is also influenced by inflows from the surrounding areas. Nitrates would result from temporary and localized agricultural practices in the vicinity of a specific well, since the monitoring data has not revealed an expansive area or permanent plume of groundwater containing high levels of nitrates.

Within the San Joaquin Valley Groundwater Basin, prehistoric marine deposits with high salt concentrations are shallow enough to mix with freshwater bearing deposits and surface waters in the Coast Ranges. Areas in the west side of the San Joaquin Valley contain high concentrations of TDS originating from Coast Range streamflow that carries prehistoric marine sediments. Agricultural and industrial wastewater also affect groundwater quality as runoff carrying salts, trace elements, fertilizers, herbicides, pesticides, and other pollutants percolates, such as nitrates, into the groundwater. Regional groundwater pumping also affects groundwater quality by affecting groundwater levels and flow direction, potentially resulting in migration from areas of poorer groundwater quality (DWR 2003).

Delta-Mendota Subbasin All MPG wells are located within the Delta-Mendota Subbasin. TDS concentrations in this subbasin range from 200 mg/L to 13,000 mg/L, with TDS concentrations generally higher in the southern portion of the subbasin where the Primary Study Area is located. The typical range of groundwater TDS within the subbasin is between 700 mg/L and 1,000 mg/L. Saline water in the shallow zone of the upper aquifer occurs over a large portion of this subbasin and reaches TDS concentrations up to 13,000 mg/L. The deep zone of the upper aquifer also contains regions of relatively high TDS concentrations above 2,000 mg/L. The lower aquifer below the Corcoran Clay layer is generally a freshwater bearing zone with relatively low TDS concentrations. The lower aquifer has localized areas of high boron concentrations (DWR 2003).

Madera Subbasin TDS concentrations in this subbasin range from 100 mg/L to 6,400 mg/L, but wells drawing from this subbasin usually show average TDS concentrations between 200 mg/L and 400 mg/L (DWR 2003).

Chowchilla Subbasin TDS concentrations in this subbasin range 120 mg/L to 6,400 mg/L, with wells drawing water with an average of 200 mg/L to 500 mg/L (DWR 2003).

Tulare Lake Groundwater Basin
Groundwater throughout this basin is suitable for agricultural and urban uses. Primary constituents of concern are TDS, arsenic, and nitrates. However, areas within the Secondary Study Area, including Westlands, contain high concentrations of TDS due to naturally-occurring salts in prehistoric sediment layers and the percolation of stream flows carrying marine deposits. Poor drainage and high evaporation rates also result in a higher concentration of salts on the surface of the Central Valley floor, which in turn percolate into groundwater supplies. In regions where the Corcoran Clay layer is present, groundwater quality is generally better below the clay layer as it limits the migration of water from shallow depths that generally contain high TDS concentrations.

High levels of arsenic also occur in localized areas around lakebeds, including Tulare Lake, Kern Lake, and Buena Vista Lake; however, these lake beds are not within the Study Areas. Elevated levels of nitrates occurring in groundwater in this subbasin are likely a result of agricultural byproducts such as animal waste and fertilizer (DWR 2003).

Westside Subbasin The Westside Subbasin underlies MPG lands in Westlands and is known to have poor groundwater quality due to naturally-occurring salts and trace elements leaching from the soils into the shallow depths of the upper aquifer. Evaporation and poor drainage in Westlands due to shallow clay layers and limited permeability also contribute to conditions of

high salinity within the region's groundwater (Westlands 2012). Shallow groundwater in many areas have TDS concentrations exceeding 10,000 mg/L, with the highest concentration recorded as 35,000 mg/L. With increases in depth, TDS concentrations decrease, but are still generally high in the upper aquifer. Below the Corcoran Clay layer, in the lower aquifer, TDS concentrations are lower than in the upper aquifer, and contain TDS concentrations up to 3,000 mg/L, but water samples from monitoring wells average at 520 mg/L. High TDS concentrations impair use of groundwater for much of the upper aquifer, especially at shallow depths (DWR 2003).

Kings Subbasin TDS concentrations in this subbasin have an average of 240 mg/L across monitoring wells and generally does not exceed 2,000 mg/L, although shallow brackish water can be found in the western portion of the basin (DWR 2003).

Existing Conditions in the Primary Study Area

Groundwater quality varies greatly across different locations and water-bearing zones in the Primary Study Area, due to geology, agriculture and industrial activity, and direction of groundwater flow. Salinity is the primary constituent affecting groundwater quality, with the major issue of concern being the northeastward migration of the naturally-occurring saline front currently located just west of the Fresno Slough and Mendota Pool.

Salinity

In the vicinity of the Mendota Pool, the direction of regional groundwater flows in the upper aquifer above the Corcoran Clay are northeast towards overdraft areas in Madera County, with poorer quality (high salinity) groundwater drawn east by this overdraft toward the Fresno Slough (LSCE 2011). This high salinity groundwater has historically occurred west of the Mendota Pool in the upper aquifer, above the Corcoran Clay layer. The source of this saline groundwater is prehistoric, marine sedimentary rock formations which have high levels of naturally occurring salts. The northeast direction of regional groundwater flows in the upper aquifer towards Madera County is strongly influenced by regional water withdrawals, particularly areas of major overdraft and groundwater drawdown in Madera County.

This has resulted in a corresponding northeastern migration of a front of this naturally-occurring brackish water over the last several decades. The northeast migration of the naturally-occurring saline front has impacted groundwater quality west of the Fresno Slough. MPG pumping along the west side of the Fresno Slough near the saline front incrementally increases the steepness of the gradient in this area and contributes to the localized migration of the saline front, particularly in the shallow zone. While this MPG pumping contributes to the ongoing regional migration of the saline front, large scale regional pumping, particularly major overdraft and groundwater drawdown in Madera County, which has altered the flow gradient from southwest to north east, is a predominant factor influencing front migration (Appendix E, page 11). The area west of the Fresno Slough generally has the poorest groundwater quality within the Primary Study Area due to proximity to the saline front and associated high concentrations of salts (LSCE & KDSA 2015). In the lower aquifer beneath the Corcoran Clay, salinity levels in the Primary Study Area have been relatively stable. The region with the highest groundwater quality is east of Mendota Pool due to the seepage of higher quality surface waters from the San Joaquin River and the Mendota Pool (see Appendix D).

Shallow Zone As discussed above, groundwater in the shallow zone is generally encountered at depths up to 130 feet bgs. MPG's Annual Monitoring Program collects data in the shallow zone at the operational depth of MPG's wells (30–125 feet bgs). Data from shallower intervals that may include perched water conditions are not included in the Annual Monitoring Program or modeled in Groundwater Model in the 2015 Hydrogeologic Technical Analysis. TDS concentrations in the shallow zone range from less than 400 mg/L near the San Joaquin River, to 2,000 mg/L along the west side of the Fresno Slough, to over 5,000 mg/L near the City of Mendota. Migration of the naturally-occurring saline front is increasing salinity levels throughout the area west of the Slough, with the highest concentrations occurring around the City of Mendota. The saline front contour of 2,000 mg/L generally follows the west bank of the Fresno Slough (Figure 28). Migration of the naturally-occurring saline front has required modifying the pumping program as part of the previous design constraint that limits the pumping of groundwater into the Pool for exchange with TDS concentrations greater than 2,000 mg/L. Groundwater in some locations shows large fluctuations from year to year, with higher salinity occurring during periods of drawdown in summer and fall and lower salinity occurring in spring and winter during periods of recharge. Annual variations in groundwater salinity also result from Meyers Water Bank operations and climatic conditions (LSCE & KDSA 2015).

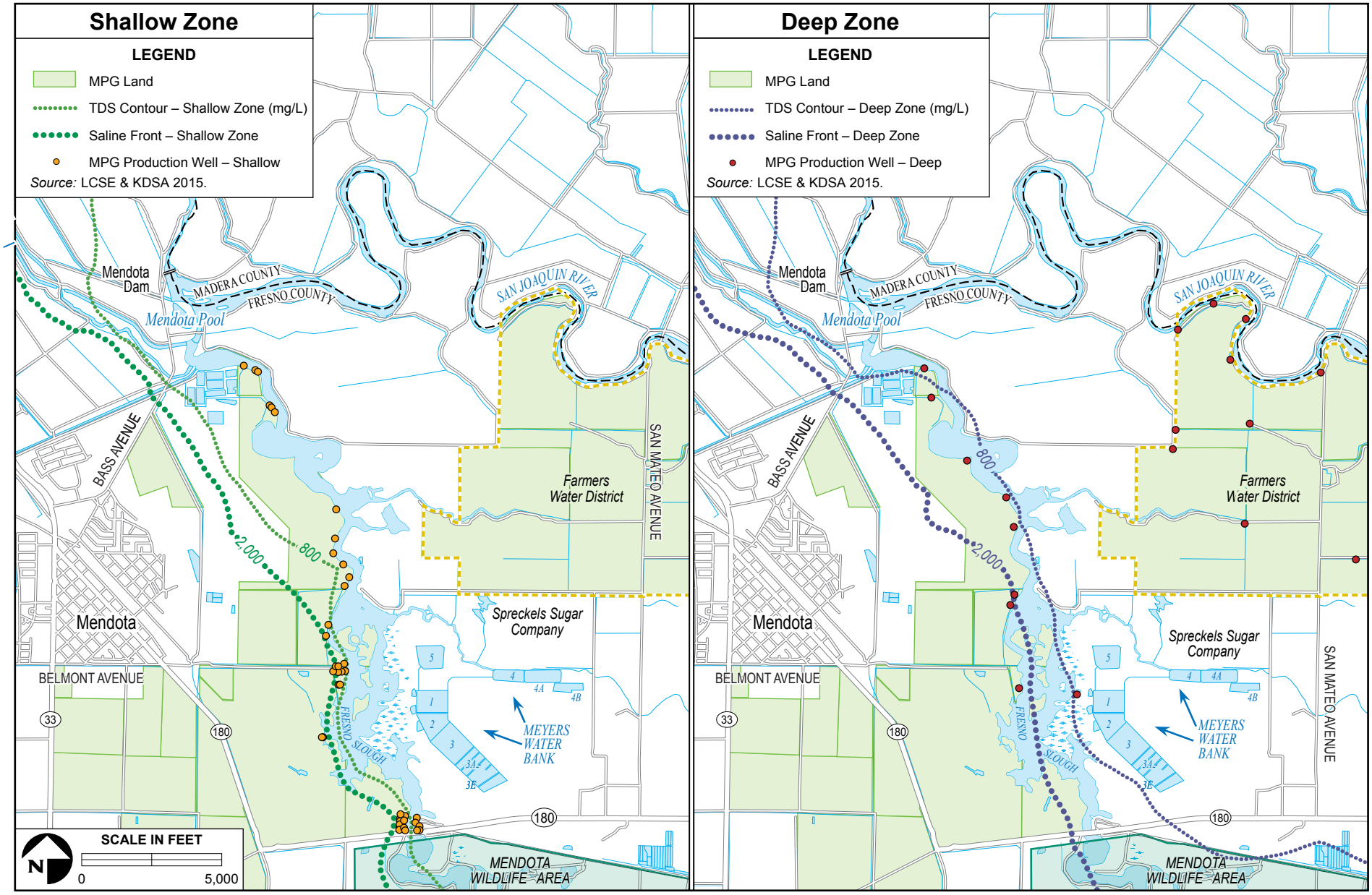
Groundwater quality in the shallow zone east of the Fresno Slough has been degraded due to disposal of wastewater from the Spreckels Sugar plant prior to 1990. Although this wastewater is no longer produced, a plume of contaminated water from past operations, referred to as Steffen's plume, has generally been migrating northeastward. The direction of the plume occasionally deviates, causing impact to some MPG wells east of the Slough (Reclamation 2012). Spreckels Sugar Company monitors this plume, as required by the CVRWQCB. Well monitoring data from the central portion of the Spreckels property show that TDS concentrations continue to be high while TDS has decreased west of the plant due to recharge from Meyers Water Bank.

Groundwater salinity east of the Fresno Slough is relatively low. This area receives some recharge from the San Joaquin River; however, salinity has gradually increased in a portion of the area over the last decade due to the northeastward migration of Steffen's plume (LSCE & KSDA 2014). North of the San Joaquin River, salinity has decreased considerably, with TDS values dropping from approximately 700 mg/L in 2002 to 280 to approximately 250 mg/L in 2014. Farther north of the river, salinity has historically been significantly greater and more variable. The highest recorded TDS measurement in 2005 was approximately 1,700 mg/L; however, TDS values decreased to approximately 275 mg/L in 2013 due to groundwater recharge from the Chowchilla Bypass and the four NCR recharge ponds (LSCE & KDSA 2015).

Deep Zone Groundwater quality in the deep zone has gradually degraded due to northeastward migration of the naturally-occurring saline front near the Fresno Slough, with regional groundwater flows drawing poor quality saline groundwater east (Figure 28). West of the Fresno Slough near the Mendota Municipal Airport, deep zone TDS concentrations range between 5,000 mg/L to 7,000 mg/L, while along the west bank of the Fresno Slough near the MPG well field, concentrations ranged from 1,310 mg/L to 1,720 mg/L in 2014; annual monitoring data shows TDS concentrations have been increasing since 2000.

In contrast, deep zone groundwater quality east of the Slough has much lower salinity. In FWD, TDS concentrations ranged from 300 mg/L to 760 mg/L.

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Location of the Saline Front – Deep Zone and Shallow Zone

FIGURE 28

While salinity has been stable in this area, some MPG wells have been affected by the Steffen's plume, which originated from the operation of the Spreckel's Sugar Company east of FWD, and is moving downward into the deep zone and northeast into FWD. Although this wastewater is no longer produced and discharged by Spreckels, TDS concentrations in the wells surrounding the region of the Steffen's plume have steadily increased since 2004. Salinity in the deep zone is low north of the San Joaquin River and has generally been stable since the mid-1990s (LSCE & KDSA 2015).

Trace Elements

MPG monitors concentrations of four trace elements in groundwater (arsenic, boron, molybdenum, and selenium) for their potential to adversely impact human and environmental health. Arsenic is a trace element that is toxic to animals and humans at elevated levels. Boron is an essential micronutrient for plants that is found at low concentrations in irrigation water; however, it is toxic to crops at higher concentrations. Molybdenum and selenium are naturally occurring elements, but are both toxic to wildlife at elevated levels.

The Annual Reports indicate that these trace elements occur in very low concentrations in groundwater resources within the Primary Study Area, and many samples taken are below detectable quantities. For this reason, there is limited data on arsenic and selenium concentrations in groundwater resources within the Primary Study Area. Boron concentrations are also generally low, with concentrations below 500 µg/L at all sample locations in the 2012–2014 Annual Reports. Molybdenum concentrations in groundwater are more variable, ranging from 6 µg/L to 17 µg/L, and tend to be higher in the central and southern portions of the MPG well fields. Concentrations of these trace elements in groundwater as reported by the 2014 Annual Report were all well under the water quality objectives included in the MPG Pumping and Monitoring Program, which are 10 µg/L for arsenic, 800 µg/L for boron, 19 µg/L for molybdenum, and 2.0 µg/L for selenium.

Nitrates are a constituent of concern in groundwater supplies used for drinking water. The presence of nitrates in groundwater are primarily the result of increasing agricultural, municipal, and industrial activities, including increased application of fertilizers to farmlands and animal waste from agricultural practices infiltrating to the groundwater table. In addition to adverse effects to agricultural productivity, higher concentrations of nitrates also result in human health effects if present in high concentrations. The most prominent human health effects are greater in infants and children under six years of age, where high concentrations of nitrates can affect the carrying of oxygen throughout the body and result in an illness called "blue baby" syndrome. Some scientific studies also suggest a linkage between high nitrate levels in drinking water with birth defects and certain types of cancer. However, long-term scientific studies are needed to determine a direct relationship. According to the EPA, long-term exposure to water with high nitrate levels may also cause diuresis, increased starchy deposits, and hemorrhaging of the spleen. People with heart or lung diseases are more susceptible to the toxic effects of nitrate than others because of reduced levels of gastric acidity (SWRCB 2017). Because of their potential health effects, both the EPA and SWRCB have established a Maximum Contaminant Level (MCL) of 10 mg/L in drinking water.

The current MPG Pumping and Monitoring Program samples general minerals within its groundwater wells, including nitrates. Based on nearly 1,600 nitrate as nitrogen records for over 200 wells in the MPG Study Areas from 1980 to 2017, concentrations are generally below the EPA and SWRCB MCL. MPG wells adjacent to the City of Mendota wells do not show any

exceedances. The last well (WO-3921-91) closest (about 0.5 miles) to the City of Mendota wells to record an exceedance of the MCL (10 mg/L) was on November 29, 2011, with a nitrate concentration of 34.5 mg/L. All other exceedances occurred at wells that are at least 1.4 miles away from City of Mendota wells (LSCE & KDSA 2017). The monitoring of nitrate levels is not a requirement of the Existing Exchange Agreements, nor has the CVRWQCB established Water Quality Objectives (WQO) for inland surface waters. None of MPG's wells are used to supply drinking water systems. It is important to note that the nearby City of Mendota also does not test for nitrates in its groundwater wells.

Existing Conditions in the Secondary Study Area

TDS concentrations in the upper aquifer exceed 2,000 mg/L in most of Westlands, and large regions of the upper aquifer are generally unusable for irrigation use (Westlands 2014). Therefore, the majority of wells in Westlands pump from the lower aquifer, with TDS concentrations in these wells averaging 520 mg/L (DWR 2003).

3.2.3 Regulatory Framework

Groundwater quality is regulated by authorities at the Federal, State, and local level. Section 3.1, *Groundwater Levels*, provides an overview of the regulatory agencies and specific regulations that are applicable to the Proposed Action and alternatives for groundwater levels and groundwater quality.

Federal Policies and Regulations

Safe Drinking Water Act The EPA implements the Safe Drinking Water Act to protect water quality. The Safe Drinking Water Act defines health-based standards for drinking water, and requires the protection of drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells. The California Department of Health and Safety, Division of Drinking Water and Environmental Management is responsible for administering California's drinking water program under this Act.

State Policies and Regulations

State Porter-Cologne Water Quality Control Act Water quality in the State of California is protected under the Porter-Cologne Water Quality Control Act. Under the Act, the SWRCB has the ultimate authority over State water rights and water quality policy while the Regional Water Quality Control Boards (Regional Boards) oversee water quality on a day-to-day basis at the local and regional level. The Act requires that the State adopt water quality policies, plans, and objectives to protect the State's waters for the use and enjoyment of people.

The Regional Boards are required to adopt and periodically update water quality control plans (Basin Plans). These plans identify the designated beneficial uses for surface and groundwater resources, define applicable water quality objectives necessary to support these beneficial uses, and establish programs that protect water quality. The Regional Boards regulate all pollutant or nuisance discharges that may affect either surface water or groundwater.

Sustainable Groundwater Management Act (SGMA) SGMA intends to manage the use of groundwater in a manner that can be maintained long-term without causing chronic lowering of groundwater levels, overdraft, and significant reduction in groundwater storage, saline water intrusion, or subsidence. See Section 3.1, *Groundwater Levels*, for further detail on SGMA.

Irrigated Lands Regulatory Program (ILRP) The ILRP addresses waste discharge (e.g., sediments, pesticides, nitrates) from commercial irrigated lands. The goal of ILRP is to reduce

impacts of agricultural discharges to groundwater and surface water. Under this program, growers must implement management practices and submit farm evaluations and nitrogen management data.

Salt and Nitrate Management Plan The Central Valley Salinity Alternatives for Long-term Sustainability (CV SALTS), a coalition of state and federal agencies, agriculturalists, and businesses, completed the Salt and Nitrate Management Plan in January 2017. The Plan contains an assessment of current water quality conditions and trends, regulatory and technical analyses, prototype studies to provide considerations when implementing policies, and recommended policies.

Local Policies and Regulations

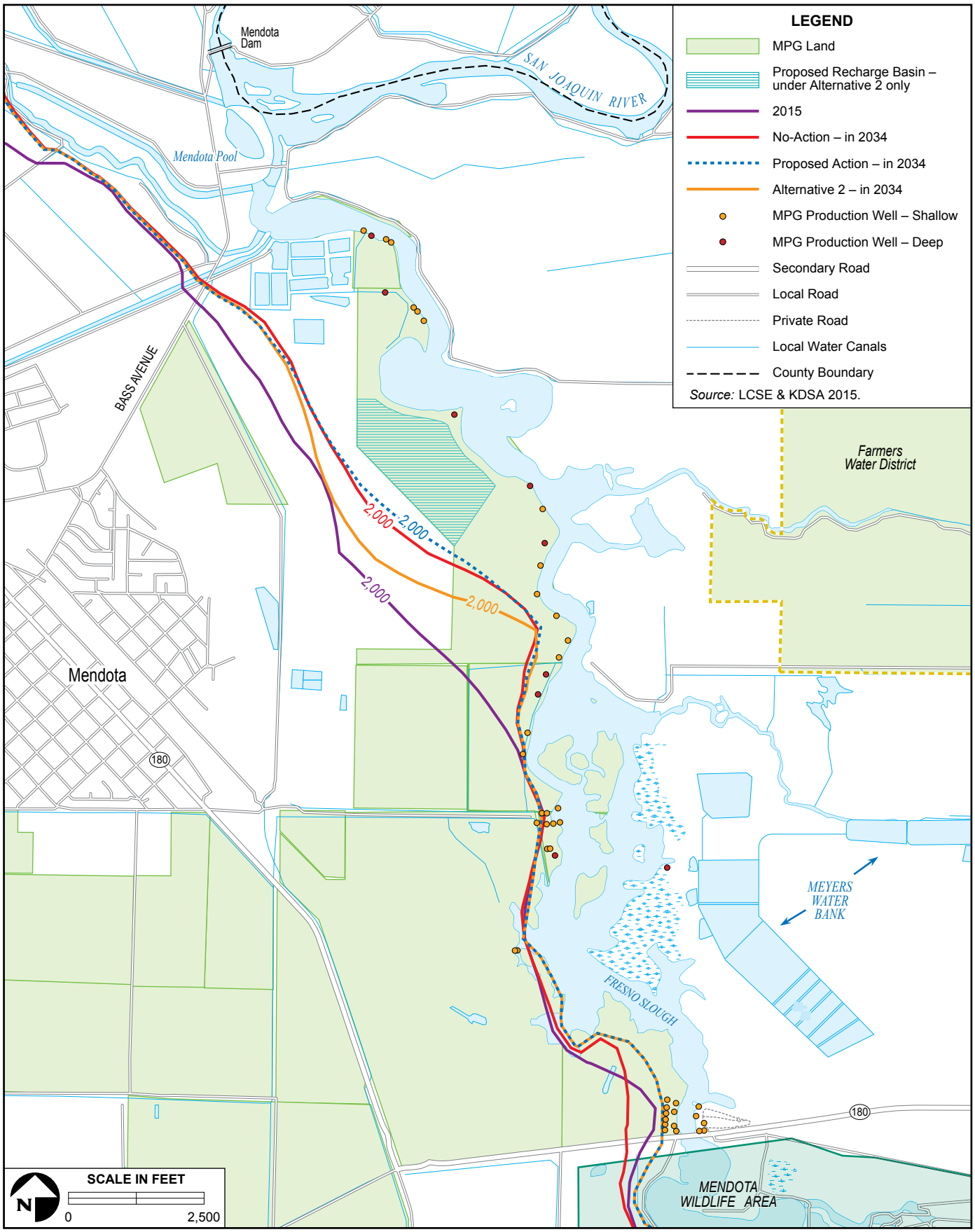
Applicable local policies and regulations pertaining to groundwater quality include the Westlands Water District Groundwater Management Plan and Groundwater Management Plan for the San Joaquin River Exchange Contractors. Refer to Section 3.1, *Groundwater Levels* for further detail on these local policies or regulations.

3.2.4 Impact Analysis/Environmental Consequence

Methodology for Analysis

Impact analyses are primarily based on the results of the Hydrogeologic Technical Analysis developed for this EIS/EIR (Appendix E). Data from the 2002–2014 Annual Reports were reviewed and considered to inform the Hydrogeologic Technical Analysis (LSCE & KDSA 2002-2015). These results were used to forecast trends and changes in groundwater quality within the Study Areas, especially those areas most directly affected by the Proposed Action and alternatives in the vicinity of the Mendota Pool and Fresno Slough. In particular, the analysis forecasts the potential extent of the northeastward migration of the naturally-occurring saline front over a 20-year period. For this analysis, saline front movement is measured by the modeled change in the 2,000 mg/L TDS contour line at the end of the 20-year period for each alternative. The 2,000 mg/L contour line represents a notable boundary for the saline front, where TDS levels drop off steeply and diminish east of the 2,000 mg/L contour; thus, the 2,000 mg/L contour line is a useful metric to measure the migration of the naturally-occurring saline front. As discussed in further detail below, the EPA also identifies TDS concentrations above 2,000 mg/L as having severe effects on many crops. TDS concentrations west of the contours are generally higher whereas concentrations east of the contours are lower (Figures 29 and 30). This migration would affect groundwater quality in both the shallow and deep zones of the upper aquifer, with regional movement of this front strongly affected by pumping and lower groundwater levels in Madera County. Further, the section forecasts the localized movement of the naturally-occurring saline front along the Fresno Slough that is attributable to MPG pumping, particularly in the shallow zone.[36]

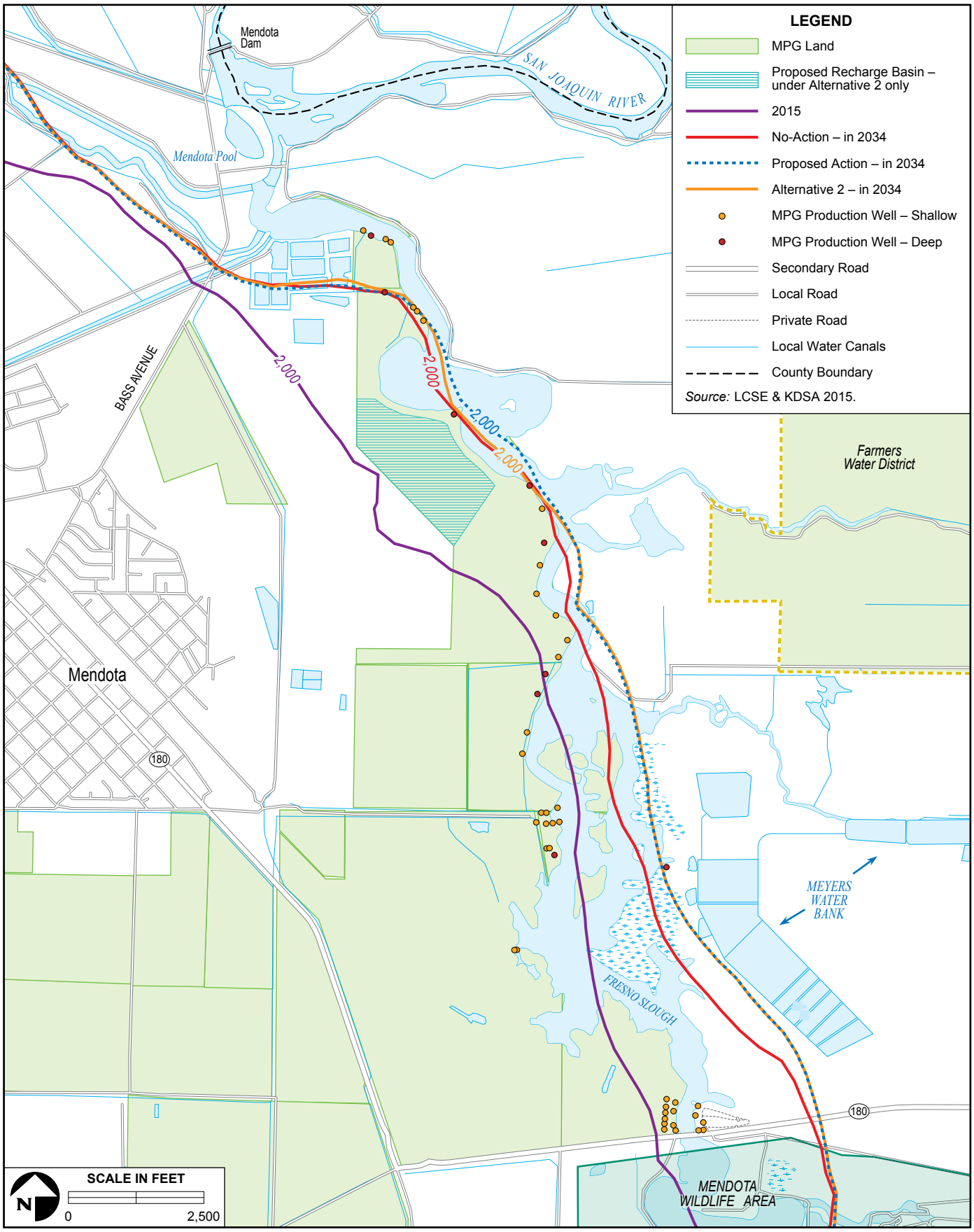
[36] Within the lower aquifer, salinity levels are estimated to remain stable as MPG is assumed to only incrementally pump from the lower aquifer (less than 3 percent of the total MPG groundwater pumped, or 670 AFY) over the 20-year exchange period. This negligible quantity of groundwater is not substantial enough to affect a measurable change in groundwater quality in the lower aquifer. Thus, none of the alternatives would have a significant impact on groundwater quality in this aquifer and it is not discussed further (see Appendix E for more information). However, this analysis is conservative because it is currently anticipated that the one remaining composite wells would be plugged prior to the start of the 2020 irrigation season.



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Migration of the Saline Front in the Shallow Zone (2,000 mg/L Contour Line)

FIGURE 29



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Migration of the Saline Front in the Deep Zone (2,000 mg/L Contour Line)

FIGURE 30

The baseline used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA to provide a full disclosure of the potential impacts. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Groundwater Quality Monitoring

The existing MPG Pumping and Monitoring Program includes monitoring and evaluation of changes in groundwater quality in the Mendota Pool area. The monitoring program includes a network of 76 MPG wells and 180 wells owned by other entities (see Table 12 for MPG well locations). The MPG monitors its wells for salinity, measured as EC or TDS, on an annual basis. Comprehensive analysis also includes analyses of trace elements including arsenic, molybdenum, selenium, and barium. Results of groundwater quality monitoring are summarized within the Annual Reports that began in 1999 and were extended to the current study areas in 2001.

Table 12: Groundwater Quality Monitoring Network

	Owner	Responsible Entity	Shallow Wells[1]	Deep Wells[1]	Total Wells[1]
MPG Wells	Terra Linda Farms	MPG	16	6	22
	Silver Creek Packing	MPG	3	0	3
	Coelho/Gardner/Hanson	MPG	14	1	15
	Meyers Farming	MPG	2	1	3
	Five Star/ Conejo Farms	MPG	10	0	10
	Coelho West	MPG	5	0	5
	Farmers Water District	MPG	0	11[2]	11
	Baker Farming Co.	MPG	0	5	5
	Panoche Creek Farms	MPG	0	1	1
	Total		**50**	**25[2]**	**75**
Non-MPG Wells	Central California Irrigation District	Owner	0	9	9
	Columbia Canal Company	Owner	0	15	15
	Paramount Farming Company	Owner	4	20	24
	Covanta Mendota	Owner	0	1	1
	Spreckels Sugar Company	Owner	24	17	41
	City of Mendota	Owner	5	4	9
	United States Geological Survey	MPG	1	1	2
	Meyers Farming	MPG	5	0	5
	Meyers Farm Water Bank	Owner	17	1	18
	Total		**56**	**68**	**124**

[1] The groundwater quality monitoring network includes both production wells and non-production wells.
[2] The total number of FWD deep wells presented in this table includes 10 deep zone wells and 1 remaining composite well.
Source: LSCE & KDSA 2015.

Groundwater Model

A numerical model for groundwater flow and solute transport was developed to evaluate the hydrologic response of the Proposed Action and alternatives on groundwater conditions within

the Primary Study Area. The model simulates the 20-year period of the Proposed Action or alternatives. Model conditions and parameters include:

- Groundwater extraction
- Groundwater inflows and outflows
- Recharge from Wonderful Orchards ponds, Meyers Water Bank, and surface water bodies
- Potential recharge from MPG recharge facilities (Terra Linda Farms Recharge Canal, NCR Recharge Ponds, and the River Ranch Recharge Basin)
- Recharge from irrigation
- Precipitation
- Land use characteristics
- Groundwater-surface water interaction
- Subsidence

The Groundwater Model for this analysis used the MT3DMS contaminant transport code provided by the USGS, a 3-dimensional modeling platform used to simulate advection, dispersion, and reactions of multiple chemical species. This model forecast changes in groundwater quality from Year 1 to Year 20 that would result from ongoing pumping by MPG and others, forecasted recharge, and the resulting northeastward movement of the natural-occurring saline front. The area covered by the groundwater flow and solute transport model extends northeast beyond the Primary Study Area and into Madera County to include groundwater pumping from Aliso, Gravelly Ford, and Madera Irrigation Districts. See Appendix E for further information on the model. Listed below are model assumptions, inputs, and results:

- The initial range of TDS concentrations assigned to the model area ranged from 300 to 13,000 mg/L.
- A TDS concentration of 4,500 mg/L was assigned to groundwater recharged from irrigation over much of the area west of the Fresno Slough (i.e. on Adjacent Overlying Lands).[37]
- The TDS concentration for irrigation recharge over the majority of the model domain east of the Fresno Slough and north of the San Joaquin River is largely unknown; over these lands, a concentration of 1,000 mg/L was assigned during the model calibration process.
- Near the Spreckels Sugar Company, a TDS concentration of 5,000 mg/L was assigned for recharge, based on the groundwater quality of shallow-zone groundwater in that area.
- An initial TDS concentration of 400 mg/L was specified for the Mendota Pool based on data for the salinity concentration in the DMC from January of 1990.
- A TDS concentration of 400 mg/L was assigned to all recharge facilities.

[37] As discussed in the Hydrogeologic Technical Analysis (Appendix E, pg. 29) methodology, this value was estimated based on analysis of salinity measurements collected by the DWR from agricultural drains in drainage impaired lands in this area.

Thresholds of Significance

The thresholds of significance for impacts are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as amended. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of impacts. The Proposed Action and alternatives under consideration would result in a significant impact related to groundwater quality if they would do any of the following:

1. Violate any groundwater quality standards
2. Alter the existing surface drainage such that groundwater supplies are substantially impacted
3. Alter the existing subsurface flow patterns such that groundwater supplies are substantially impacted
4. Otherwise substantially degrade groundwater quality

Groundwater quality criteria are generally established by the CVRWQCB based on the beneficial use of a water body. Groundwater quality must meet criteria for the beneficial uses that are defined in the Sacramento and Groundwater Basin Plan for the Delta-Mendota Subbasin. The beneficial uses for groundwater surrounding the Mendota Pool (Detailed Analysis Unit 235) are municipal and domestic supply, agricultural supply, industrial service, and process supply (CVRWQCB 2004). Groundwater quality criteria differ from surface water quality criteria listed in Section 3.3, *Surface Water Quality*, as surface waters in the Mendota Pool and Fresno Slough are also considered to have beneficial uses for wildlife habitat. The thresholds selected for this EIS/EIR also consider the WQOs used in the Annual Reports (Table 13).

According to the EPA and Food and Agriculture Organization (FAO), TDS concentrations below 450 mg/L have no harmful effects on crops; concentrations between 450 mg/L to 2,000 mg/L have slight to moderate effects on many crops; and long-term use of water with concentrations above 2,000 mg/L have severe effects on many crops (Ayers & Wescot 1985, EPA 1986, Westlands 2014;). TDS concentrations above 5,000 mg/L are toxic to many crops, especially fruits (EPA 1986).

A TDS concentration of 800 mg/L was selected as the threshold of significance for this analysis given that water with concentrations up to 800 mg/L can be used for agricultural irrigation on most crops grown on permeable soils with careful water management practices (Ayers and Wescot 1985, EPA 1986). At TDS concentrations of 800 mg/L and over, farmers begin to experience limited crop choices, reduction in yield, and potential damage to soils. TDS concentrations of 1,200 mg/L and 2,000 mg/L were selected to track the movement of the saline front and number of affected wells. Currently, groundwater being pumped by a number of MPG wells exceed the 800 mg/L threshold. Under the previous design constrains, MPG could discharge groundwater with TDS concentrations up to 2,000 mg/L into the Mendota Pool for exchange during the months of January–August and December (the non-Fall months). This design constraint was revised under the 1-Year Extension EA and would continue under the Proposed Action and Alternative 2 to lower the allowable TDS concentration of groundwater discharged into the Mendota Pool to 1,600 mg/L. Groundwater with high TDS concentrations may be mixed with higher quality water sources for agricultural irrigation. Thresholds for trace elements were selected from the Sacramento and San Joaquin Valley Basin Plan (Table 13).

Table 13: Groundwater Quality Criteria

Parameter	Maximum Allowable Concentration	Reference and Notes
TDS	2,000 mg/L	Quality Criteria for Water, EPA 1986; Water quality standards for agricultural irrigation Ayers & Wescot 1985. Under the existing design constraints, wells exceeding concentrations of 2,000 mg/L (limited to 1,200 mg/L during Fall months) may not be used for the Exchange Agreements
Arsenic	10 µg/L	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2011; Dept. of Public Health Primary Maximum Contaminant Level (MCL). 10 µg/L is also the water quality objective used in the Annual Reports.
Boron	800 µg/L	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2011; 800 µg/L is also the water quality objective used in the Annual Reports.
Molybdenum	19 µg/L	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2011; 19 µg/L is also the water quality objective used in the Annual Reports.
Selenium	2.0 µg/L	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2011; Beneficial Use Agricultural Water Quality, Ayers & Wescot 1985; 2.0 µg/L is also the water quality objective used in the Annual Reports.

Impacts and Mitigation Measures

While MPG pumping would incrementally contribute to overall regional migration of the naturally-occurring saline front, the effects specifically attributable to MPG pumping operations would largely be confined to the area around the Mendota Pool and Fresno Slough near their well fields and front migration is strongly influenced by flow gradient which runs from the southwest to northeast and west to east toward Madera County. The northeastward migration of the saline front would create two types of impacts:

- Impacts to wells mainly located along the west side of the Fresno Slough, the vast majority of which are owned and operated by MPG. Although impacts to MPG wells may affect the beneficial agricultural use of groundwater, the loss of MPG wells to the program due to increased salinity is considered an economic impact rather than an environmental impact. Consistent with standard agricultural practices throughout the Central Valley, MPG farmers regularly replace and relocate wells for a variety of reasons.

- Impacts resulting in substantial degradation of public groundwater resources and the deprivation of the MPG and others of access to the beneficial uses of such water due to the migration of the naturally-occurring saline front. This impact is based on total increases in TDS and effects on beneficial uses as well as the extent of the groundwater basin that is impacted.

Results of the Groundwater Model in the Hydrogeologic Technical Analysis project trends in the migration of the naturally-occurring saline front and a corresponding increase in TDS, showing the effects of both MPG and non-MPG pumping, and groundwater recharge from the Terra Linda Farms Recharge Canal, the four existing NCR Recharge Ponds, and Meyers Water Bank. Results of the Groundwater Model are summarized in Table 14. MPG pumping under all alternatives is expected to contribute to the migration of the naturally-occurring saline front to varying degrees, while pumping and localized areas of lower groundwater in Madera County have the most influential effect on regional groundwater movement and salinity changes across

all alternatives. Within the Hydrogeologic Technical Analysis, the model shows that TDS concentrations in the vicinity of the four existing NCR Recharge Ponds north of the San Joaquin River would not vary substantially.

Increasing salinity levels in groundwater can adversely affect beneficial municipal and agricultural uses. Groundwater with TDS concentrations above 800 mg/L used for irrigation may begin to result in impacts to agricultural beneficial uses, including limitations in crop types, reductions in crop yields, and degraded soil quality. Over time, continued application of high salinity irrigation water increases osmotic pressure in crop roots to the extent that the crop cannot extract sufficient water from a salty soil solution. High salinity in irrigation water may also cause problems in soil structure, infiltration, and permeability, thereby reducing its quality (EPA 1986). High-salinity groundwater can also adversely affect municipal users such as the City of Mendota. Municipal treatment and the drilling of replacement wells is possible, but may result in increased costs to other entities. Groundwater with high TDS concentrations that are exchanged through the Mendota Pool and Fresno Slough may also result in secondary impacts to surface water quality and biological resources; these impacts are addressed in Sections 3.3, *Surface Water Quality*, and 3.4, *Biological Resources*.

Shallow Zone Summary Within the Delta-Mendota Subbasin, the migration of the naturally-occurring saline front would impact the groundwater quality in the shallow zone or reduce groundwater available for beneficial uses in the Primary Study Area. Overall, the Groundwater Model projects that average TDS values of groundwater west of the Fresno Slough would decrease in some wells (by as much as 1,200 mg/L) and increase in others (by as much as 2,900 mg/L). However, the combined average TDS values west of the Fresno would increase by 40 mg/L under the No Project Alternative, 90 mg/L under the Proposed Action, and 60 mg/L under Alternative 2 (see Table 14). Values near the San Joaquin River would decrease due to estimated seepage of low TDS water from the San Joaquin River. Under all alternatives, MPG would continue to pump the majority of its groundwater from the shallow zone near the Mendota Pool, and model results indicate the localized migration of the naturally-occurring saline front would be greatest near the MPG shallow well field, west of the Fresno Slough. While MPG shallow zone pumping would contribute to the localized migration of the naturally-occurring saline front in the vicinity of MPG wells, regional migration of the naturally-occurring saline front is primarily influenced by the hydraulic gradient and the northeasterly groundwater flow direction caused by regional pumping, particularly groundwater pumping in Madera County. These results are discussed in detail in the impact discussion below.

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Table 14: Change in TDS Concentrations by Geographic Subarea

Subarea		No Action Alternative	Proposed Action	Alternative 2
Shallow Zone	*Average*	*-30 mg/L*	*-20 mg/L*	*-20 mg/L*
North/East of the SJR	Total [1]	-430–160 mg/L (-30 mg/L)[3]	-420–160 mg/L (-30 mg/L)	-420–160 mg/L (-30 mg/L)
	Relative [2]	-	-20–20 mg/L (3 mg/L)	-10–20 mg/L (4 mg/L)
South/West of SJR	Total	-520–960 mg/L (200 mg/L)	-510–960 mg/L (200 mg/L)	-510–960 mg/L (200 mg/L)
	Relative	-	-50–30 mg/L (1 mg/L)	-50–40 mg/L (2 mg/L)
West of Fresno Slough	Total	-1,200–2,700 mg/L (40 mg/L)	-980–2,900 mg/L (90 mg/L)	-980–2,600 mg/L (60 mg/L)
	Relative	-	-960–2,200 mg/L (50 mg/L)	-2,200–2,200 mg/L (20 mg/L)
MWA	Total	-1,400–1,000 mg/L (-240 mg/L)	-1,400–1,000 mg/L (-220 mg/L)	-1,400–1,000 mg/L (-220 mg/L)
	Relative	-	-80–800 mg/L (20 mg/L)	-80–800 mg/L (20 mg/L)
East of Fresno Slough	Total	-1,400–280 mg/L (-50 mg/L)	-1,600–490 mg/L (-50 mg/L)	-1,600–490 mg/L (-50 mg/L)
	Relative	-	-300–560 mg/L (-9 mg/L)	-280–580 mg/L (-8 mg/L)
East of Chowchilla Bypass	Total	-150–150 mg/L (30 mg/L)	-150–160 mg/L (30 mg/L)	-150–160 mg/L (30 mg/L)
	Relative	-	-20–40 mg/L (1 mg/L)	-20–40 mg/L (1 mg/L)
Deep Zone	*Average*	*200 mg/L*	*210 mg/L*	*210 mg/L*
North/East of the SJR	Total	-300–420 mg/L (40 mg/L)	-290–580 mg/L (40 mg/L)	-290–590 mg/L (40 mg/L)
	Relative	-	-50–150 mg/L (3 mg/L)	-50–160 mg/L (3 mg/L)
South/West of SJR	Total	-290–980 mg/L (380 mg/L)	-290–960 mg/L (380 mg/L)	-290–960 mg/L (380 mg/L)
	Relative	-	-50–30 mg/L (-2 mg/L)	-50–40 mg/L (-1 mg/L)
West of Fresno Slough	Total	-500–2,200 mg/L (640 mg/L)	-570–2,200 mg/L (640 mg/L)	-540–2,200 mg/L (630 mg/L)
	Relative	-	-570–1,500 mg/L (-3 mg/L)	-1,100–1,500 mg/L (-10 mg/L)
MWA	Total	-650–1,700 mg/L (310 mg/L)	-680–1,800 mg/L (320 mg/L)	-680–1,800 mg/L (320 mg/L)
	Relative	-	-180–310 mg/L (10 mg/L)	-170–320 mg/L (9 mg/L)
East of Fresno Slough	Total	-1,100–1,800 mg/L (250 mg/L)	-1,200–2,100 mg/L (300 mg/L)	-1,200–2,100 mg/L (300 mg/L)
	Relative	-	-190–1,500 mg/L (40 mg/L)	-170 to 1,500 mg/L (40 mg/L)
East of Chowchilla Bypass	Total	-180–330 mg/L (50 mg/L)	-170–340 mg/L (50 mg/L)	-170–340 mg/L (50 mg/L)
	Relative	-	-20–30 mg/L (2 mg/L)	-14–30 mg/L (2 mg/L)

[1] The term "Total" represents the range in the difference in TDS concentrations of all of the wells within the subarea from the start of Year 1 to the end of Year 20. Positive numbers indicate net increase in TDS concentrations. Negative values represent a decrease in TDS concentrations.

[2] The term "Relative" represents the difference in TDS concentrations that would occur under the Proposed Action/Alternative 2 when compared to the No Action Alternative. Positive numbers indicate TDS concentrations that are higher than under the No Action Alternative. Negative values indicate TDS concentrations that are lower than under the No Action Alternative.

[3] Values in parenthesis represent the average change in TDS concentrations over the geographic subregion.

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Migration of the naturally-occurring saline front would have the highest influence on groundwater west of the Fresno Slough, and would somewhat limit the potential for this groundwater to be applied directly to MPG lands. While precise forecasts of affected wells is difficult to evaluate due to the complexity of the Groundwater Model and a number of variable factors, the groundwater in the vicinity of multiple MPG wells could reach TDS concentrations that exceed 800 mg/L or 2,000 mg/L. If unabated, this could result in increased salinity levels in water applied directly to MPG agricultural lands and water discharged into the Mendota Pool. However, high-salinity groundwater would not be directly applied to MPG lands because it would affect crop production and the continued routine replacement of wells would ensure that highly saline groundwater would not be pumped. Moreover, in accordance with the requirement of the design constraints, MPG pumping would be managed so that the groundwater discharged into the Mendota Pool would not have TDS concentrations above the design criteria (i.e. >1,600 mg/L).

The continued migration of the naturally-occurring saline front could also impact current and future beneficial uses of this groundwater for other entities. Migration of the front has the potential to incrementally increase the groundwater salinity in the vicinity of non-MPG shallow wells west of the Fresno Slough. However, any migration of the naturally-occurring saline front attributable to MPG groundwater pumping under the Proposed Action and Alternatives is not expected to restrict the use of non-MPG wells for beneficial uses because the implementation of recharge components under the Action alternatives and seepage from the San Joaquin River would slow movement of the saline front by diluting groundwater in the shallow zone. MPG is the primary entity using groundwater for agricultural beneficial uses immediately west of the Slough, but the migration of the naturally-occurring saline front would, to some extent, impair potential future agricultural use of this groundwater for other entities, as TDS concentration can begin to reduce variety of crops, reduce yields from certain crops, and cause soil damage. However, although MPG pumping would influence the localized migration of the naturally-occurring saline front, the Hydrogeologic Technical Analysis projects that the average TDS concentrations in the shallow zone across the 91,769-acre Primary Study Area would experience only an incremental reduction in TDS concentrations (Figure 31). The Proposed Action and Alternative 2 would result in less of a reduction in TDS concentrations than the No Action Alternative (Figure 32). The primary influence on the migration of the saline front would continue to be regional non-MPG pumping outside of the Primary Study Area, particularly groundwater pumping in Madera County.

Deep Zone Summary Migration of the naturally-occurring saline front in the deep zone is also primarily influenced by the groundwater hydraulic gradient and flow direction caused by regional non-MPG pumping, including deep-zone pumping by Wonderful Orchards, CCC, CCID, Spreckels, and even more so, other pumpers in Madera County. Regional pumping in Madera County is the primary influencer of deep zone groundwater flow direction.

Within the Primary Study Area, average TDS concentrations vary by sub-region by the end of the 20-year period, with highest concentrations occurring west of, and along the Fresno Slough, and lowest concentrations occurring near the San Joaquin River (Table 14). The increase in TDS concentrations throughout the entire Primary Study Area in the deep zone are projected to occur largely as a result of regional groundwater being drawn towards areas of lower groundwater levels and cones of depression in Madera County (Figure 33). The Proposed Action and Alternative 2 would increase TDS concentrations a little more than the No Action Alternative

(Figure 34). Since most of MPG pumping west of the Fresno Slough is from the shallow zone, a relatively low volume of water is pumped from the deep zone in this area. Thus, MPG's effect on the localized migration of the saline front is incremental when compared to regional pumping, particularly major overdraft in Madera County, which acts on the migration of the saline front. Therefore, MPG's contribution to the saline front advancement in the deep zone under all alternatives would be relatively minor.

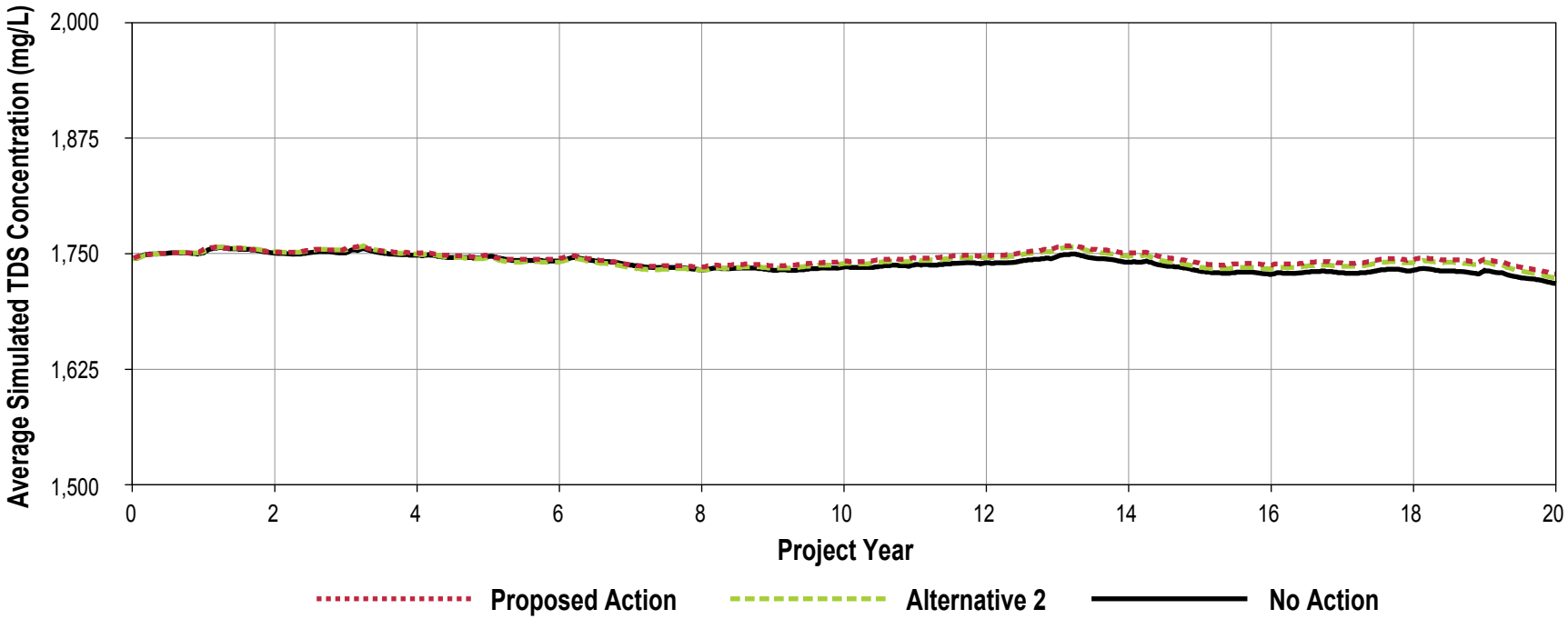
To address continued migration of the naturally-occurring saline front in the deep zone and potential effects on beneficial uses, MPG farmers could drill new wells in areas outside of the saline front, towards the northern end of Fresno Slough, and in areas of lower salinity to the east.

As groundwater is drawn towards the cones of depression in Madera County, the continued migration of the naturally-occurring saline front could also impact current and future beneficial uses for other entities, regardless of MPG groundwater pumping. These results are discussed in detail in the impact discussion below.

Lower Aquifer Summary Due to the thickness and low permeability of the Corcoran Clay layer, water reserves within the lower aquifer have remained relatively stable. As such, TDS concentrations are expected to continue to remain at a stable concentration of nearly 700 mg/L under all alternatives, as water in the lower aquifer is not expected to mix with lower quality water in the upper aquifer (Figure 35). Therefore, groundwater withdrawals resulting from implementation of either of the described alternatives are not expected to affect TDS concentrations in the lower aquifer and impacts related to salinity in the lower aquifer of the Primary Study Area are expected to be less than significant and are not addressed further.

Trace Elements Summary Concentrations of trace elements within groundwater are very low within the Primary Study Area and have historically been well below the thresholds presented in Table 13. Changes to MPG pumping under any of the alternatives are not expected to substantially affect concentrations of trace minerals, as historically periods of increased and decreased MPG pumping have not significantly affected trace element concentrations in groundwater. Therefore, impacts related to trace elements are expected to be less than significant and are not addressed further. Although the Groundwater Model does not project nitrates concentrations in MPG wells, based on nearly 1,600 nitrate as nitrogen records for over 200 wells in the MPG Study Areas from 1980 to 2017, concentrations are generally below the EPA and SWRCB MCL. Wells adjacent to the City of Mendota wells do not show any exceedances. Further, any accumulation of nitrates in MPG wells would be the result of temporary and localized agricultural practices near that specific well, since the monitoring data has not revealed an expansive area or permanent plume of groundwater containing high levels of nitrates. Therefore, the Proposed Action or Alternative would not impact the beneficial use of groundwater for drinking water.

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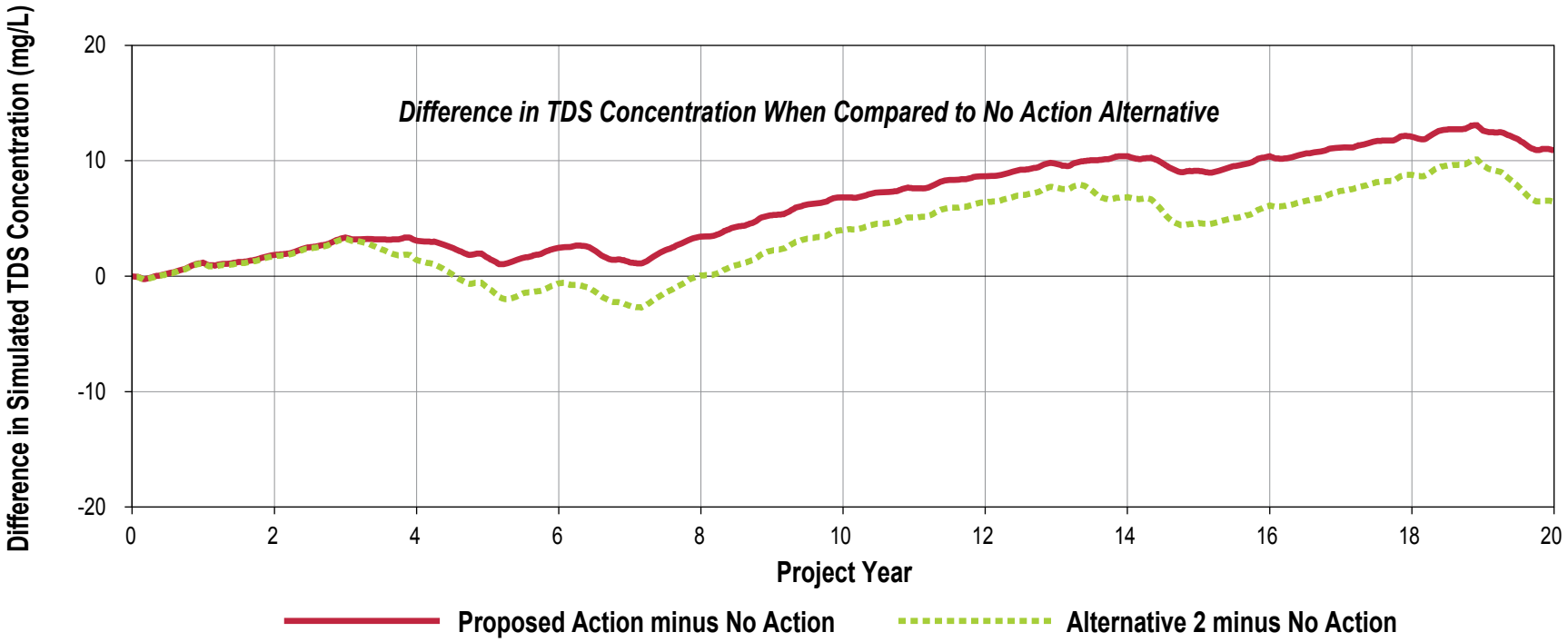
Average TDS concentrations in shallow wells within the 91,769-acre Primary Study Area would average around 1,750 mg/L and decrease incrementally under all of the alternatives. Regional changes in water quality resulting from migration of saline front in the shallow zone would be offset by seepage from SJRRP restoration flows that would dilute groundwater TDS levels in regions surrounding the San Joaquin River. However, saline front migration influenced by MPG shallow zone pumping would more strongly influence increases in groundwater salinity near the Mendota Pool and the Fresno Slough.

Source: LCSE & KDSA 2015.

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Average TDS Concentrations in the Primary Study Area – Shallow Zone

FIGURE 31



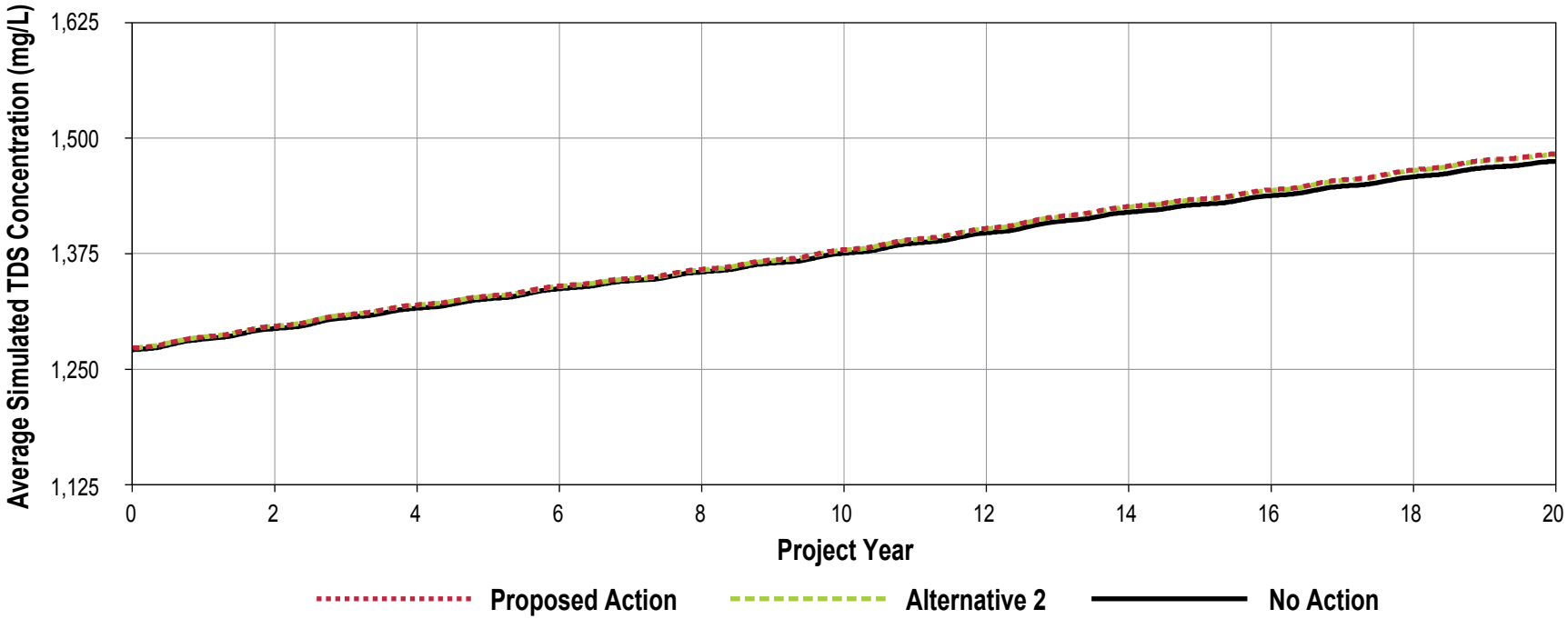
Compared to changes in TDS concentrations under the No Action Alternative, both the Proposed Action and Alternative 2 would result in higher shallow zone TDS concentrations by the end of the 20-year exchange period. However, overall TDS concentrations under all Alternatives would be less than under Existing Conditions.

Source: LCSE & KDSA 2015.

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Difference in Average TDS Concentrations in the Primary Study Area by Alternative – Shallow Zone

FIGURE 32



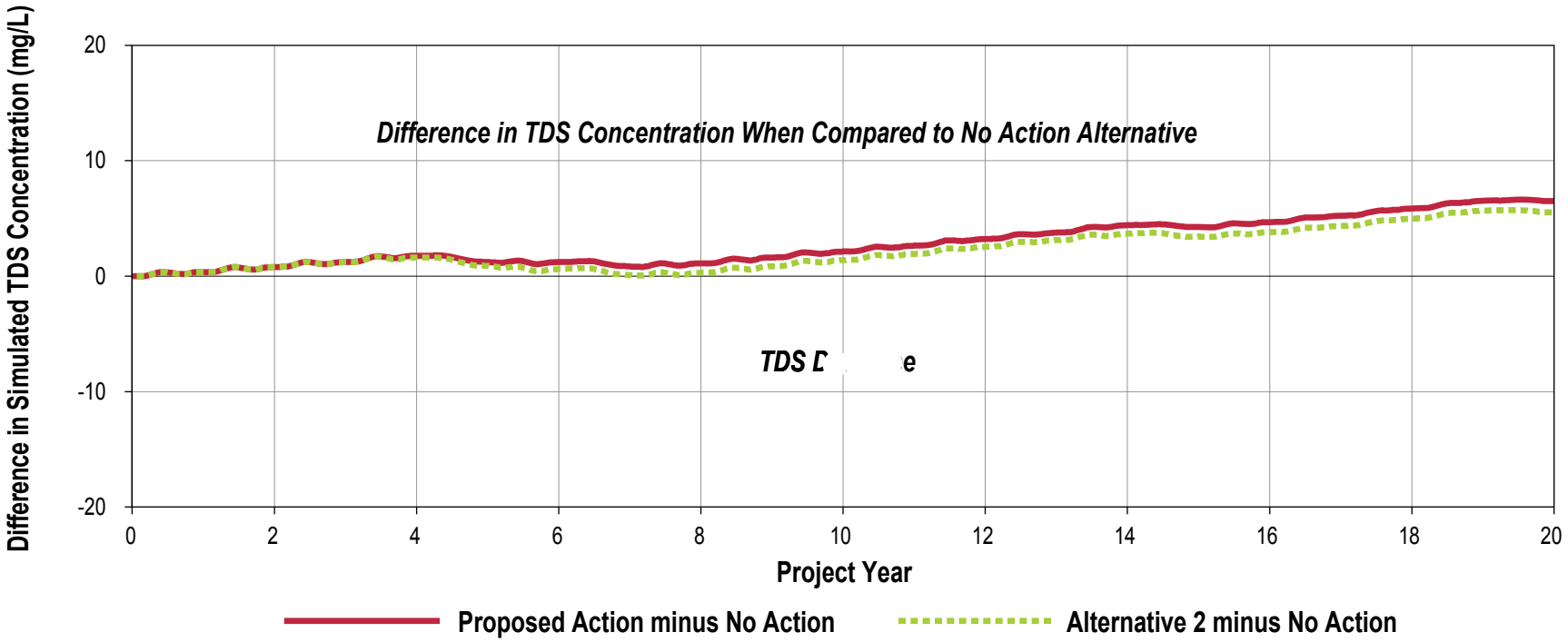
Average TDS concentrations in deep wells within the Primary Study Area would substantially increase under all of the alternatives due to the advancement of the saline front in the deep zone, which is strongly related to groundwater overdraft in Madera County. Wells west of the Fresno Slough would continue to experience high salinity levels; those to the east in Madera County would largely maintain low salinity levels.

Source: LCSE & KDSA 2015.

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Average TDS Concentrations in the Primary Study Area – Deep Zone

FIGURE 33



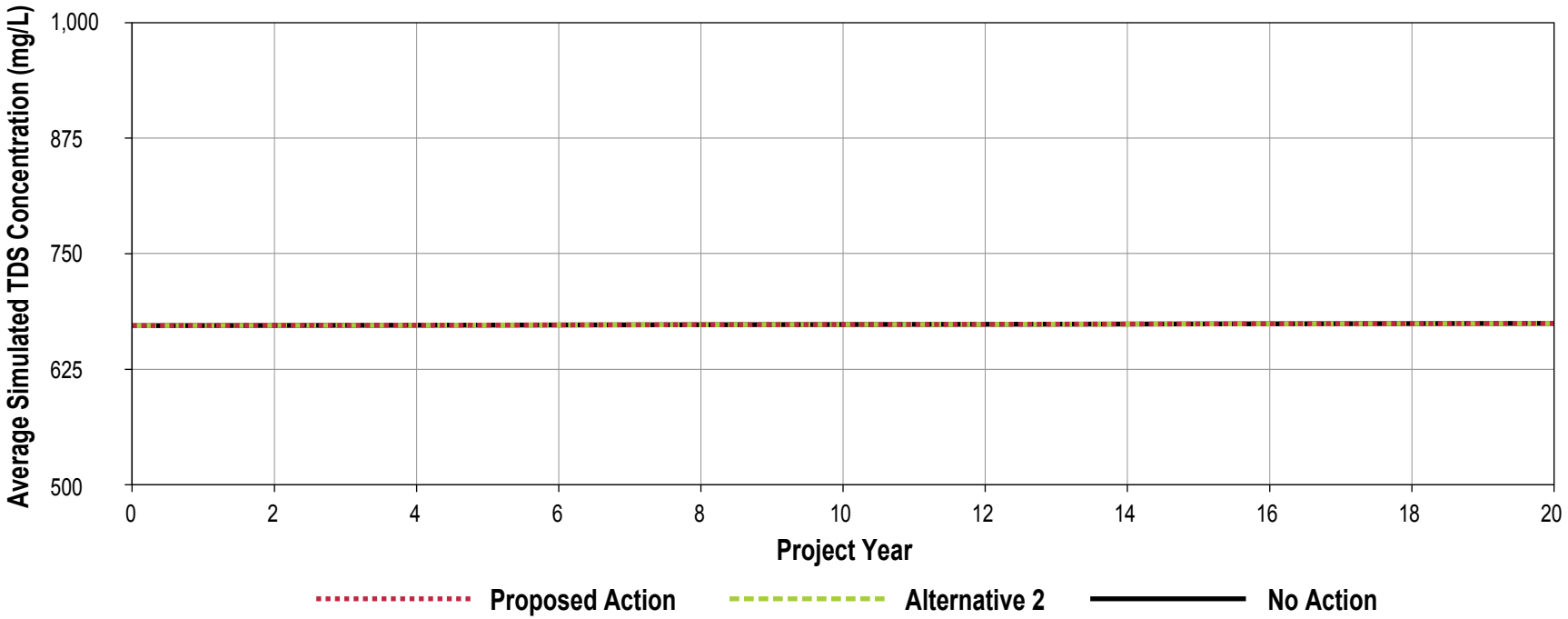
Compared to changes in TDS concentrations anticipated under the No Action Alternative, both the Proposed Action and Alternative 2 are expected to result in a similar increase in TDS concentrations in the deep zone of the Primary Study Area. Under the Proposed Action, the increase in TDS concentrations would be slightly higher than under Alternative 2 because of recharge efforts under Alternative 2.

Source: LCSE & KDSA 2015.

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Difference in Average TDS Concentrations in the Primary Study Area by Alternative – Deep Zone

FIGURE 34



Average TDS concentrations in the lower aquifer within the Primary Study Area are not expected to change with implementation of any of the described alternatives.

Source: LCSE & KDSA 2015.

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Average TDS Concentrations in the Primary Study Area – Lower Aquifer

FIGURE 35

Impact GWQ-1: Migration of the Naturally-Occurring Saline Front in the Shallow Zone of the Primary Study Area

No Action Alternative With the pumping of 33,395 AFY under the No Action Alternative, when compared to existing conditions, the 2,000 mg/L TDS contour in the shallow zone, excluding perched groundwater, would experience a localized migration of up to 1,500 feet east near the northern portion of the Fresno Slough by the end of the proposed 20-year exchange period (Figure 29). Average TDS concentrations in the shallow zone within the Primary Study Area is anticipated to be about 1,700 mg/L at the end of the 20-year exchange period. At the southern end of the Fresno Slough and north of the MWA, very little migration would occur when compared to existing conditions (Figure 29). The southern portion of the Fresno Slough and Meyers Water Bank provide a source of high-quality water for infiltration that slows the migration of the saline front in this area. The lowest TDS concentrations would occur in groundwater near the San Joaquin River due to seepage of low TDS water from the San Joaquin River (Table 14). According to the Hydrogeologic Technical Analysis, when compared to existing conditions, the average shallow zone TDS concentration across the entire Primary Study Area is projected to decline by about 30 mg/L during the 20-year period (Table 14, Figure 31). This incremental average change indicates relatively stable TDS concentrations regionally.

The continued migration of the 2,000 mg/L TDS contour would mean that approximately 120 acres of the local aquifer system would contain groundwater exceeding 2,000 mg/L, reducing the suitability of a negligible 0.016 percent of the acreage within the Delta-Mendota Subbasin for the direct application of this groundwater, as well as potentially impacting other users outside of the Primary Study Area.

With the cessation of the design constraints under the No Action Alternative, individual MPG farmers are free to utilize groundwater without restriction of the design constraints in a manner that best suits individual farming practices. Farmers may also replace wells as salinity increases west of the Fresno Slough.

Although SGMA does not classify naturally-occurring high-salinity groundwater as "contaminated groundwater" requiring cleanup, it is anticipated that the adopted GSP for the Delta-Mendota Groundwater Subbasin would identify management strategies to maintain sustainable yield from former MPG wells no longer regulated by design constraints, such as an increase in the use of recharge facilities, more efficient irrigation, a switch to lower water demand crops or measures such as reductions in groundwater pumping. These management strategies may have an indirect effect on slowing the migration of the naturally-occurring saline front. More importantly, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Groundwater Subbasins) would also be required to identify management strategies to mitigate overdraft and achieve sustainable groundwater yield. Since overdraft in these subbasins has the greatest influence on the continued migration of the naturally-occurring saline front, the implementation of the approved GSPs for those subbasins could also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front.

Proposed Action Under the Proposed Action, the migration of the 2,000 mg/L TDS contour is projected to continue northeastward toward the Fresno Slough an average of 300 feet and up to 1,200 feet in some locations over the 20-year life of the program when compared to existing conditions (Figure 29). When compared to the No Action Alternative, the migration of the

2,000 mg/L contour would be slightly greater around the Terra Linda Farms Recharge Canal and at the southern end of the Fresno Slough. Although the Terra Linda Farms Recharge Canal would provide a source of high-quality water for groundwater recharge, the quantity of recharge water from this facility would not be great enough to offset the increased pumping under the Proposed Action as the four existing NCR Recharge Ponds are too far north and east to slow the migration of naturally-occurring saline front. Under the Proposed Action, the estimated average TDS concentration within the Primary Study Area would be similar to the No Action Alternative (about 1,750 mg/L) at the end of 20-year exchange period (Figure 31). The highest TDS concentrations are projected to occur west of the Mendota Pool. TDS concentrations increase the most west of the Terra Linda Canal and north of Whitesbridge Avenue west of the Fresno Slough (Table 14). The remaining portion of the Primary Study Area exhibits little change over the 20-year period (Appendix E, page 74).

The continued migration of the 2,000 mg/L TDS contour would cause an estimated 250 additional acres of the Delta-Mendota Subbasin (0.034 percent of the total acreage) to have a TDS concentration of greater than 2,000 mg/L when compared to existing conditions. This is an additional 130 acres (0.017 percent of the total acreage) than under the No Action Alternative (Appendix E, Table 8-8, pg. 64). While there would be localized groundwater quality degradation, the continued migration of the naturally-occurring saline front under the Proposed Action would only affect a relatively small area of the Delta-Mendota Subbasin and potentially only a limited number of users in the vicinity.

The Hydrogeologic Technical Analysis projects that the average TDS concentration in the shallow zone across the Primary Study Area under the Proposed Action is expected to decrease by almost 20 mg/L over the 20-year period (Table 14), indicating that TDS concentrations in the shallow zone would be relatively stable (Figure 31). When compared to the No Action Alternative, the additional groundwater pumping under the Proposed Action would limit the reduction in TDS concentrations by 10 mg/L, which would decrease by 30 mg/L under the No Action Alternative (Table 14, Figure 32). As mentioned above, the quantity of recharge water from the Terra Linda Farms Recharge Canal would not be great enough to offset the increased pumping under the Proposed Action and improve water quality in the vicinity of the canal. Similarly, the MPG groundwater recharge proposed at the four NCR recharge ponds under the Proposed Action is located too far north to affect TDS concentrations west of the Fresno Slough.

Although the GSPs would implement management strategies to achieve sustainable groundwater yield, because the management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort. The projected decline in water quality is therefore more conservative than may actually occur under the Proposed Action.

As with the No Action Alternative, wells located in areas of high salinity would be replaced with wells located in areas with lower salinity, or water pumped from these wells would be blended with other water to provide suitable irrigation or exchange water. The Proposed Action anticipates that MPG will provide replacement wells as needed, and ample area exists where groundwater has lower salinity to do so within the projected 20-year program horizon.

The continued migration of the saline front in the shallow zone also has the potential to incrementally increase the salinity levels of groundwater where non-MPG shallow wells are

located west of the Fresno Slough. Although groundwater quality data are unavailable in this area, the continued migration of the naturally-occurring saline front attributable to MPG groundwater pumping under the Proposed Action is not expected to be substantial enough to restrict the use of these wells for beneficial uses, as evidenced by a decline in the average TDS concentration when compared to existing conditions. Any change in the salinity levels of groundwater in this area would likely be less than for groundwater in the immediate vicinity of MPG wells. Further, as with the No Action Alternative, regional groundwater pumping has a greater influence on the continued migration of the saline front that MPG pumping, particularly groundwater pumping in Madera County.

Unlike the No Action Alternative, with implementation of design constraints, groundwater with TDS concentrations over 1,600 mg/L would be prohibited from being discharged to the Mendota Pool for exchange. Therefore, the Proposed Action would also protect water quality in the Mendota Pool to a greater extent than under No Action Alternative.

Alternative 2 Under Alternative 2, the saline front in the shallow zone would continue to migrate northeastward, with the 2,000 mg/L contour projected to advance up to 1,000 feet eastward, with average migration of 200 feet east from existing conditions (Figure 29). This migration of the saline front would increase TDS concentrations above 2,000 mg/L over approximately 160 acres of the Delta-Mendota Subbasin (0.021 percent of the total acreage). This area of impact is 40 acres greater than under the No Action Alternative, but 90 acres less than under the Proposed Action (Appendix E, Table 8-8, pg. 64). Under Alternative 2, estimated average TDS concentrations within the Primary Study Area will be similar to the No Action Alternative and Proposed Action (about 1,750 mg/L) at the end of 20-year exchange period.

According to the Hydrogeologic Technical Analysis, average shallow zone TDS concentrations in the Primary Study Area are projected to decline by about 20 mg/L over the 20-year program (Figure 31). This reduction is 10 mg/L less than would occur under the No Action Alternative, but approximately equal to the reduction that would occur under the Proposed Action (Figure 32). Although Alternative 2 proposes the construction of the 85-acre River Ranch Recharge Basin in addition to the recharge facilities planned under the Proposed Action, the estimated recharge from this basin (20,000 AF of recharge with an average TDS concentration of 400 mg/L over the 20-year exchange period) in combination with the estimated recharge from the other facilities is not substantial enough to reduce the average TDS concentration over the Primary Study Area when compared to the Proposed Action. The incremental change is indicative of relatively stable conditions over the 20-year exchange period.

Unlike the No Action Alternative, with implementation of design constraints, groundwater with TDS concentrations over 1,600 mg/L would be prohibited from being discharged to the Mendota Pool for exchange. Therefore, Alternative 2 would also protect water quality in the Mendota Pool to a greater extent than under than under the No Action Alternative.

The continued migration of the saline front in the shallow zone under Alternative 2 also has the potential to incrementally increase the salinity levels of groundwater where non-MPG shallow wells are located west of the Fresno Slough. However, groundwater quality data is unavailable for this area and pumping under the Alternative 2 is not expected to restrict the use of these wells for beneficial uses.

Further, as mentioned above, the average TDS concentration in the Primary Study Area is expected to decline and groundwater pumping in Madera County would continue to be the primary influence on the regional migration of the front. The additional recharge from the Terra Linda Farms Recharge Canal, River Ranch Recharge Basin, and the NCR recharge ponds would assist in slowing the migration of the saline front, especially in the northern portion of the Fresno Slough (Appendix E, page 52). Although the GSPs would implement management strategies to achieve sustainable groundwater yield, including a possible reduction in groundwater pumping, because the management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort. The projected decline in water quality is therefore more conservative than may actually occur under Alternative 2. Therefore, impacts to other entities are not expected to be significant.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact GWQ-2: Migration of the Naturally-Occurring Saline Front in the Deep Zone of the Primary Study Area
No Action Alternative Although the migration of the naturally-occurring saline front would continue under this alternative, the reduction in pumping from existing conditions would reduce both MPG's contribution to, and the rate of, localized migration and associated groundwater degradation.

Under the No Action Alternative, when compared to exiting conditions, the 2,000 mg/L TDS concentration contour is projected to migrate between 200 to 2,500 feet east during the proposed 20-year exchange period (Figure 30). This migration in the deep zone is greater than in the shallow zone in response to the strong regional influence of non-MPG pumping on the migration of the saline front, particularly groundwater pumping in Madera County. The continued localized migration of the saline front would be influenced by MPG pumping west of the Fresno Slough, across the Fresno Slough in places, and south of Whitesbridge Avenue in the MWA (Table 14, Appendix E, page 64). The migration of the saline front would increase TDS concentration above 2,000 mg/L over approximately 2,100 acres of the Delta-Mendota Subbasin (0.28 percent of the total subbasin acreage) (Appendix E, Table 8-9, pg. 65), reducing the suitability of this groundwater for beneficial agricultural use as well as potentially impacting other users within the affected regions.

When compared to existing conditions, the continued migration of the saline front would increase the average TDS concentrations in the deep zone across the Primary Study Area to an average of 1,500 mg/L, for an increase of approximately 200 mg/L over the 20-year period (Table 14, Figure 33). On a sub-region basis, the average TDS concentration in the deep zone, north/east of the San Joaquin River, is modeled to increase by 40 mg/L (Table 14). South/west of the San Joaquin River, the average TDS concentration would increase by 380 mg/L. West of the Fresno Slough, the average TDS concentration would increase by 640 mg/L, while it would increase by 250 mg/L east of the Fresno Slough. South of the MWA, the average TDS concentration would increase by 310 mg/L, and would also increase by 50 mg/L east of the Chowchilla Bypass (Table 14).

As described above, migration of the naturally-occurring saline front and the associated increase in TDS concentrations are largely attributed to regional pumping, and MPG's contribution to the

regional migration of the saline front in the deep zone would be relatively minor, even though more pumping may occur from the deep zone without the design constraints that are required under the Proposed Action and Alternative 2. Where increasing groundwater salinity affects MPG wells, MPG farmers could drill replacement wells as needed in lower salinity areas, such as in the area east of the Fresno Slough.

Increasing salinity levels could also impact current and future beneficial uses of this groundwater for other entities including but not limited to Locke Ranch wells. However, accurate data from these wells is unavailable and it is difficult to estimate any loss in well production. Further, as mentioned above, groundwater pumping in Madera County is the primary influence on the regional migration of the front, and migration would continue to occur regardless of MPG pumping (LSCE & KSDA 2017).

It is important to note that impacts under the No Action Alternative may be greater than those stated above because both the existing design constraints would cease to be implemented, including those limiting pumping from the deep zone. If groundwater is pumped from the deep zone in quantities exceeding those permitted under the design constraints, localized migration of the naturally-occurring saline front may be more heavily influenced by MPG pumping.

Although SGMA does not classify naturally-occurring high-salinity groundwater as "contaminated groundwater" requiring cleanup, it is anticipated that the GSP for the Delta-Mendota Groundwater Subbasin would identify actions such as an increase in the use of recharge facilities, more efficient irrigation, a switch to lower water demand crops or measures such as reductions in groundwater pumping to maintain sustainable yield from the groundwater basin in which MPG wells are located and regulated by design constraints, which may have an indirect effect on slowing the migration of the naturally-occurring saline front. More importantly, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) would be required to identify management strategies to mitigate overdraft and achieve sustainable groundwater yield. Since overdraft in these subbasins has the greatest influence on the continued migration of the naturally-occurring saline front, the implementation of the approved GSPs for those subbasins could also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. However, because the management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort, thus making the projected decline in water quality more conservative than may actually occur under the No Action Alternative.

Since the use of wells for discharge into the Fresno Slough would no longer be restricted by design constraints, surface water quality and biological resources could be impacted; these impacts are addressed separately in Impacts SWQ-2 and BIO-2.

Proposed Action Under the Proposed Action, the 2,000 mg/L contour in the deep zone would continue to migrate east towards the Fresno Slough, and across the Slough in some regions. Specifically, the 2,000 mg/L contour would migrate 200 to 2,500 feet east from existing conditions over the 20-year exchange period (Figure 30). This movement is up to 1,300 feet greater than the migration that would occur in the shallow zone because the influence of groundwater recharge from the Terra Linda Farms Recharge Canal, Fresno Slough, San Joaquin River, and Meyers Water Bank are not as great in the deep zone. This continued migration of the

saline front would affect approximately 2,300 acres of the Delta-Mendota Subbasin (0.30 percent of the total acreage) (Appendix E, Table 8-9, pg. 65). This would be an increase of 200 acres (0.027 percent of the total acreage) over the No Action Alternative. The continued migration would reduce the suitability of this portion of the basin to be directly used for beneficial agricultural use, and could potentially impact other beneficial uses of groundwater from the Delta-Mendota Subbasin.

According to the Hydrogeologic Technical Analysis, when compared to existing conditions, the average TDS concentration of the deep zone in the Primary Study Area would be 1,500 mg/L (Appendix E, page 76), which represents an increase of approximately 210 mg/L over the 20-year exchange period (Table 14, Figure 33). On a sub-region basis, it is projected that the average TDS concentrations north/east of the San Joaquin River would increase by 40 mg/L, while it would increase by 380 mg/L south/west of San Joaquin River (Table 14). West of the Fresno Slough, TDS concentrations would increase by 640 mg/L, while they would increase by 300 mg/L east of Fresno Slough (Table 14). In the area south of the MWA, the TDS concentration would increase by 320 mg/L, while it would increase by 15 mg/L east of the Chowchilla Bypass (Table 14). As described above, migration of the naturally-occurring saline front and associated increases in TDS values are largely attributed to regional pumping, and MPG's contribution to the migration of the saline front would not be significant, particularly since the design constraints limit deep zone pumping to 12,000 AFY and to the months of March, April, and May, and from September through November.

Unlike the No Action Alternative, with the design constraints in place, groundwater with a TDS concentration of over 1,600 mg/L would be removed from the exchange program or blended with higher quality water prior to being discharged into the Mendota Pool for exchange. With the continued migration of the naturally occurring saline front the potential loss or impairment of MPG deep zone wells could require the replacement of these wells with those in areas with lower salinity. The Proposed Action anticipates that MPG would provide replacement wells as needed, as they have in the past, and ample area exists in the vicinity to do so within the projected 20-year program horizon. MPG farmers could drill new wells in areas outside with lower levels of salinity, such as towards the northern end of Fresno Slough, and in areas of lower salinity to the east.

Although the GSPs would implement management strategies to achieve sustainable groundwater yield, because the management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort. The projected decline in water quality in the deep zone is therefore more conservative than may actually occur under the Proposed Action with implementation of the adopted GSPs.

Alternative 2 As with the MPG groundwater recharge facilities planned under the Proposed Action, percolation of recharged groundwater from the River Ranch Recharge Basin proposed under Alternative 2 would be largely confined to the shallow zone, and would not materially influence groundwater in the deep zone. Therefore, impacts from the continued migration of the naturally occurring saline front would largely be similar to those described under the Proposed Action (Table 14, Figure 30).

Results of the Hydrogeologic Technical Analysis indicate that over the 20-year exchange period, the naturally-occurring saline front in the deep zone would continue to migrate 100 to 2,000 feet

eastward under Alternative 2 (Appendix E, page 84). The continued migration of the saline front would affect approximately 2,300 acres of the Delta-Mendota Subbasin (0.30 percent of the total acreage). This would be an increase of 200 acres (0.027 percent of the total acreage) over the No Action Alternative, but equal to the increase that would occur under the Proposed Action (Appendix E, Table 8-9, pg. 65). The continued migration would reduce the suitability of this portion of the basin to be directly used for beneficial agricultural use and could potentially impact other beneficial uses of groundwater from the Delta-Mendota Subbasin.

According to the Hydrogeologic Technical Analysis, when compared to existing conditions, the average TDS concentration of the deep zone in the Primary Study Area would be 1,500 mg/L (Appendix E, page 84), which represents an increase of approximately 210 mg/L over the 20-year exchange period (Table 14, Figure 33). On a sub-region basin, the highest TDS concentrations would occur west of the Fresno Slough, while the lowest TDS concentrations would occur near the San Joaquin River, because the naturally occurring high-salinity groundwater south and west of the 2,000 mg/L contour would not migrate that far north or east during the 20-year exchange period (Table 14). However, because of the saline front's continued migration, it is projected that the average TDS concentration would still increase by 40 mg/L north/east of the San Joaquin River, by 380 mg/L south/west of the San Joaquin River, by 630 mg/L west of the Fresno Slough, by 300 mg/L east of the Fresno Slough, by 320 mg/L south of the MWA, and by 50 mg/L east of Chowchilla Bypass (Table 14). As described above, migration of the naturally-occurring saline front and associated increases in TDS values are largely attributed to regional pumping, particularly groundwater pumping in Madera County, and MPG's contribution to the saline front migration would be limited by the design constraints.

Unlike the No Action Alternative, with implementation of design constraints, MPG groundwater with TDS concentration above 1,600 mg/L would be removed from the exchange program or blended with higher quality water prior to being discharged into the Mendota Pool for exchange. With the continued migration of the naturally-occurring saline front, the potential loss or impairment of MPG deep zone wells could require the replacement of these wells with those in areas with lower salinity. As with the Proposed Action, this Alternative anticipates that MPG would provide replacement wells as needed and ample area exists in the vicinity to do so over the projected 20-year exchange program. MPG farmers could drill new wells in areas outside with lower levels of salinity, such as towards the northern end of Fresno Slough, and in areas of lower salinity to the east.

Although the GSPs would implement management strategies to achieve sustainable groundwater yield, because the management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort. The projected decline in water quality in the deep zone is therefore more conservative than may actually occur under Alternative 2 with implementation of the adopted GSPs.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact GWQ-3: Groundwater Quality Impacts in Westlands
No Action Alternative Within Westlands, groundwater quality in the upper aquifer contains higher salinity levels, where the TDS concentration can exceed 10,000 mg/L in some areas. As the groundwater in some areas of the upper aquifer is less suitable for agricultural irrigation, the

analysis in this Draft EIS/EIR assumes that additional groundwater pumping is likely to occur from the lower aquifer below the Corcoran Clay layer, which generally has TDS concentrations below 3,000 mg/L.

Depending on individual response of farmers in Westlands, the No Project Alternative could result in the pumping of up to an additional 25,000 AFY from the Westlands Subbasin,. Any additional pumping in Westlands increases the potential for intra-borehole flow and vertical mixing between aquifers; however, the thickness and low permeability of the Corcoran Clay layer in Westlands would substantially limit mixing between the aquifers; therefore, additional pumping would not substantially contaminate groundwater quality in the lower aquifer. The GSPs would implement management strategies to achieve sustainable groundwater yield, particularly if management strategies are successfully implemented in the high-priority groundwater basins in Madera County northeast of Westlands. However, because the management strategies are still in their early phases of development, the specific strategies are not known with enough certainty to include them in the modeling effort. The projected decline in water quality in Westlands is therefore more conservative than what may actually occur under No Action Alternative with implementation of the adopted GSPs.

The Westside Subbasin has historically experienced a long-term decline in groundwater levels and was subject to substantial subsidence in response to such overdraft, although a GSP is currently being developed in accordance with SGMA to achieve sustainable yield by 2040. Impacts associated with groundwater level declines, loss of storage, and subsidence are discussed under Impact GWL-4 and Impact SUB-3 in Sections 3.1, *Groundwater Levels,* and 3.6, *Subsidence*, respectively.

Proposed Action No additional impacts to groundwater quality in Westlands are anticipated under the Proposed Action, as the Proposed Action would not result in a change to groundwater pumping activities in this region.

Alternative 2 No additional impacts to groundwater quality in Westlands are anticipated under Alternative 2, as this alternative would not result in a change to groundwater pumping activities in this region.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Effects
Actions considered under cumulative effects would occur during the life of the Proposed Action or alternatives. Related Projects generally include those with continued or increased extraction of groundwater with potential to accelerate migration of the naturally-occurring saline front and associated degradation of groundwater quality. Related Projects also include those which replenish groundwater resources with higher-quality water, resulting in localized beneficial impacts. Although unknown at this time, it is anticipated that the individual projects implemented under the GSPs would provide a beneficial effect to groundwater. In addition, individual unregulated actions and cumulative trends not considered as formal Related Projects under NEPA or CEQA, including changes in land use, water demand, and climate change, may greatly affect long-term groundwater degradation in the Study Areas and are also presented below.

Cumulative pumping activities within the Primary Study Area contribute to groundwater drawdowns, and therefore increase the rate at which the saline front migrates eastward across the Fresno Slough. Regardless of MPG pumping rates, the Hydrogeologic Technical Analysis shows that the saline front would continue to advance northeastward as a result of the regional groundwater gradient and flow direction; factors which are primarily influenced by regional pumping. Therefore, groundwater quality will continue to decline as a result of the regional pumping that influences the groundwater flow direction in the Primary Study Area, regardless of MPG pumping.

Related Projects that include increases in, or continuation of, groundwater pumping within the vicinity of the Study Areas are:

- SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project
- Exchange Contractors 25-Year Water Transfer Program;
- Tranquillity Irrigation District Transfer to San Luis Water District;
- Transfers of CVP Water from CCID and from Firebaugh Canal Water
- Exchange Agreements for Conveyance of Groundwater in Delta-Mendota Canal;
- Groundwater Pumping/Water Transfer Project;
- Meyers Water Bank; and
- DMC Groundwater Pump-in Program – Revised Design Constraints.

These projects would facilitate the continued substantial groundwater pumping and associated impacts on saline migration within the region. Groundwater degradation is also largely accelerated by unregulated groundwater pumping by independent entities not subject to permitting and environmental review, and continued trends of cutbacks in CVP water allocations.

Localized areas of groundwater degradation, such as the contaminated plume near Spreckel's Sugar Company, could continue to migrate away from the source of contamination and across the shallow zone, and possibly into the deep zone. Unless properly remediated, the spread of localized groundwater contamination may become more substantial over time as cumulative influences such as the pumping of groundwater for agricultural and municipal uses alters the flow of groundwater and possibly results in the dispersion of this degraded groundwater across a larger area.

Groundwater banks have the potential for beneficial effects on groundwater quality as they result in localized areas of high-quality water infiltration. Expansion of Meyers Water Bank, which would allow for increased water banking of up to 60,000 AF of CVP water may incrementally improve groundwater quality east of the Fresno Slough with increased storage of high-quality water. Also, in restoring river flows, the SJRRP is anticipated to increase groundwater recharge, although reduced inflows into the Mendota Pool and seepage in the Primary Study Area may result from SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project, which would limit the groundwater quality improvements in the shallow zone resulting from Restoration

Flows, and possibly in the deep zone in some places, within the immediate vicinity of the San Joaquin River.

Northeastward migration of the naturally-occurring saline front, particularly in the deep zone, is expected to continue beyond the 20-year exchange period due to the prevailing direction and rate of groundwater flow resulting from the high rates of regional pumping. This results in groundwater becoming increasingly unsuitable for agricultural and municipal uses.

Groundwater salinity may also be improved by implementation of GSPs under SGMA, which require groundwater basins to achieve sustainable yield within 20 years (i.e., by 2040). By reducing regional pumping to a sustainable yield, the major factor drawing the saline front northeastward would be mitigated, and may be halted or reversed in localized areas when combined with Restoration Flows or local recharge efforts. The management strategies that each regional GSP chooses to achieve sustainable yield by 2040 and any effect they would have on regional migration of the saline front is challenging to predict at this time because approval of the GSP management strategies will not be realized until 2020 at the earliest. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, it is also very likely that management strategies to reduce water use, such as more efficient irrigation systems, and an increase in the development of groundwater recharge facilitates would be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. These strategies are becoming more likely as federal and state grant money are being made available to address groundwater sustainability in the Central Valley. Even so, it is important to note that the Proposed Action and Alternative 2, with specific design constraints that limit pumping and recharge components, provide examples of the programs that will likely be required to achieve SGMA's goal of sustainable groundwater yield by 2040.

Over 50 to 100 years, climate change, including projections of diminishing snowpack and streamflows, and more frequent occurrences of extreme drought conditions could result in continued migration of the saline front and groundwater quality degradation (Griffin and Anchukaitis 2014). Drought conditions, when combined with reductions in natural recharge and CVP water cutbacks, could also result in increased pumping, especially by unmonitored and unregulated entities. However, SGMA requires that groundwater basins achieve sustainable yield, which includes protection of water quality, by 2040. This may be achieved by wide range of measures including increased groundwater recharge, a switch to more water efficient crops, increased irrigation efficiency, retirement of some croplands or a combination of these or other techniques. To achieve sustainable yield GSPs must also adaptively manage groundwater resources in response to varying conditions, including droughts and diminishing snowpack and basin inflows. Although GSPs are not yet adopted and precise provisions are unknown, because conformance with SGMA is a legal requirement, the law will likely play a meaningful role in reducing or avoiding potential climate change related effects on migration of the saline front. See Section 3.11 for further details on potential Climate Change impacts.

Impact GWQ-4 (Cumulative): Migration of the Naturally-Occurring Saline Front in the Shallow Zone of the Primary Study Area

No Action Alternative With implementation of the Related Projects, all scenarios would result in a localized and incremental improvement in groundwater quality. Specifically, the average

TDS concentration in the Primary Study Area by the end of the 20-year exchange period under the No Action Alternative is projected to decline by 55 mg/L (Appendix E, page 92).

However, even with a localized improvement on shallow zone groundwater quality, from a regional perspective, continued groundwater pumping (both regulated and unregulated) would continue to draw the naturally-occurring saline front to the northeast and result in a decline to groundwater quality until sustainable yield is achieved under SGMA. For instance, MPG is a relatively small user of the overall groundwater in the Delta-Mendota Groundwater Subbasin. As a result, while the continued migration of the saline front could continue in the near term due to overdraft areas in Madera County, the migration may ultimately be halted or reversed when the groundwater basins are brought into sustainable yield. In any event, the requirements of SGMA should prevent this overdraft area from increasing its influence on regional groundwater movement. The Mendota Pool, Fresno Slough, and San Joaquin River also act as barriers to the migration of the saline front; this barrier would be more prominent with implementation of the cumulative projects in the Primary Study Area, particularly the SJRRP Mendota Pool Bypass and Reach 2B Improvements Project and the Meyers Water Bank. Even without the design constraints of the Proposed Action or Alternative 2, it is anticipated that the No Action Alternative would contribute to the localized movement of the saline front. Owing to a reduction in pumping when compared to existing conditions and the Proposed Action, the No Action Alternative would reduce the total acres of the Primary Study area with a TDS concentration by approximately 150 acres (Appendix E, Table 9-8, pg. 93)

Proposed Action As concluded in the Hydrogeologic Technical Analysis, the cumulative average TDS concentration by the end of the 20-year exchange program under the Proposed Action is projected to decline by 44 mg/L, compared to a decline of 55 mg/L under the No Action Alternative (Appendix E, Table 9-7). Therefore, MPG pumping would somewhat limit the localized improvement of groundwater quality, but not to the point that groundwater recharge from Related Projects would be negated. However, on a regional scale, continued non-MPG groundwater pumping would continue to draw the naturally occurring saline front toward the northeast in the near-term. However, as with the No Project Alternative, the migration of the saline front may ultimately be halted or reversed when the groundwater basins are brought into sustainable yield under SGMA. At the very least, SGMA should prevent this overdraft area from increasing its influence on regional groundwater movement. The barrier to movement of the saline front created by the Mendota Pool, Fresno Slough, and San Joaquin River would also be improved by cumulative projects in the Primary Study Area. In this manner, the Hydrogeologic Technical Report finds that the portion of the Primary Study Area with shallow zone groundwater exceeding a TDS concentration of 2,000 mg/L would be reduced by 23 acres when compared to the No Action Alternative as a result of the proposed recharge facilities (Appendix E, Table 9-8, page 93). As a result, the Proposed Action does would not result in a significant cumulative impact to groundwater quality in the shallow zone.

Alternative 2 All other conditions being the same as under the Proposed Action, the localized improvement of groundwater quality in the Primary Study would be even greater than under the Proposed Project with implementation of the River Ranch Recharge Basin under Alternative 2. The cumulative average TDS concentration in the Primary Study Area by the end of the 20-year exchange program is expected to decline by 48 mg/L under Alternative 2, compared to an improvement of 55 mg/L under the No Action Alternative and 44 mg/L under the Proposed Action. The River Ranch Recharge Basin would limit the decrease in groundwater quality caused

by MPG pumping for exchange, so that the cumulative projects in the Primary Study Area continue to benefit groundwater quality. As a result, the Hydrogeologic Technical Report estimates that the portion of the Primary Study Area with shallow zone groundwater exceeding a TDS concentration of 2,000 mg/L would be reduced by 99 acres (Appendix E, Table 9-8, page 93). As a result, Alternative 2 would not result in a significant cumulative impact to groundwater quality in the shallow zone.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact GWQ-5 (Cumulative): Migration of the Naturally-Occurring Saline Front in the Deep Zone of the Primary Study Area
No Action Alternative The barrier to the migration of the saline front formed by the Mendota Pool, Fresno Slough, San Joaquin River, and cumulative recharge projects in the Primary Study Area generally does not extend into the deep zone. As a result, in the near-term, the overdraft areas in Madera County would continue to draw the naturally occurring saline front northeast across the Primary Study Area. Under the cumulative No Action Alternative scenario, the average TDS concentration over the 20-year exchange period is projected to increase by 160 mg/L over the Primary Study Area (Appendix E, Table 9-6). The Hydrogeologic Technical Report also estimates that without the cumulative benefits of SMGA, the portion of the Primary Study Area with the deep zone groundwater exceeding a TDS concentration of 2,000 mg/L would be increased by 1,670 acres (Appendix E, Table 9-9, page 94). Although a greater impact than in the shallow zone, this continues to represent less than one percent (0.22 percent) of the total Delta-Mendota Subbasin, and impacts would largely occur on MPG farmlands west of the Fresno Slough. Specifically, the increase in TDS concentrations in the deep zone would be highest west of the Fresno Slough, where TDS concentrations would experience an average increase of 557 mg/L over the 20-year period (Appendix E, page 93). Since pumping by the disbanded farmers is expected to decrease under the No Action Alternative when compared to existing conditions, this pumping would represent a negligible contribution, if any, to decline in groundwater quality, further exemplifying the influence of overdraft areas on regional groundwater movement.

In any event, the above findings are fairly conservative in that the model results do not account for any decrease in the rate of decline, or improvement, in groundwater quality that is likely to occur with the implementation of GSPs under SGMA. While their specific mechanisms of action and effect on groundwater quality is difficult to estimate in the near term, the overdraft areas in Madera County would ultimately be brought into sustainable yield by 2040, near the end of the 20-year exchange period. As a result, the migration of the saline front is likely to be slowed and may ultimately be halted or reversed when the groundwater basins are brought into sustainable yield. Under any circumstance, the requirements of SGMA are expected to prevent the overdraft areas in Madera County from increasing their influence on regional groundwater movement. Further, farmers would be able to implement strategies to limit the impact from wells with high salinity levels on irrigation practices, such as strategically operating certain wells and manifolding wells together to provide suitable water for irrigation. The strategic operation of wells would be a particularly effective strategy for the disbanded farmers west of the Fresno Slough (the area expected to be most affected) because most of these wells are shallow wells. As discussed above, the shallow zone will be substantially less affected by any migration of the

naturally occurring saline front. As a result, impacts to groundwater quality in the deep zone are conservative and an incremental degradation of groundwater quality by naturally occurring salts over less than one percent of the 747,000-acre groundwater basin would not constitute a substantial degradation of groundwater quality, and cumulative impacts would be less than significant.

Proposed Action As with the No Action Alternative, the barrier to the migration of the saline front formed by the Mendota Pool, Fresno Slough, San Joaquin River, and cumulative recharge projects in the Primary Study Area generally does not extend into the deep zone. As a result, in the near-term, the overdraft areas in Madera County would continue to draw the naturally occurring saline front northeast across the Primary Study Area. The average TDS concentration in the deep zone by the end of the 20-year exchange period under the Proposed Action is projected to increase by 170 mg/L, which is 10 mg/L higher than the projected increase of 160 mg/L expected to occur under the No Action Alternative (Appendix E, Table 9-6).

The Hydrogeologic Technical Report also estimates that without the cumulative benefits of SMGA, the area of deep zone groundwater exceeding a TDS concentration of 2,000 mg/L would increase by 1,810 acres, or more than 140 acres more than under the No Project Alternative (Appendix E, Table 9-9, page 94). This continues to represent less than one percent (0.24 percent) of the total Delta-Mendota Subbasin, and impacts would largely occur on MPG farmlands west of the Fresno Slough. As with the No Project Alternative, the increase in TDS concentrations in the deep zone would be highest west of the Fresno Slough, where TDS concentrations would experience a similar increase over the 20-year period (Appendix E, page 93). However, because MPG pumping under the Proposed would be greater than under the No Project or existing conditions, the Proposed Action would represent a negligible contribution to the decline in groundwater quality (i.e., only 7.7 percent), with the overdraft areas having by far the greatest effect on the decline of groundwater in the deep zone.

As with the No Action Alternative, these findings are conservative because they do not account for any decrease in the rate of decline, or improvement, in groundwater quality that may occur with the implementation of GSPs under SGMA. It is expected that the overdraft areas in Madera County would ultimately be brought into sustainable yield by 2040, near the end of the 20-year exchange period, and the migration of the saline front will likely slow and may ultimately be halted or reversed. Further, MPG farmers would continue to be able to implement strategies to limit the impact of high salinity wells as under the No Project Alternative. As a result, impacts to groundwater quality in the deep zone are conservative and an incremental decline in groundwater quality by naturally occurring salts over less than one percent of the 747,000-acre groundwater basin would not constitute a substantial degradation of groundwater quality, and cumulative impacts would be less than significant.

Alternative 2 Because the River Ranch Recharge Basin would have limited effects to water quality in the deep zone, impacts of the Alternative 2 are materially the same as under the Proposed Action. The average TDS concentrations in the deep zone by the end of the 20-year exchange program is projected to increase by 170 mg/L, which is 10 mg/L greater than under the No Action Alternative and identical to the Proposed Action (Appendix E, Table 9-6). The Hydrogeologic Technical Report also estimates that without the cumulative benefits of SMGA, the area of deep zone groundwater exceeding a TDS concentration of 2,000 mg/L would increase by 1,800 acres, or more than 130 acres more than under the No Project Alternative, but 10 acres

less than under the Proposed Project (Appendix E, Table 9-9, page 94). This continues to represent less than one percent (0.24 percent) of the total Delta-Mendota Subbasin, and impacts would largely occur on MPG farmlands west of the Fresno Slough. Similar to the Proposed Project, the Proposed Action would represent a negligible contribution to the decline in groundwater quality in the deep zone (i.e., only 7.7 percent), with the overdraft areas having by far the greatest effect on the decline of groundwater in the deep zone.

As with the No Action Alternative and Proposed Action, these findings are conservative because they do not account for any decrease in the rate of decline, or improvement, in groundwater quality that may occur with the implementation of GSPs under SGMA. As a result, impacts to groundwater quality in the deep zone are conservative and an incremental decline in groundwater quality by naturally occurring salts over less than one percent of the 747,000-acre groundwater basin would not constitute a substantial degradation of groundwater quality, and cumulative impacts would be less than significant.

Significance Determination before Mitigation
CEQA Significance Determination *Significant and unavoidable* for all Alternatives.

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3.3 Surface Water Quality

This section evaluates the potential impacts to surface water quality – particularly in the Mendota Pool, Fresno Slough, and MWA – that would result from implementation of the Proposed Action and alternatives. This section draws on the 2015 Hydrogeologic Technical Analysis developed for this EIS/EIR and associated Surface Water Mixing Models (referred to as the Surface Water Mixing Models in this section). The Surface Water Mixing Models were verified by comparing the result with the surface water sampling information from the 1990–2012 Annual Reports compiled in compliance with conditions of the Existing Exchange Agreements. Where relevant to the discussion, information from the 2010–2016 Annual Reports is also used in the analysis of impacts to surface water quality. The 2015 Hydrogeologic Technical Analysis developed for this EIS/EIR and associated Surface Water Mixing Models can be found in Appendix E.

3.3.1 Environmental Setting/Affected Environment

Background

State law defines beneficial uses of California waters in terms of whether water quality is sufficient to protect supplies for domestic, municipal, agricultural and industrial, recreation, aesthetic enjoyment, navigation, and fish and wildlife uses. Maintaining surface water quality is important in protecting the beneficial uses of water bodies such as rivers, lakes, streams, and wetlands. As with groundwater quality, surface water quality is dependent on a range of factors including those constituents requiring monitoring under the Existing Exchange Agreements (i.e., salinity and concentrations of trace elements). No beneficial uses are identified for the Fresno Slough and Mendota Pool under the Basin Plans for the Sacramento and San Joaquin River Basins and Tulare Lake Basin, although these bodies of water are primarily used for the storage and transfer of water irrigating agricultural uses. These bodies of water are also used for cold and warm freshwater habitat and wildlife habitat.

In addition to the constituents requiring monitoring under the Existing Exchange Agreements, the current and proposed MPG Pumping and Monitoring Program samples trace elements and general minerals in groundwater that is pumped from its wells, including arsenic, boron, molybdenum, and selenium. These elements occur naturally in the soils of California, and are also present in pesticides, fertilizers, and animal waste that are applied to agricultural lands. The four trace elements of concern (arsenic, boron, molybdenum, and selenium) are monitored in surface waters under the MPG Annual Pumping and Monitoring Program due to their potentially harmful effects on plants and wildlife, while salinity is monitored for its harmful effects on aquatic biological species if levels extend beyond their tolerance (SWRCB 2004). See Section 3.4, *Biological Resources*, for a discussion regarding potential effects of increased salinity on biological resources. Nitrates have been monitored at over 200 well sites in the MPG Study Areas from 1980 to 2017, and concentrations are generally below the EPA and SWRCB MCL for drinking water. Because the Mendota Pool and Fresno Slough are primarily used for the storage and transfer of water for the irrigation of agricultural uses, this section primarily focuses on salinity and concentrations of trace elements and potential surface water impacts resulting

from the mixing of groundwater inputs into surface waters in the Mendota Pool area (e.g., Mendota Pool, Fresno Slough, and San Joaquin River).

Salinity is the measure of salts dissolved in water, and elevated salinity reduces the quality of water and affects agricultural production by reducing crop yields (CVRWQCB 2016a). The salinity concentration of surface water bodies within the Primary Study Area are generally lower than levels measured in local groundwater wells. Agricultural return flows may have higher levels of salinity than surface water flows due to the direct application of higher salinity groundwater to farmlands. The current and proposed MPG Pumping and Monitoring Program implements Design Constraints that limit the salinity concentrations of groundwater discharged into the Mendota Pool and Fresno Slough. Data on other agricultural return flows into the Pool and Slough are unavailable to the MPG Monitoring Program, but MPG routinely monitors the salinity of the Mendota Pool and Fresno Slough for overall quality, beyond that caused by MPG pumping.

Findings from Previous EIS

The 2004 Final EIS evaluated potential surface water quality impacts on irrigation use, protection of aquatic species, and water supply to the MWA, and found that the 10-Year Exchange Agreements would have a less than significant effect with implementation of the design constraints. The 2004 Final EIS outlined water quality constituents of concern—arsenic, boron, molybdenum, selenium, and salinity—and set forth the most conservative water quality criteria or guidelines for the Study Area. The EIS determined that surface water quality in terms of salinity, boron, and molybdenum was generally higher in the Mendota Pool and declined toward the Fresno Slough near the MWA. Higher salinity in this portion was found to be due primarily to groundwater pumping into the Mendota Pool by the MPG and others.

The Existing Exchange Agreements include design constraints and adaptive management measures to minimize impacts of groundwater pumping by the MPG and to protect surface water quality. The adaptive management component of the program stipulated that the pumping program may be modified based on results from the monitoring program in order to maintain surface water quality. The 2004 Final EIS found that these measures would be sufficient to protect surface water quality in the Mendota Pool and Fresno Slough.

As demonstrated in the Annual Reports and discussed further below, the 10-Year Exchange Program did not cause an exceedance of thresholds for surface water quality of the Mendota Pool and Fresno Slough. MPG wells were properly managed so that the TDS concentration in MPG wells pumped for exchange were below those established by the previous design constraints. Although the 10-Year Exchange Program did not establish the average annual, monthly, and daily salinity thresholds utilized by this EIS/EIR, monitoring results indicate that TDS concentrations exceeded Reclamation's contractual water quality standards for the MWA in five out of eight years during the 2007-2014 period. However, these exceedances were associated with periods of low southerly flows caused by reduced diversions, substantial non-MPG pump-ins into the Fresno Slough, and higher salinity drought influenced levels in the DMC (LCSE & KDSA 2015), and were not attributed to MPG exchange pumping. The concentration of trace elements (arsenic, boron, molybdenum, and selenium) in the Mendota Pool and Fresno Slough have generally been below adopted thresholds. While some exceedance of adopted thresholds have been observed, elevated concentrations are not believed to be associated with MPG

groundwater inputs because observed concentrations of trace elements have been below the established thresholds in MPG wells.

Design Constraints Addressing Surface Water Quality

Nine of the design constraints included in the Existing Exchange Agreements would be carried forward in the Proposed Action and Alternative 2, with additional modifications, specifically to address protecting surface water quality of the Mendota Pool and Fresno Slough. The proposed design constraints related to surface water quality under the Proposed Action and Alternative 2 would require MPG to:

1. Pump MPG wells along the west side of the Fresno Slough only when flow in the Fresno Slough is to the south. Wells in FWD could pump irrespective of flow direction in the Mendota Pool.
2. Curtail MPG discharge into the Mendota Pool west of the Fresno Slough if EC measurements at the Exchange Contractors' canal intakes exceed that of the DMC by 90 μmhos/cm for a period of three consecutive days or more. If the MPG wells are shut off for this reason, they would not be turned back on until the EC at the canal intakes returns to a level that is that is no more than 30 μmhos/cm above the DMC inflow.
3. Implement annual pumping programs to comply with monthly and annual surface water quality criteria for water flowing into the MWA and measured at Sample Location 9 (Figure 36) (see Table 4, design constraints 16-18, listed as items 4-6 immediately below). The goal is to minimize overall surface water quality degradation, particularly with respect to salinity (TDS or EC) entering the MWA.
4. The quality of water flowing into the MWA and measured at Sample Location 9 shall not exceed a monthly average of 600 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.
5. During the Fall (September, October, and November) pumping period when water quality at the MWA is most critical, the quality of water flowing into the MWA and measured at Sample Location 9 shall not exceed a monthly average of 450 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.
6. The average quality of water flowing into the MWA and measured at Sample Location 9 in any given year shall not exceed an annual average of 450 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.
7. Shut off wells with selenium concentrations equal to or greater than the water quality criterion of 2.0 μg/L.
8. Shut off wells with boron concentrations equal to or greater than the water quality criterion of 800 μg/L.

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9. Modify the pumping program based on the results of the surface water monitoring program to reduce overall surface water quality degradation, particularly with respect to salinity (TDS or EC). This will ensure that the quality of water supplied to the MWA and other users in the southern portion of the pool will meet applicable water quality criteria. MPG discharge points into the Mendota Pool with TDS concentrations greater than 1,600 mg/L will not be pumped for exchange into the Pool (or greater than 1,200 mg/L during September, October, and November).

Based on the results of the surface water and groundwater monitoring program, the pumping program will be modified to reduce surface water quality impacts, particularly with respect to salinity and trace elements, and to minimize groundwater quality impacts and groundwater level variations associated with MPG exchange activities. The modifications would include measures such as reductions in total pumping, adjustments to timing of pumping, and reduction or discontinuation of pumping from specific wells.

Study Areas

The Proposed Action or alternatives may affect the surface water quality of the Mendota Pool and Fresno Slough through MPG groundwater deliveries. With consideration to these water bodies, the Primary Study Area includes the Mendota Pool, the Fresno Slough, flooded fields within the MWA, portions of the DMC and San Joaquin River, irrigation canals, bypass channels, and land bordering the Mendota Pool and Fresno Slough (Figure 6).

As discussed in Section 1.1.2, the Mendota Pool is a small non-Federal reservoir formed by water impounded by the Mendota Dam at the confluence of the San Joaquin River and the Fresno Slough. There are no established boundaries for the Mendota Pool. The Mendota Pool is fed by water from the DMC from the north, the San Joaquin River from the east and Fresno Slough from the south. During flood events, the North Fork of the Kings River flows through the Fresno Slough into the Mendota Pool. For the purposes of this analysis, "Mendota Pool" refers to the northern extent of the Fresno Slough at its confluence with the San Joaquin River, DMC, and Exchange Contractor canals in the vicinity of the Mendota Dam. While the Mendota Pool is technically part of the Fresno Slough, the "Fresno Slough" in this analysis refers to the reach of the Fresno Slough between the Mendota Pool and the James Bypass, south of the junction with the river and Exchange Contractor canals (Figure 4, Figure 6).

As the Proposed Action or alternatives would not affect surface water bodies located in Westlands, impacts to surface water quality in Westlands are not described in this section.

3.3.2 Regional Hydrology

The quality of surface water in the Primary Study Area is influenced by inflows from two regional drainage basins: the San Joaquin River Basin and the Tulare Lake Basin. Water quality in the Mendota Pool and Fresno Slough are also affected by the operation of the CVP, DMC and associated imports of high-quality water, groundwater pumping into these water bodies, and return flows from adjacent agricultural lands. Periodic flood flows from the North Fork of the Kings River also deliver occasional high flows to the Mendota Pool via the Fresno Slough. These high flows cause the Fresno Slough to periodically flow north, although flow is typically to the south during the agricultural season as a result of water withdrawals south of the Fresno Slough. Consequently, the Fresno Slough can flow in either direction as a result of water withdrawals or rainfall and flood flows.

San Joaquin River Basin The 366-mile-long San Joaquin River and its tributaries drain surface water from 15,880 square miles between the Sierra Nevada and Coastal Range in the Central Valley and flow northward into the Delta. Annually, water flow rates in the basin peak in the springtime after channel-forming flow events occur during the winter (Bay-Delta Authority 2003).

Water quality in the headwaters of the San Joaquin River in the Sierra Nevada is generally of excellent quality. Downstream of Friant Dam, most of the river's water is diverted into canals and aqueducts, or percolates downward to the groundwater table. Historically, the approximately 60-mile segment of the river in the San Joaquin Valley east of the Mendota Pool experienced significant decreases in flows and frequently ran dry because the San Joaquin River is located in a semi-arid environment that experiences re-occurring drought conditions. More importantly, San Joaquin River flows are impounded in multiple reservoirs constructed upstream of the Mendota Pool during the mid-20th Century, the largest reservoir being Millerton Lake (formed by the Friant Dam, a component of the CVP). Surface water from the San Joaquin River is used for agricultural irrigation and/or otherwise conveyed away from the river for agricultural, municipal, and other uses. Operation of Friant Dam has been changed to include Restoration Flows as part of the SJRRP.

Five miles before the San Joaquin River reaches the Mendota Pool, the Chowchilla and Eastside Bypasses route flood flows around the main channel and discharge water to two locations in the river 42 miles and 50 miles downstream (DWR 2010). At the Mendota Pool, the river turns sharply north where releases from the Mendota Dam with water supplied by the DMC replenish San Joaquin River flows to the north (Reclamation 2011a). Water quality in the San Joaquin River north of the Mendota Pool is generally good, although it contains higher TDS concentrations than those recorded in the upper watershed east of the Mendota Pool due to groundwater and agricultural return flows.

Tulare Lake Basin The Tulare Lake Basin covers 16,406 square miles and comprises the drainage area in the San Joaquin Valley south of the San Joaquin River, including the Mendota Pool and Fresno Slough. The Kings, Tule, and Kern Rivers are major tributaries that flow west from the Sierra Nevada into the Central Valley and provide the bulk of surface water supply to the basin. Water from the Sierra snowmelt is high quality. Imported water also enters the basin system through the DMC and SLC/California Aqueduct. While these sources generally contain high quality water suitable for domestic, municipal and agricultural beneficial uses, these imported water supplies can significantly increase salinity within the natural watershed, increasing EC measurements by as much as 50 percent in surface waters (CVRWQCB 2016b). Seepage water from the Friant-Kern Canal also enters the basin system. As snowmelt is the source of water in the Friant-Kern Canal, it is generally of good quality, although Delta water introduced from the Cross Valley Canal may result in occasional and minor degradation of water quality in the Friant-Kern Canal.

Surface water flows in the western portion of the basin in Kings and Fresno Counties tend to be poorer quality due to salinity from prehistoric marine sediments and naturally occurring trace elements such as selenium and molybdenum. Salinity is the primary constituent of concern affecting surface water quality in the Tulare Lake Basin and the beneficial uses appropriate for this water. Molybdenum and selenium have also been found in the Kings River at concentrations high enough to cause concern for agricultural and biological uses.

The Kings River flows towards the dry Tulare Lake bed and splits north of Lemoore to form the North Fork and South Fork distributaries. The North Fork of the Kings River carries the majority of Kings River flows westward and joins with the Fresno Slough; which provides an occasional link to the San Joaquin River. Specifically, during heavy runoff events, flood waters from the Kings River reach the Fresno Slough as surface outflow. These flood flows represent the only significant outflows from the Tulare Lake Basin to the Mendota Pool area (CVRWQCB 2016b).

Existing Conditions

Drought Conditions

In 2014, the governor of California issued a Drought State of Emergency, requiring immediate action be taken to conserve and preserve California water supplies. Subsequent Executive Orders have been issued to increase water conservation throughout the State. The most recent, Executive Order B-37-16, was issued on May 9, 2016, to bolster the state's drought resilience and preparedness by establishing longer-term water conservation measures, including improving agricultural water management and drought plans. Due to the lack of precipitation and consecutive dry years, the San Joaquin River, as well as other Central Valley and Sierra watersheds, experienced increasingly low flows and even prolonged periods of no flow. These conditions influenced the decision by the Exchange Contractors to utilize San Joaquin River water in addition to, or in place of water, delivered to DMC through the Delta. In addition, these drought conditions had a significant effect on the capacity and quality of groundwater aquifers of the Central Valley due to an increasing reliance on groundwater, reductions in groundwater recharge, and the continued migration of the naturally-occurring saline front.

Declines in groundwater quality in the Central Valley, which have been influenced by drought conditions, resulted in recent decreases in surface water conditions in the areas surrounding the Mendota Pool. Inputs of higher salinity groundwater into the Pool and Slough resulted from the continued migration of the naturally-occurring saline front, low San Joaquin River flows, increasing salinity in DMC flows, increasing rates of evaporation, and the lack of flood flows from the Kings River. This in turn resulted in substantial increases in the salinity of these surface waters. Drought conditions have mandated further surface and groundwater management requirements, as well as the implementation of corrective actions by local agencies to reduce or prevent worsening salinity concentrations which pose a critical threat to the anthropologic and biotic resources that rely on quality of these water sources. While the winters of 2016/2017 and 2017/2018 resulted in greater rainfall and snowpack conditions from previous years, water conservation measures continue to be required to conserve supplies.

Surface Water Resources and Flows in the Primary Study Area

Water quality in the Mendota Pool and Fresno Slough are affected by flows from the DMC, San Joaquin River, groundwater inputs and diversions out of these water bodies and return flows from adjacent agricultural lands. Both the Mendota Pool and Fresno Slough are used as a transfer facility for water supplies from a wide variety of users, including groundwater pumped into Mendota Pool and the Slough under the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Agreements, and for Adjacent Overlying Use (Table 15). In the summer months, surface waters in the Primary Study Area are characterized by low river flows and high inputs of lower quality groundwater, in comparison to winter months where the Primary Study

Area receives greater flows of higher quality water from the San Joaquin River and DMC as well as periodic Kings River flood flows. Major water sources are characterized below.

Mendota Pool At the confluence of the San Joaquin River and Fresno Slough, the Mendota Pool has an average depth of 4-15 feet, and operates at an estimated flow capacity of 3,000 cfs during peak irrigation seasons (White 2015). Major inflows include high-quality water from the DMC and the San Joaquin River, and variable quality groundwater discharged into the Mendota Pool by the MPG, the City of Mendota, and Meyers Water Bank (Table 15).

Table 15: Inflows and Outflows of the Primary Study Area

	Inflows	Outflows
Mendota Pool[1]	• DMC • San Joaquin River • MPG groundwater inputs from FWD • City of Mendota groundwater	• Mendota Dam • Columbia Canal • Firebaugh Intake Canal • CCID Main Canal • CCID Outside Canal • MWA water entitlements • City of Mendota
Fresno Slough	• DMC inputs into the Mendota Pool[1] • MPG groundwater inputs along the Fresno Slough • Meyers Water Bank • James Irrigation District • Tranquillity Irrigation District • Fresno Slough Water District • James Bypass	• MPG Adjacent Overlying Use[2] • Meyers Water Bank • James Irrigation District • Tranquillity Irrigation District • Fresno Slough Water District • Laterals 6 & 7 • Coelho-Gardner Hansen (CGH) canals • Mid-Valley Water District • Hughes, Melvin • Wilson, JW • Reclamation District #1606

[1] While the Mendota Pool is technically part of the Fresno Slough, the "Fresno Slough" in this analysis refers to the reach of the Fresno Slough between the Mendota Pool and the James Bypass, south of the junction with the river and Exchange Contractor canals (refer to Figure 4). As discussed in Section 3.3.4, *Methodology for Analysis*, the Surface Water Mixing Model is composed of two models, the northern surface water mixing model for the Mendota Pool and the southern surface water mixing model for the Fresno Slough. DMC and well inputs typically cause the flows in the Pool to be north to south. Northern flows would only occur during rare flood events on the North Fork of the Kings River.

[2] Includes Terra Linda Farms (Coelho Family Trust), CGH, and Meyers Farms.

Source: LSCE & KDSA 2014.

The DMC is a CVP canal that delivers water to the Mendota Pool, distributing supplies to multiple irrigation water supply diversion canals. Since the construction of Friant Dam and the diversion of San Joaquin River water to the Friant-Kern Canal, the DMC is historically the primary source of water flowing into the Mendota Pool. The DMC supplies Delta water from the C.W. Jones Pumping Plant in Tracy and O'Neill Forebay to contractors along the west side of the Valley and generally contains higher water quality than the underlying groundwater basin. The DMC terminates at the Mendota Pool, where water is conveyed into the Pool via Check 21. Most of the deliveries from the DMC are diverted out of the northern portion of the Mendota Pool, with the largest diversions going to the Exchange Contractors' intake canals.

In the eastern San Joaquin River branch of the Mendota Pool, west of the Columbia Canal intake, irrigation water management practices often resulted in reversing the direction of flow in the San Joaquin River. Although the natural flow of the river is from east to west, minimal flow in the river combined with large inputs from the DMC at the Mendota Pool and diversions at the

Columbia Canal intake historically resulted in flows from west to east through this five-mile-long section. Since 2009, interim or Restoration Flows from the San Joaquin River have also influenced water quality in the Mendota Pool and, to a lesser extent, the Fresno Slough.[38] Water quality in the Mendota Pool and Fresno Slough has improved due to increased inputs of high-quality water from the SJRRP. This program also allows for the capture of intermittent Restoration Flows in several locations, including the Mendota Pool. Recaptured water at the Mendota Pool would replace supplies that are normally delivered through the DMC. San Joaquin River flows tend be of higher quality than DMC deliveries, so recapture of San Joaquin River water results in higher water quality in the Mendota Pool (LSCE & KDSA 2014). As addressed in the discussion of Cumulative Effects below, the effect of Restoration Flows on water quality in the eastern San Joaquin River may be reduced by implementation of the related SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project (Related Project No. 1 in Section 3.0, *Scope of Analysis*, of this Draft EIS/EIR) and the LTRRRP (Related Project No. 31 in Section 3.0, *Scope of Analysis*, of this Draft EIS/EIR).

Fresno Slough and MWA The Fresno Slough stretches for almost 15 miles south of the Mendota Pool, including more than five miles extending from SR-180 south through the MWA. For much of this reach, the Slough is confined between levees, is farmed in places, and supports limited native habitat. However, within the MWA, the Slough broadens into a substantial body of shallow open water, reaching up to 0.5 mile in width, and continues as a broad open body of water until it merges with the Mendota Pool. Within the MWA, the Slough is bordered by 12,425 acres of seasonally flooded and permanent wetlands as well as fields that are flooded to produce crops to sustain wildlife. Water is supplied to the MWA and its complex of wetlands by deliveries of up to 29,640 AFY of CVP water via the Mendota Pool. DMC water, which mixes with San Joaquin River, MPG groundwater, and other groundwater inputs into the Pool and Slough, flows south down the Fresno Slough, under SR-180 and into the MWA, where it is distributed by series of lift-pumps, gravity-intake structures and ditches to adjacent wetlands and agricultural fields. Supplemental water sources include incremental amounts (approximately 10 AFY) supplied by Westlands or James Irrigation District (CDFW 2011).

Water Supply Deliveries The amount, timing, and source of water deliveries into the Mendota Pool and Fresno Slough affect surface water quality. CVP deliveries from the DMC constitute by far the largest source of water entering the Primary Study Area. Restoration Flows from the San Joaquin River are another source of high-quality water to the Pool, although the pending SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project include the construction of a Compact Bypass bifurcation structure, which would generally limit the conveyance of Restoration Flows into the Mendota Pool to the 2,500 cfs contractually obligated to be delivered to the Mendota Pool (Reclamation 2016). The other major regular source of water for the Pool is inputs from groundwater pumping from MPG and others. Although groundwater constitutes a

[38] The release of interim flows ceased in July of 2012. Starting on January 1, 2014, the SJRRP has begun releasing intermittent Restoration Flow waters from Friant Dam into the San Joaquin River. However, due to a critical low water year in 2014, Restoration Flows began to be reduced in February 2014 and kept being reduced until Restoration Flows were stopped in March 2014. Restoration Flows were restored in February 2016 and continue to be released.

relatively minor percentage of water, the higher salinity content of some wells can cause surface water quality issues.

Reclamation currently has contracts in place that facilitate the delivery of approximately 930,000 AFY of water through the Mendota Pool (Reclamation 2011b; 2011c). The Exchange Contractors, which consist of CCID, CCC, FCWD, and SLCC, receive 650,000 to 840,000 AFY of this water through withdrawals from the DMC or the Mendota Pool, and from occasional flood flows from the San Joaquin River and the North Fork of the Kings River. Water delivered via the Mendota Pool is also used to fulfill CVP contractual obligations for James Irrigation District and Tranquillity Irrigation District of 45,000 AFY and 34,000 AFY, respectively (Reclamation 2011b; 2011c).

Reclamation also purchases water from the Exchange Contractors and NCR to deliver up to 29,640 AFY to the MWA via the Mendota Pool. Water deliveries to the MWA are greater in summer and fall months, usually peaking in September with water deliveries up to 5,500 AF (CDFW 2011). Given the MWA's water delivery schedule and beneficial uses for freshwater habitat, surface water quality during the fall period is of particular concern to CDFW.

Many entities pump groundwater into the Pool and Slough, with MPG delivering the largest amount. Under the Existing Exchange Agreements, MPG may exchange up to 25,000 of groundwater via the Mendota Pool. Additionally, varying percentage of the 12,000 AFY pumped for Adjacent Overlying Use is transferred via the Mendota Pool. In 2014, MPG pumped a total of 23,106 AF for exchange and 9,222 AF for Adjacent Overlying Use. The City of Mendota generally pumps between 1,400 and 4,400 AFY, with an unknown amount entering the Mendota Pool. Meyers Water Bank inputs vary between 0 and 6,000 AFY.

MPG water deliveries into the Mendota Pool vary by month and year, generally peaking in the spring and summer, with a historic recorded maximum of 6,879 AF in May 2007, and slowing during fall and winter months, especially in December (Table 16).

Table 16: Historic (2002-2014) MPG Water Deliveries

Month	Average AF	Maximum AF
January	237	753
February	900	2,031
March	2,795	6,507
April	2,759	6,495
May	3,833	6,879
June	2,945	6,311
July	3,013	5,165
August	2,634	4,921
September	2,784	5,727
October	1,831	5,106
November	681	2,430
December	102	424

Source: 2002-2014 Annual Reports, LSCE & KDSA 2003-2015.

Salinity in the Primary Study Area

Surface water quality in the Primary Study Area is governed by a mix of Federal and State plans and regulations. Overarching responsibility for protecting surface waters generally lies with the

CVRWQCB, which prepares and implements basin plans to identify and protect beneficial uses of surface waters. The Mendota Pool and Fresno Slough are located on the border between the Sacramento and San Joaquin River Basin Plan and Tulare Lake Basin Plan. However, these Basin Plans do not specifically identify WQOs for surface waters within the Primary Study Area. There are currently no regulating standards for EC for these surface waters in the Existing Exchange Agreements. The CVRWQCB Basin Plans designate beneficial uses of tributary streams that are not specifically listed in the Basin Plan by reference to the named waters to which they are tributary (commonly referred to the "tributary rule"). These means that any beneficial uses identified for the Mendota Pool or Fresno Slough, for example, would apply to unlisted tributary streams to these water bodies. However, on May 10, 2005, the Sacramento County Superior Court issued a ruling in the matter of *Deltakeeper, et al. v. California Regional Water Quality Control Board, Central Valley Region, et al* (2005) that the extent of which this rule applies to constructed agricultural drains and other non-stream tributaries shall be clarified. At this time, the CVRWQCB generally does not use the tributary rule to apply beneficial uses for constructed agricultural drains. Surface water quality standards are discussed further in Section 3.3.4, *Impact Analysis/Environmental Consequences* below.

Salinity in the Primary Study Area varies based on location, time of year, and the sources of water inflows. The San Joaquin River and DMC generally provides high-quality inflows, however the quality of DMC inflows can be subject to large daily and seasonal fluctuations, and tend to increase during extended dry periods. In historic years, inflows to the Mendota Pool from the DMC have ranged in salinity from 67 mg/L to 598 mg/L. From 1999 to 2011, the annual average concentration of TDS in the DMC was 302 mg/L. In more recent years, inflows to the Mendota Pool from the DMC have ranged from 201 mg/L to 723 mg/L. Representing unusually dry years, the annual average TDS concentration at DMC Check 21 in the 2014–2015 years was approximately 135 mg/L higher (500–525 mg/L) than the average TDS concentration over the 2006–2015 period (390 mg/L). Also representing unusually dry conditions, the annual average TDS concentration at Check 21 from 2012 to 2015 was approximately 455 mg/L. In 2014, the annual TDS concentration at Check 21 was 484 mg/L (Table 19). These increases in higher salinity DMC inflows, as well as contributions from other saline surface water inputs, have resulted in consecutive exceedances of surface water quality thresholds in the Fresno Slough and MWA in recent years.

Groundwater pumped into the Mendota Pool varies and generally contains higher levels of salinity than inflows from the San Joaquin River and DMC. Because water from the DMC and San Joaquin River enter the Mendota Pool from the north, water quality is generally higher in the Mendota Pool than further south in the Fresno Slough, where water is more affected by groundwater input. In particular, water quality is generally high along the San Joaquin River, near Mendota Dam and Pool and declines substantially within the MWA and further south (Table 17). As discussed further below, the 2014 Annual Report identifies locations within the Fresno Slough as having salinity-related water quality problems.

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Table 17: 2014 Summary of Surface Water Grab Sample Data – Salinity [1]

	Sample Location[2]	EC @ 25ºC (µmhos/cm)			TDS (mg/L)			Exceedance of TDS Annual Average Value (450 mg/L)
		Max	Med	#	Max	Med	#	
Mendota Pool	1. Columbia Canal	810	79	8	518	51	8	No
	2. Mendota Dam	1,110	471	10	710	301	10	No
	3. CCID Main Canal	1,110	456	10	710	292	10	No
	4. DMC	1,130	752	14	723	481	14	**Yes**
	5. CCID Outside Canal	1,140	691	1	730	442	1	No
	6. Firebaugh Intake Canal	1,390	742	10	890	475	10	**Yes**
	7. West of Fordel	695	530	2	445	339	2	No
Fresno Slough	8. Etchegoinberry[3]	590	590	1	378	378	1	No
	9. MWA	1,470	1,420	8	941	909	8	**Yes**
	10. James Irrigation District Booster Plant	1,560	1,550	8	998	992	8	**Yes**
	11. Tranquillity Irrigation District Intake	1,380	1,235	2	883	790	2	**Yes**

Notes: Max = maximum recorded, Med = median of recorded samples, # = number of samples

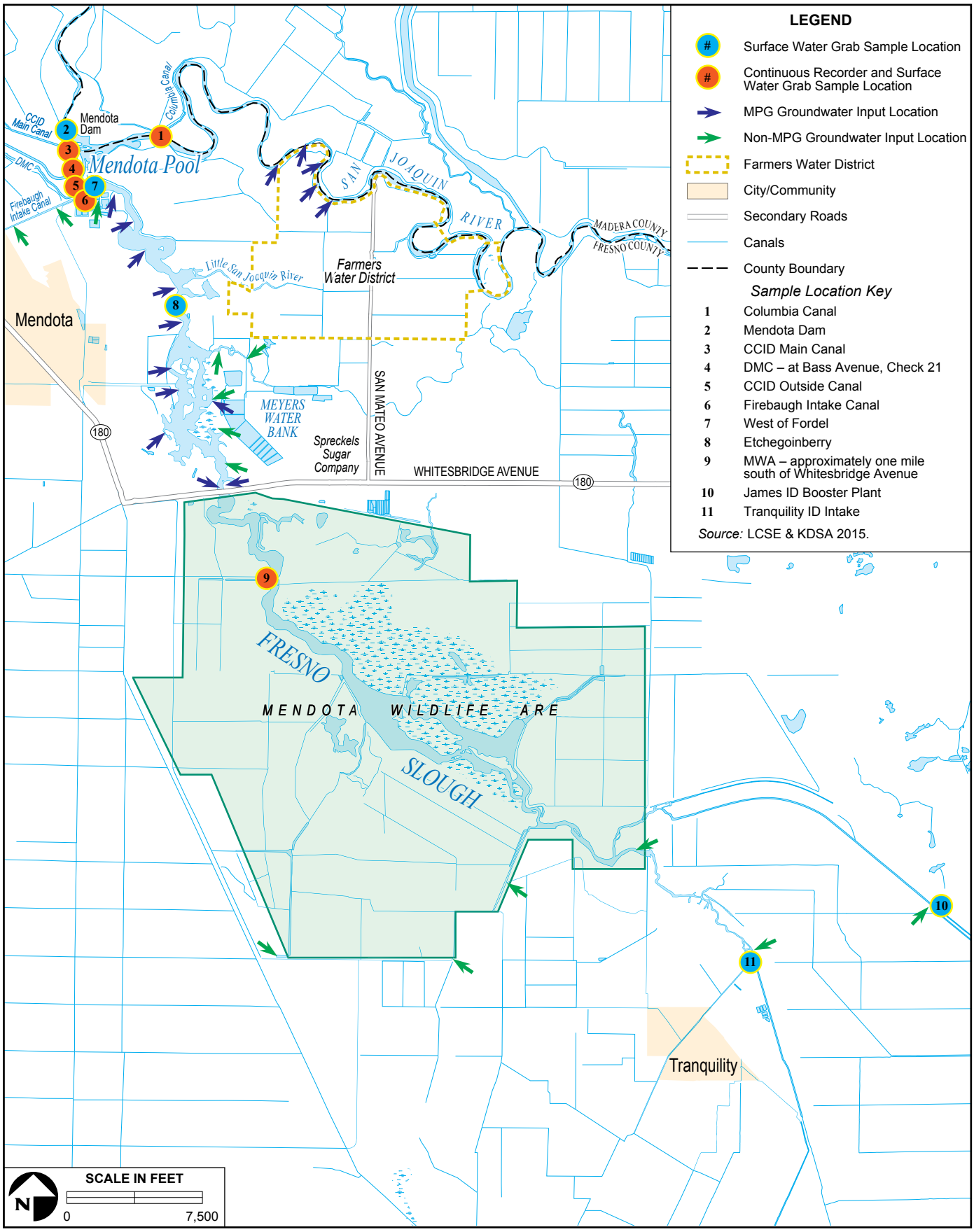
[1] The Surface Water Mixing Models are based on sampling information from the 1990–2012 Annual Reports. Where relevant to the discussion, information from the 2010–2016 Annual Reports is also used in the analysis of impacts to surface water quality. The 2014 Annual Report was the most recent available during the preparation of the Draft EIS/EIR.

[2] See Figure 36 for Sample Locations.

[3] Etchegoinberry was not sampled in the 2014 Annual Report. Therefore, data for the Etchegoinberry sampling location is from the 2013 Annual Report.

Source: Appendix D of the 2014 Annual Report (LSCE & KDSA 2015).

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Surface Water Sampling Locations

FIGURE 36

Table 18: Annual Salinity Values at the Mendota Dam, Sample Location 2 (2007-2014)

Year	Measured Average EC (µmhos/cm)	TDS Conversion (mg/L)[1]	Exceedance of TDS Annual Average (450 mg/L)[3]
2007	498	319	No
2008[2]	578	370	No
2009	580	371	No
2010	454	290	No
2011[2]	173	111	No
2012	461	295	No
2013	519	340	No
2014[4]	506	324	No
Average	471	303	--

[1] Conversions from EC to TDS are estimates and may vary slightly from recorded data.
[2] MPG pumping for exchange did not occur during these years.
[3] Reclamation contractual Water Quality Standards for the Mendota Pool and Fresno Slough. An annual average TDS threshold of 450 mg/L is used when assessing multiple historic years.
[4] The data from the 2013 and 2014 Annual Reports is provided for informational purposes and is not included in the Surface Water Mixing Model, which is calibrated for the 1990–2012 years.
Source: 2014 Annual Report, LSCE & KDSA 2015.

Table 19: Average Monthly Salinity Values in the DMC, Daily EC Readings at Check 21 (2014)[1]

Month	Monthly Average EC (µmhos/cm)	TDS Conversion (mg/L)[2]	Exceedance of TDS Monthly Average (Numeric TDS Threshold)[3]
January	836	535	No (600 mg/L)
February	821	525	No (600 mg/L)
March	829	530	No (600 mg/L)
April	734	470	No (600 mg/L)
May	608	389	No (600 mg/L)
June	677	433	No (600 mg/L)
July	729	466	No (600 mg/L)
August	748	479	No (600 mg/L)
September	829	530	**Yes** (450 mg/L)
October	698	447	No (450 mg/L)
November	727	465	**Yes** (458 mg/L)
December	835	534	No (600 mg/L)
Average	**756**	**484**[5]	**Yes**[3,4]

[1] The data from the 2014 Annual Report is provided for informational purposes and is not included in the Surface Water Mixing Model, which is calibrated for the 1990–2012 years.
[2] Conversions from EC to TDS are estimates and may vary slightly.
[3] Reclamation contractual Water Quality Standards for the Mendota Pool and Fresno Slough.
[4] Average monthly values are in exceedance of standard for annual average TDS concentrations (450 mg/L) for the months of September and November (both of which are 450 mg/L) based on the 2014 Annual Report.
[5] This value may differ to the median TDS concentration stated in Table 18, as this value averages 365 continuous samples of EC readings, which is then converted to TDS. The value in Table 18 is the median of the 5 grab samples that measured TDS concentrations in 2013.
Source: 2014 Annual Report, Table H-1, LSCE & KDSA 2015.

Mendota Pool The DMC and the Mendota Pool experience lowest salinity levels in the summer and highest in winter/spring, as observed in the 2002–2013 Surface Water Mixing Model and single-year drought data from 2014 and 2015, with peak values occurring in January to April, and in December, and the lowest occurring in May to November. Similar observations of salinity at the

DMC were made in 2014 (Table 19), however, the lowest concentrations occurred approximately a month earlier (April to October). Salinity in the DMC can be subject to large daily and seasonal fluctuations from tidal effects in the Sacramento-San Joaquin Delta, rainfall, and the discharge of higher salinity agricultural drain water in the spring from sumps along the DMC upstream (north) of the Pool[39]. Periodically, salinity at northern canal intakes can be relatively high; however, the Annual Reports indicate that is due to agricultural drainage and not a result of MPG pumping (LSCE & KDSA 2015). MPG groundwater from FWD pumped into the Mendota Pool for exchange averaged 7,485 AFY between 1989 and 2013. These MPG wells exhibited relatively low TDS concentrations between 260 mg/L and 760 mg/L in 2014 (LSCE & KDSA 2015; Figure 36). Further, the design constraints only allow MPG inflows to the Fresno Slough during times of southerly flow.

TDS concentrations at the Mendota Dam ranged from 111 to 371 mg/L between the years 2007 and 2014 (Table 18). Occasionally, the CCID Outside Canal (Sample Location 5) and Firebaugh Intake Canal (Sample Location 6) have exceeded the existing design constraint threshold of 90 µmhos/cm above DMC measurements; exceedance of these thresholds requires MPG to temporarily suspend deliveries. In 2013, EC values exceeded this design constraint threshold in January, February, March and December; however, these exceedances occurred during periods where low quantities of MPG waters were exchanged, and was likely not a result of MPG pumping inputs; as such, MPG was not required to suspend deliveries (LSCE & KDSA 2015).

Fresno Slough and MWA Surface water quality is of particular concern in the Fresno Slough, especially in the MWA due to the presence of freshwater habitat and sensitive species. Groundwater inputs upstream of the MWA have the potential to impact water quality at this location. The 29,640 AFY of CVP water provided to MWA at the Mendota Pool mixes with San Joaquin River water and groundwater pumped into the Pool and Fresno Slough from MPG and others as this water moves south toward MWA. This affects the salinity of water received in the MWA.

The Annual Reports indicate that salinity in the Fresno Slough, including areas within the MWA, are higher than in the Mendota Pool (LSCE & KDSA 2015). The 2014 Annual Report states that MPG pumping has contributed to increased salinity in the Fresno Slough in recent years. Groundwater quality in MPG wells along the Fresno Slough is affected by a naturally-occurring groundwater saline front which generally lies west of the Fresno Slough; accordingly, MPG wells along the west side of the Slough are generally more affected (see Section 3.2, *Groundwater Quality*). TDS levels in groundwater from wells entering the central portion of the Slough ranged from 760 mg/L to 4,450 mg/L in 2014, while groundwater entering the southern portion of the slough ranged from 640 mg/L to 2,740 mg/L. Wells containing the highest TDS levels also demonstrate having a high variability from year-to-year, thus making it difficult to establish a trend for these wells (the previous design constraints prohibited the delivery of MPG water in excess of 2,000 mg/L). MPG wells located along the Fresno Slough contributed to more than half of MPG water delivered to the Mendota Pool, averaging 13,852 AFY from 1997 to 2014. Increases in salinity in the Fresno Slough area are compounded by a number of factors, including reduced southerly flow, increased non-MPG pump-in amounts, higher salinity levels in the DMC, and MPG pumping. This pumping has had a greater effect on water quality in recent

[39] It should be noted that drainage discharges into the DMC from the Firebaugh Sumps were discontinued in May 2015.

years because the flow of DMC water to the south has decreased due to reduced diversions from the southern portion of the Pool, including those for Westlands (LSCE & KDSA 2015).

Salinity in the MWA (Sample Location 9) in 2014 averaged 909 mg/L TDS, the highest of the past eight years of record, and measurements were highest in May and August due to lower southerly flows caused by reduced diversions and non-MPG pumping into the Fresno Slough during a period of low flow (LSCE & KDSA 2015). In previous years, EC measurements within the MWA have occasionally exceeded 960 mg/L. As shown in Table 20, TDS concentrations at the MWA exceeded Reclamation's water quality standards five out of the past eight years. Historically high salinity levels from groundwater introduced into the Fresno Slough at James Irrigation District (Sample Location 10) and Tranquillity Irrigation District (Sample Location 11) also affect water quality in the southern portion of the MWA. However, this effect is limited and does not highly influence salinity levels at Sample Location 9 in the MWA due to the southerly direction of surface water flows in the Fresno Slough (LSCE & KDSA 2015).

Table 20: Annual Salinity Values at the MWA, Sample Location 9 (2007-2014)

Year	Measured Average EC (µmhos/cm)	TDS Conversion (mg/L)[1]	Exceedance of TDS Annual Average (450 mg/L)[3]
2007	773	495	**Yes**
2008	914	585	**Yes**
2009	893	571	**Yes**
2010	541	346	No
2011[2]	--	--	--
2012	665	425	No
2013	827	529	**Yes**
2014	1,420	909	**Yes**
Average	**862**	**551**	**--**

[1] Conversions from EC to TDS are estimates and may vary by 10 mg/L.
[2] MPG pumping for exchange did not occur during these years and no measurements were taken. Missing data for 2011 is therefore excluded from calculations of total annual average.
[3] Reclamation contractual Water Quality Standards for the Mendota Pool and Fresno Slough. An annual average TDS threshold of 450 mg/L is used when assessing multiple historic years.
Source: 2014 Annual Report, LSCE & KDSA 2015.

While previous years have allowed for sample collections from the Etchegoinberry site located in the Fresno Slough, poor access issues have resulted in the decision to remove the Etchegoinberry site from the sampling program. Therefore, recent sample measurements for this site are not present in the data tables presented in this section.

Trace Elements in the Primary Study Area

Current Basin Plans set water quality objectives for trace elements that apply to regions outside of the Primary Study Area; these standards (listed in Tables 22 and 23 in the discussion of the thresholds of impact below) were identified as thresholds in the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements, and are currently used as WQOs in the Annual Reports. No beneficial uses are identified for the Fresno Slough and Mendota Pool under the Basin Plans for the Sacramento and San Joaquin River Basins and Tulare Lake Basin, although these bodies of water are primarily used for the storage and transfer of water irrigating agricultural uses. These bodies of water are also used for freshwater habitat and wildlife habitat. Water quality standards are discussed further in Section 3.3.4, *Impact Analysis/Environmental*

Consequences, below. See Section 3.4, *Biological Resources*, for a discussion regarding potential effects of increased salinity on biological resources.

Sampling conducted in support of the Annual Reports (2002–2014) indicates that all trace elements are generally low in the Primary Study Area, with the exception of concentrations of boron, which exceeded MWA target WQO in 2014. The Pool tends to have lower concentrations of selenium but higher concentrations of molybdenum compared to the Fresno Slough and MWA.

Mendota Pool Arsenic discharged into the Mendota Pool from MPG wells have typically been below the reportable limits. Similar to previous monitoring years, arsenic concentrations were low in Sample Locations 1-7 in 2014, ranging from nondetectable quantities to 4 µg/L. Median arsenic concentrations within the Mendota Pool ranged from less than 2.5 µg/L to 3.5 µg/L. Boron concentrations in the Pool ranged from less than 25 µg/L to 600 µg/L, with a median of 240 µg/L in 2014. Boron concentrations recorded were lowest at the Columbia Canal intake, with a median of 50 µg/L. Molybdenum concentrations remain low within the Mendota Pool and ranged from 2 to 3.5 µg/L, with a median of 2.6 µg/L in 2014 (Table 21).

The Mendota Pool is listed on California 2014-2016 CWA Section 303(d) List of Impaired Waters for selenium, with the potential source unknown (CVRWQCB 2018). Most 2014 samples contained nondetectable concentrations of selenium (<1.0 µg/L); however, samples taken from locations in the Mendota Pool contained concentrations between 0.4 and 2.5 µg/L (LSCE & KDSA 2015). Selenium is present in the soil in the Central Valley, and enters surface water supplies through agricultural return flows. Elevated selenium concentrations in the Pool were generally caused by the discharge of drain water to the DMC from the Firebaugh Sumps, and are not related to MPG pumping. In 2014, selenium concentrations were highest in February due to inflow of agricultural drainage water from sumps along the DMC upstream of the Pool (LSCE & KDSA 2015). The Re-routing of the Firebaugh Sumps from the DMC to the San Joaquin Water Quality Improvements Project was approved by Reclamation in late 2014, and the Firebaugh sumps no longer discharge drain water into the DMC. Drain water is now routed through underground pipelines to the San Joaquin River Water Quality Project's reuse area and used on salt tolerant crops.

Fresno Slough and MWA Concentrations of trace elements are generally low in the Fresno Slough, with the exception of elevated concentrations of arsenic in samples taken at the James Irrigation District Booster Plan (Sample Location 10) and Tranquillity Irrigation District (Sample Location 11); boron in samples taken at the MWA (Sample Location 9), James Irrigation District Booster Plan, and Tranquillity Irrigation District; and elevated molybdenum concentrations at Tranquillity Irrigation District in 2014 (Table 22; LSCE & KDSA 2015). Sample Locations 10 and 11 are more than five miles away from any MPG input locations; elevated concentrations of trace elements in these areas are not believed to be associated with MPG groundwater inputs.

Average arsenic concentrations in the Fresno Slough ranged from 2 to 6.5 µg/L, with the highest concentrations at James Irrigation District Booster Plant and Tranquillity Irrigation District. The CDFW has a target of 5 µg/L for arsenic concentrations at the MWA, and samples taken from the MWA were within this target. Median boron concentrations in the Fresno Slough ranged from 300 to 850 µg/L. Similar to the 2013 report, surface water concentration were higher in the southern portion of the Fresno Slough than in the northern portion in 2014. In the MWA, all eight samples exceeded the MWA-specific WQO for boron (300 µg/L) with concentration ranging from 400 to 600 µg/L (LSCE and KDSA 2015).

Table 21: 2014 Summary of Surface Water Sample Data - Trace Elements

	Sample Location[1]	Arsenic (µg/L)				Boron (µg/L)				Molybdenum (µg/L)				Selenium (µg/L)			
		Max	Med	#	Exceeds WQO? (10 µg/L)[2]	Max	Med	#	Exceeds WQO? (800 µg/L)[2]	Max	Med	#	Exceeds WQO? (19 µg/L)[2]	Max	Med	#	Exceeds WQO? (2.0 µg/L)[2]
Mendota Pool	Columbia Canal	4	3	2	No	290	50	8	No	3	2	2	No	<0.1	<1	8	No
	Mendota Dam	3	<2.5	2	No	540	200	10	No	3	2	2	No	1.5	<1	10	No
	CCID Main Canal	4	3.5	2	No	560	200	9	No	3	2	2	No	1.5	<1	10	No
	DMC	3	3	3	No	600	350	14	No	4	3.5	2	No	2.1[3]	<1	10	No
	CCID Outside Canal	3	2.5	2	No	590	300	11	No	3	2.5	2	No	1.6	<1	10	No
	Firebaugh Intake Canal	3	2.5	2	No	590	330	10	No	4	3	2	No	1.5	<1	10	No
	West of Fordel	3	3	2	No	300	250	2	No	4	3	2	No	<0.4	<0.4	2	No
Fresno Slough	Etchegoinberry[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MWA[5]	3	3	3	No	600	500	8	**Yes**[5]	6	5.5	2	No	0.5	0.45	2	No
	James Irrigation District Booster Plant	8	5	3	No	1150	500	5	**Yes**	12	9.5	2	No	0.5	0.45	2	No
	Tranquillity Irrigation District Intake	9	6.5	2	No	1200	850	2	**Yes**	21	16.5	2	**Yes**	0.4	0.23	2	No

Notes: Max = maximum recorded, Med = median of recorded samples, # = number of samples, WQO = Water Quality Objective

[1] See Figure 36 for Sample Locations.

[2] Criteria used in the Annual Reports.

[3] The target level is 2 µg/L. This data represents grab samples which are taken periodically throughout the year, but monitoring for selenium is not measured daily or in real time. Therefore, the exact number of days that selenium concentrations exceeded the target level is unknown, but it did occur in at least one of the grab samples. However, the average of all grab samples taken throughout the year shows an average concentration of less than 1.0 µg/L. Reclamation requires that no wells with selenium concentrations above 2 µg/L be allowed to introduce water for exchange under previous, current, or future exchanges.

[4] Etchegoinberry was not sampled for the 2014 Annual Report. Therefore, data for the Etchegoinberry sampling location is from the 2013 Annual Report.

[5] WQO for boron in the MWA is set by the CDFW at 0.3 mg/L (300 µg/L).

Source: Appendix D of the 2014 Annual Report (LSCE & KDSA 2015).

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With the exception of boron, which exceeded the WQO in every sample for MWA, concentrations of trace elements were below the WQO for the MWA in 2014 (LSCE and KDSA 2015).

3.3.3 Regulatory Framework

Surface water quality is regulated by a number of authorities at the Federal, State, and local level. This section provides an overview of the regulatory agencies and specific regulations that are applicable to the Proposed Action or alternatives.

Federal Policies and Regulations

Central Valley Project Improvement Act (CVPIA) In 1992, the United States Congress passed the CVPIA, Title 34 of Public Law 102-575, which mandates improvements to the Central Valley river system and refuges in order to support river- and wetland-dependent wildlife. This Act includes a mandate to treat environmental water (i.e., water that is used in rivers and wetlands to protect, restore, and/or enhance fish and wildlife populations and associated habitats) with equal priority to other uses, such as agricultural and municipal, and requires the following dedications of CVP water:

- 800,000 AF of water for the primary purpose of implementing the fish, wildlife, and habitat restoration and advancing measures authorized in the CVPIA, as outlined in Section 3406(b)(2); and
- 410,000 AF of water for wetland management at 19 Central Valley refuges and managed wetlands, as outlined in Section 3406(d)(1).

The CVPIA requires delivery of this mandated CVP water allocation, referred to as "Level 2" water, in all year-types except critically dry water year conditions, when Level 2 water can be reduced by 25 percent. The CVPIA also directs the United States Department of Interior to acquire an additional 163,000 AF of water for refuges, referred to as "Level 4" water, through transactions with willing sellers.

Clean Water Act The Clean Water Act of 1972 (CWA) is the primary Federal law establishing and governing water quality standards in surface waters of the United States, and includes regulations for discharges of pollutants into these waters, such as the following sections that are applicable to the Proposed Action or alternatives:

- Section 404 of the CWA regulates the discharge of dredged and fill materials into waters of the U.S., which include all navigable waters, their tributaries, and some isolated waters, as well as some wetlands adjacent to the aforementioned waters (33 CFR § 328.3). Areas typically not considered to be jurisdictional waters include non-tidal drainage and irrigation ditches excavated on dry land, artificially irrigated areas, artificial lakes or ponds used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water-filled depressions (33 CFR Part 328). Areas meeting the regulatory definition of waters of the U.S. are subject to the jurisdiction of the U.S. Army Corps of Engineers (USACE) under provisions of CWA section 404. Construction activities involving placement of fill into jurisdictional waters of the U.S. are regulated by the USACE through permit requirements. No USACE permit is effective in the absence of state water quality certification pursuant to section 401 of the CWA.

- Section 303 of the CWA requires states to adopt surface water quality standards that define designated users and water quality criteria, and to adopt an anti-degradation policy. Section 303(d) of the CWA requires states to maintain a list of impaired water bodies in order to develop Total Maximum Daily Load (TMDL) thresholds for these waters. TMDLs are developed to improve water quality in impaired water bodies by defining maximum pollutant loads. TMDLs for the San Joaquin River and for the Mendota Pool are developed by the CVRWQCB. Segments of the San Joaquin River in the Primary Study Area are listed under Section 303(d) for boron, invasive species, Dichlorodiphenyltrichloroethane (DDT), Group A pesticides, toxicity, and acidity (pH). The Mendota Pool is listed under Section 303(d) for selenium. The Fresno Slough, from Graham Road to James Bypass, is listed under Section 303(d) for toxicity and pesticides (CVRWQCB 2018).

- Section 304 of the CWA directs the EPA to publish National Recommended Water Quality Criteria to aid states in developing surface water quality standards that are sufficient for protection of aquatic life and human health. This includes the Aquatic Life Criteria list with chemical concentration goals to protect surface water for aquatic life.

- Section 401 of the CWA allows for evaluation of water quality when a proposed activity requiring a federal license or permit could result in a discharge to waters of the U.S. In California, the SWRCB and its nine Regional Boards issue water quality certifications. Each Regional Board is responsible for implementing Section 401 in compliance with the CWA and its water quality control plan (also known as a Basin Plan). Applicants for a federal license or permit to conduct activities that may result in the discharge to waters of the U.S. (including wetlands) must also obtain a Section 401 water quality certification to ensure that any such discharge will comply with the applicable provisions of the CWA. Compliance with Section 401 is required for all projects that have a federal component and may affect state water quality.

- Section 402 of the CWA specifically requires the EPA to develop and implement the National Pollutant Discharge Elimination System (NPDES) program. In California, the EPA authorizes the SWRCB to oversee the NPDES program through the Regional Boards. This program requires a NPDES permit for point sources of pollution discharging into a surface water body (e.g., a factory or wastewater treatment plant).

Safe Drinking Water Act The Safe Drinking Water Act defines health-based standards for drinking water, and requires the protection of drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells. As with the CWA, the EPA delegates administration of programs under the Safe Drinking Water Act to State agencies. The California Department of Health and Safety, Division of Drinking Water and Environmental Management is responsible for administering California's drinking-water program under this Act.

Anti-degradation Policy The anti-degradation policy, established in 1968 and revised in 2005 (Title 40, Section 131.12 of the CFR), requires the State to develop, adopt, and implement policies that protect existing uses, water quality, and national water resources, as authorized by Section 303(c) of the CWA.

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Executive Order 11990 (Protection of Wetlands) Executive Order 11990 is an overall wetlands policy aimed at avoiding the long and short term adverse impacts associated with the destruction or modification of wetlands. This order applies to all Federal agencies that manage Federal lands, sponsor Federal projects, or provide Federal funds to State or local projects.

California Toxics Rule In 2000, the EPA promulgated numeric water quality standards for priority toxic pollutants and other provisions for water quality standards to be applied to waters in the State of California. These standards are intended to protect human health and the environment. In April 1991, California adopted numeric criteria for priority toxic pollutants in the State's Inland Surface Water Plans and Enclosed Bays and Estuaries Plans. In 1994, a California State court ordered California to rescind these water quality control plans. The California Toxics Rule fills a gap created by the 1994 court decision. Thus, the State has been without numeric criteria for priority toxic pollutants, which is required by the CWA, and necessitated this action by the EPA. This Federal criteria is applicable in California inland surface waters, enclosed bays and estuaries.

State Policies and Regulations

Porter-Cologne Water Quality Control Act Water quality in the State of California is protected under the Porter-Cologne Water Quality Control Act. Under the Act, the SWRCB has the ultimate authority over State water rights and water quality policy while the Regional Boards oversee water quality on a day-to-day basis at the local and regional level. The Act requires that the State adopt water quality policies, plans, and objectives to protect the State's waters for the use and enjoyment of people.

The Regional Boards are required to adopt and periodically update water quality control plans (Basin Plans). These plans identify the designated beneficial uses for surface and groundwater resources, define applicable water quality objectives necessary to support these beneficial uses, and establish programs that protect water quality. The Regional Boards regulate all pollutant or nuisance discharges that may affect either surface water or groundwater. The Regional Boards, as well as the SWRCB, also have the responsibility of granting NPDES permits, Section 401 water quality certifications, or other approvals.

Sustainable Groundwater Management Act (SGMA) SGMA intends to manage the use of groundwater in a manner that can be maintained long-term without causing chronic lowering of groundwater levels, significant reduction in groundwater storage, saline water intrusion, or subsidence. SGMA provides a framework and guidance for developing and implementing a GSP and designating management authority to local GSAs for each groundwater basin. Following implementation of SGMA, the DWR has designated groundwater basins within Fresno and Madera Counties as high-priority basins. The local GSPs for these basins must include data on groundwater levels, water quality, subsidence and surface water interaction. In order to reach sustainability goals for groundwater basins, each GSP must provide a monitoring program for managing groundwater levels, water quality, subsidence, and changes to surface flow and surface water quality. The DWR has designated groundwater subbasins within Fresno and Madera Counties as high priority basins. As such, these basins are required to adopt a GSP by 2020. Please refer to Section 3.1, *Groundwater Levels*, of this EIS/EIR for a more detailed discussion of SGMA.

Water Quality Control Plan for the Sacramento and San Joaquin River Basins This Basin Plan covers the area of the Sacramento and San Joaquin River watersheds and was last updated in 2016. The Basin Plan provides water quality objectives and defines beneficial uses for surface water bodies, including the portion of the San Joaquin River located within the Primary Study Area.

Water Quality Control Plan for the Tulare Lake Basin Portions of the Primary Study Area south of the San Joaquin River are located in the Tulare Lake Basin, which is regulated by the CVRWQCB. The Basin Plan for the Tulare Lake Basin was developed in 1975 by the CVRWQCB and approved by the SWRCB; it has been subsequently revised and approved several times, with the most recent revision in 2016. This Basin Plan performs all the functions of a Basin Plan as required by the Porter-Cologne Water Quality Control Act.

MWA Refuge Water Management Plan The MWA Refuge Water Management Plan was adopted in 1994 and revised in 2011, with the objective of managing the MWA to protect habitats of sensitive species, to restore or enhance wetlands, and to provide wildlife-oriented public uses. The MWA is owned by the State of California and managed by the CDFW. The Refuge Water Management Plan includes proposals to maintain and enhance wildlife habitat by obtaining high quality water to optimally manage the MWA. During the months of October to February, 1,500 acres of wetlands east of the Mendota Pool become part of the Mendota Pool by contact. These wetlands utilize 5,000 additional AFY, which are not attributed to the MWA's water allocation.

California Governor's Drought Declaration California Governor Brown on January 17, 2014 proclaimed a State of Emergency and directed state officials to take all necessary actions to make water immediately available. On April 25, 2014, the Governor issued an executive order to speed up actions necessary to reduce harmful effects of the drought, and called on all Californians to redouble their efforts to conserve water. On December 22, 2014 Governor Brown issued Executive Order B-28-14 extending directives to DWR and the SWRCB to take actions necessary to make water immediately available through May 31, 2016 and to extend CEQA suspensions for certain water supply projects. On April 1, 2015, the governor issued Executive Order B-29-15. Key provisions include ordering the SWRCB to impose restrictions to achieve a 25 percent reduction in potable urban water usage through February 28, 2016. On May 9, 2016, the governor issued Executive Order B-37-16, establishing long-term water conservation measures known as Making Water Conservation a California Way of Life that continue to be in effect. These measures include elimination of wasteful water use practices and mandated adjustments to emergency water conservation regulations and restrictions during extended drought conditions. These extended water conservation measures recognize differing water supply conditions for many communities, and require that communities develop water efficiency measures and conservation plans specific to the conditions of their respective sources of water supply.

The SWRCB adopted new emergency conservation regulations on May 18, 2016, that repeal and replace prior drought regulations that used a percentage-based water reduction standard. The new regulations, effective from June 2016 through January 2017, require local agencies to ensure a three-year water supply assuming a continuous shortage such as that experienced 2012 through 2015. Water agencies will be required to meet a conservation standard equal to the projected shortage in their supplies and report to the SWRCB. The Governor's drought declaration also calls upon local urban water suppliers and municipalities to implement their local water shortage

contingency plans immediately in order to avoid or forestall outright restrictions that could become necessary later in the drought season. On February 8, 2017, the SWRCB adopted emergency regulation that extends the above regulations through October 2017.

While most of the emergency water conservation regulations expired on November 25, 2017, the governor issued Executive Order B-40-17 on April 7, 2017 that continued the drought response in Fresno, Kings, Tulare, and Tuolumne Counties. Under Executive Order B-40-17, emergency drinking water projects will continue to help address diminished groundwater supplies.

Irrigated Lands Regulatory Program (ILRP) The ILRP addresses waste discharge (e.g., sediments, pesticides, nitrates) from commercial irrigated lands. The goal of ILRP is to reduce impacts of agricultural discharges to groundwater and surface water. Under this program, growers must implement management practices and submit farm evaluations and nitrogen management data.

Salt and Nitrate Management Plan CV SALTS, a coalition of state and federal agencies, agriculturalists, and businesses, completed the Salt and Nitrate Management Plan in January 2017. The Plan contains an assessment of current water quality conditions and trends, regulatory and technical analyses, prototype studies to provide considerations when implementing policies, and recommended policies.

3.3.4 Impact Analysis/Environmental Consequence

Methodology for Analysis

This EIS/EIR evaluates changes in surface water quality resulting from the Proposed Action or alternatives as they potentially affect the MWA and users that receive water from the Mendota Pool and Fresno Slough.

The baselines used for this analysis are the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA to provide a full disclosure of potential impacts. The existing setting includes water exchanges under the 10-Year Exchange Program and subsequent 3-Year Extension Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

The assessment of surface water quality impacts builds upon data provided in the Surface Water Mixing Models prepared by LSCE as part of the Hydrogeologic Technical Analysis (Appendix E),and incorporates data from the Annual Reports and scoping comments provided by CDFW. In particular, the possible indirect effect of continued migration of the naturally-occurring saline front on MPG well water quality and the effectiveness of the existing monitoring program in providing timely warnings of surface water quality issues in the Fresno Slough and MWA are considered.

Surface Water Quality Monitoring In order to determine compliance with existing water quality standards, surface water quality monitoring data from the Annual Reports were analyzed for constituents of concern—including arsenic, boron, molybdenum, selenium, and salinity (as EC or TDS)—and compared to applicable water quality thresholds described above. Surface water quality monitoring is currently performed as required for the MPG Pumping and

Monitoring Program under the 2004 Final EIS, Settlement Agreement No. 2, and subsequent 3-Year Extension Exchange Agreements. Water quality measurements are also taken for comparison from sources that contribute flows into the Mendota Pool and Fresno Slough, including the DMC, the San Joaquin River, the James Bypass for the Kings River, and the MWA, as well as groundwater contributions from the MPG. For information specific to groundwater quality from MPG wells, see Section 3.2, *Groundwater Quality*. The surface water quality monitoring program includes 11 monitoring locations within the Primary Study Area (Figure 36):

1. Columbia Canal
2. Mendota Dam
3. CCID Main Canal
4. DMC – at Bass Avenue, Check 21
5. CCID Outside Canal
6. Firebaugh Intake Canal
7. West of Fordel
8. Etchegoinberry (removed from sampling program in 2014)
9. MWA – approximately one mile south of Whites Bridge
10. James Irrigation District Booster Plant
11. Tranquillity Irrigation District Intake

During the years that the MPG executes an exchange with Reclamation, the MPG performs extensive surface water monitoring. With the exception of the Etchegoinberry sampling location, which was removed from the program in 2014, semi-annual grab samples are taken at 11 sampling locations, typically in June and October, and analyzed for irrigation suitability and trace elements. Additionally, monthly grab samples are analyzed for irrigation suitability.

The MPG also performs continuous EC measurements at the MWA, one mile south of Whites Bridge; although EC measurements are taken continuously at this location, readings are not checked on a frequent basis (approximately once per month). Sampling conducted by Reclamation, the Exchange Contractors, and James Irrigation District supplement MPG measurements in exchange years and provide most of the water quality data in years where there is no exchange. The results of surface water quality monitoring are analyzed and presented in the Annual Reports; the most recent Annual Report from the 2014 monitoring year is included in Appendix D.

Surface Water Mixing Models Two predictive models describing surface water mixing are used in the Surface Water Mixing Models of the Hydrogeologic Technical Analysis (Appendix E) to determine cumulative surface water quality effects, and those related to MPG pumping. The Northern Surface Water Mixing Model models surface water quality at the Mendota Dam, while the Southern Surface Water Mixing Model models surface water quality at the Fresno Slough and MWA.

The Surface Water Mixing Models were developed using a water budget approach for both the San Joaquin River at the Mendota Dam and for the Fresno Slough at the MWA. The water budget approach measures major inflows and outflows in the Mendota Pool and Fresno Slough to calculate predictive concentrations of constituents within the modeled locations. The models are used primarily to estimate salinity as TDS at these two locations. A key element of both models is an assumption of ongoing implementation of the design constraints detailed in Section 2.0, *Description of Alternatives* (refer to Table 4, Proposed Design Constraints) and restated in Section 3.3.1., *Design Constraints Addressing Surface Water Quality*.

The Surface Water Mixing Model was calibrated using data collected from 1990 to 2012. Considering 2012 a normal year represents a conservative analysis since the DWR classified it as

a dry year. The 2013, 2014, and 2015 water years were considered abnormally dry due to drought conditions. These years resulted in the use of San Joaquin River water by Exchange Contractors in addition to or in place of water delivered from the Delta through the DMC for the first time in history. Therefore, these conditions were not considered in the Surface Water Mixing Models and a separate Mixing Model for Dry Year Conditions was run to estimate conditions in the event of another drought of similar magnitude over the 20-year exchange period. While not used in the model calibration, the initial two years of the simulation period represent the 2013 and 2014 dry period, which allows the predictive scenario model inputs sufficient time to equilibrate to hydrologic conditions. Data collected during preparation of the 2013 and 2014 Annual Reports—and used to allow the model to reach equilibrium—is also provided in this section for informational purposes. The next twenty-year period (Year 1 through Year 20) was utilized for analysis of predictive scenario results.

Northern Surface Water Mixing Model: San Joaquin River at the Mendota Dam Changes in TDS concentrations in the San Joaquin River at the Mendota Dam were estimated using a modified formulation of the water budget model. Inflows into the northern branch of the Mendota Pool include the San Joaquin River upstream of the Pool, the DMC, and groundwater pumping in the FWD for exchange. Outflows include diversions from the Columbia Canal and flow over the Mendota Dam. Monthly average flow rates and TDS concentration of the surface water inflows and outflows were calculated from the groundwater flow and transport model from Year 1 through Year 20. More details on this model are included in the Surface Water Mixing Model section in the Hydrogeologic Technical Analysis (Appendix E).

Southern Surface Water Mixing Model: Fresno Slough at the MWA This model calculates TDS concentrations at the MWA based on the net inflow from the DMC and inflows from groundwater pumping. Water contributions from the DMC are calculated based on the fraction of total DMC inflow into the Mendota Pool which would reach the MWA. Flows from the San Joaquin River are assumed to have no influence on TDS concentrations in the MWA as flows do not typically reach that far south (flows are typically intercepted by intake canals within the northern area of the Fresno Slough) and are not considered in the southern surface water mixing model. Groundwater contributions to the Fresno Slough include MPG groundwater pumped for exchange under the Proposed Action and Alternative 2, pumping for Adjacent Overlying Use from wells located at Terra Linda Farms and Vista Verde Farms, pumped groundwater for the Meyers Water Bank, and pumped groundwater for the City of Mendota. Groundwater pumping from the FWD is not estimated to contribute significantly to TDS concentrations at the MWA as this water would be diverted to the north of the Mendota Pool and was omitted from the mass balance calculation. In instances where King River flood flows enter the Fresno Slough and the flow direction becomes northerly, the model is limited at predicting TDS concentrations because these events would be overly speculative due to the large number of variables occurring during large storm events. For this reason, northerly flows in the Slough are not included in the model. Further, northerly flows from flood events in the King River or from the San Joaquin River are generally of a higher quality than those from the DMC or groundwater pumping. Therefore, the results of the model represent a conservative estimate of impacts. More details on this model are included in the Surface Water Mixing Models section in the Hydrogeologic Technical Analysis (Appendix E).

Mixing Model Dry Year Conditions at the MWA Due to the frequency of drought conditions in California and the sensitivity of surface water quality within the MWA, an additional model was

prepared to predict the surface water quality resulting from implementation of the No Action Alternative, Proposed Action, and Alternative 2. This model predicts the surface water quality in the MWA that would be influenced by significant/consecutive dry years and drought conditions which may be experienced over the duration of the proposed 20-year Exchange Program.[40] More details on this model are included in the Surface Water Mixing Models section in the Hydrogeologic Technical Analysis (Appendix E).

Thresholds of Significance

The thresholds of significance for impacts are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as well as relevant water quality standards set forth by the Regional Boards, CDFW, and EPA, and thresholds established for the Proposed Action (see Table 4). These thresholds encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action and alternatives under consideration would result in a significant impact related to surface water quality if they would do any of the following:

1. Violate existing water quality standards or otherwise substantially degrade water quality;
2. Result in substantial water quality changes that adversely affect beneficial uses; or;
3. Result in substantive impacts on public health or environmental receptors

Surface water in the Primary Study Area are conservatively assumed to serve beneficial uses for agriculture, freshwater habitat, and wildlife habitat. As such, surface waters in these water bodies must comply with the objectives and criteria for each beneficial use. Surface waters in the Mendota Pool and Fresno Slough are not utilized for drinking water; drinking water in the study areas is pumped from groundwater wells. As a result, the Proposed Action and alternatives were not evaluated for their impacts on EPA- and SWRCB-established MCLs for drinking water. Please refer to Section 3.2, *Groundwater Quality*, of this EIS/EIR for an evaluation of the Proposed Action and Alternatives impacts on drinking water MCLs.

Significance of impacts resulting from the Proposed Action or alternatives is based on the exceedance of the most conservative numerical water quality standard applicable to the Primary Study Area. Surface water quality standards used in this EIS/EIR were established after substantial review of the San Joaquin River and Tulare Lake Basin Plans, MWA Refuge Water Management Plan, the California Toxics Rule, National Toxics Rule, communications with CVRWQCB and CDFW, and consultations with an Wood Environment & Infrastructure Solutions biologist and water specialist.

As no numeric thresholds for salinity apply to surface waters within the Mendota Pool and Fresno Slough, Reclamation's contractual water quality standards for the Mendota Pool also

[40] Although the Groundwater Model Report was completed in 2015, surface water quality information for the 2014 and 2015 water years was not yet available for inclusion in the Surface Water Mixing Models. Therefore, a year (2009) was selected during the calibration period of 1990 through 2012 for calibration of simulation of dry year conditions at the MWA. As such, surface water quality simulations are not representative of the trends observed at MWA since 2012.

serve as the basis for establishing a salinity threshold for surface waters at the MWA. The surface water quality thresholds are as follows (Table 22 and Table 23):

Table 22: Surface Water Quality Thresholds (Metals)

Parameter	Maximum Concentration	Reference and Notes
Arsenic	10 µg/L[1]	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2016a; criteria for Sacramento River and Delta. Dept. of Public Health Primary Maximum Contaminant Level (MCL).
Boron	800 µg/L[1]	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2016a; criteria for San Joaquin River reach between Merced River and Vernalis.
Molybdenum	19 µg/L[1]	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2016a; criteria for San Joaquin River reach between Sack Dam and Merced River. Beneficial Use Agricultural Water Quality, Ayers & Wescot 1985.
Selenium	2.0 µg/L[1]	Sacramento-San Joaquin Valley Basin Plan, CVRWQCB 2016a; criteria for San Joaquin River reach between Sack Dam and Merced River. Beneficial Use Agricultural Water Quality, Ayers & Wescot 1985.

Notes: Beneficial uses of California waters that may be protected against water quality degradation include domestic, municipal, agricultural, industrial, recreational, aesthetic enjoyment, preservation of fish and wildlife, and aquatic resources or preserves. Beneficial uses do not include all reasonable uses of water (i.e., wastewater disposal or dilution of salts; CVRWQCB 2016a).

[1] As the Basin Plans do not contain specific WQOs for the Mendota Pool or Fresno Slough, objectives that apply to nearby regions included within the Basin Plans are used. Thresholds for arsenic, boron, molybdenum and selenium concentrations are the same as thresholds for trace element concentrations in the 2004 Final EIS and are the WQOs listed in the Annual Reports. Reclamation's standard for selenium concentration in non-Project water introduced into federal facilities or for exchange is ≤ 2 ppb with no allowance for dilution. This criterion is based on the CVRWQCB's 1996 selenium objective of 2 ppb monthly average for Grasslands wetlands water supply channels.

Sources: CDFW 2011; California Toxics Rule; National Toxics Rule; CVRWQCB 2016a.

Table 23: Surface Water Quality Thresholds (Salinity)

Parameter	Maximum Concentration	Measurement Type
TDS	600 mg/L	Monthly (January – August; December)
	450 mg/L	Monthly (September – November)
	450 mg/L	Annual

Impacts and Mitigation Measures

Analysis of surface water quality impacts associated with the Proposed Action and Alternatives primarily focus on the potential for deterioration in surface water quality within the Mendota Pool, the Fresno Slough, the MWA, and along the portion of the San Joaquin River and associated canals that MPG wells in FWD use to convey groundwater to the Mendota Pool.

The Proposed Action and Alternatives would introduce groundwater into the Mendota Pool and Fresno Slough that would mix with surface water within these water bodies. Surface water would then be removed from the Mendota Pool via irrigation canals and pipelines located in both the northern and southern portions of the Mendota Pool and Fresno Slough. While the Mendota Pool receives flows from the DMC, the Proposed Action and alternatives would have no effect on water quality within the canal because all groundwater would be pumped into the Mendota Pool south of Check 21, which limits flows southward from the DMC and into the Pool. On the rare

occasion that water in the Pool overtops the Mendota Dam, overflow water is conveyed into the San Joaquin River and not northward into the DMC.

Based on existing surface water flows and quality, the highest potential for water quality degradation associated with increased salinity would be in the Fresno Slough and the MWA. Potential impacts would be related to the periodic inflow of lower quality (i.e., higher salinity) MPG groundwater into the Fresno Slough north of SR-180. While there is some potential for impacts in the northern portion of the Mendota Pool (e.g., inputs into the San Joaquin River from wells located in the FWD), water in this area generally contains a lower salinity level due to its proximity to Check 21 and because groundwater from wells in this area generally is lower in salinity compared to wells along the Fresno Slough.

Further, none of the alternatives would impact the direction of flow of the Fresno Slough. Input of groundwater into the Mendota Pool, as a part of the groundwater exchange, would occur during the agricultural season and would not influence the direction of flow as deliveries would occur when surface water in the Fresno Slough is already flowing in a southerly direction.

Under the Proposed Action and Alternative 2, MPG would continue monitoring of MPG-related impacts to surface water quality under a modified version of the adaptive management program currently in effect under the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements. The revised adaptive monitoring program would monitor surface water quality within the Mendota Pool and Fresno Slough for potential impacts resulting from the mixing of surface and groundwater. Monitoring under this effort is consistent with requirements for groundwater and surface water interaction under SGMA, and MPG monitoring efforts under these actions would contribute to local GSPs and sustainable groundwater management practices.

Salinity Monthly average TDS concentrations between the beginning and end of the 20-Year Exchange Agreements were modeled for locations at the Mendota Dam and MWA (Table 24, Table 25, and Table 26). Projected TDS concentrations at the Mendota Dam under all alternatives are below monthly average TDS thresholds. Further, the projected annual average TDS concentrations at the Mendota Dam are below the threshold for annual average TDS concentrations.

As shown in Table 25, the monthly average TDS concentrations at the MWA in 2012 (the most recent normal year on which the Surface Water Mixing Models are based) were exceeded in March, April, May, September, and October. Inflows from the DMC were assumed to range from about 12,000 to 130,000 AF per month and were assumed to have TDS concentrations generally within Reclamation's contractual water quality obligations, ranging from about 240 to 460 mg/L. TDS from the DMC had an annual average of 353 mg/L. These exceedances are likely to occur during dry or very dry years where MPG pumping would be greater. Under wet or normal water years, the MWA is not expected to see elevated salinity levels (Table 25). The results of the Surface Water Mixing Models are described in detail below. This result is reinforced by the Mixing Model Dry Year results, which show that 2009, a historically dry year, exceeded the existing salinity threshold at the MWA during the months of April, May, and September to November. Both the 2009 and 2012 years also exceeded the existing annual average salinity threshold at the MWA.

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Table 24: Predicted Average Monthly TDS concentrations at the Mendota Dam During Normal Years

Month	Existing Conditions (2012)[1]	Exceedance of TDS Thresholds[3]	No Action Alternative[2]	Exceedance of TDS Thresholds[3]	Proposed Action[4]	Exceedance of TDS Thresholds[3]	Alternative 2[4]	Exceedance of TDS Thresholds[3]
January	458	No	364	No	365	No	365	No
February	416	No	345	No	345	No	345	No
March	388	No	279	No	283	No	283	No
April	365	No	255	No	263	No	263	No
May	189	No	260	No	265	No	265	No
June	265	No	256	No	256	No	256	No
July	223	No	220	No	220	No	220	No
August	--	No	257	No	258	No	257	No
September	407	No	304	No	306	No	306	No
October	383	No	302	No	304	No	304	No
November	237	No	330	No	330	No	330	No
December	255	No	324	No	324	No	324	No
Annual Average	295	No	291	No	293	No	293	No

Note: Under model conditions, none of the monthly and annual averages exceed water quality thresholds for the Mendota Pool as described in Table 23. Further, it is important to consider that the current design constraints lower the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the non-Fall months, from 2,000 mg/L under the previous design constraints to 1,600 mg/L under the existing design constraints. The Surface Water Mixing Model is conservative when predicting TDS concentrations at the Mendota Dam because it assumes the previous limit of 2,000 mg/L.

[1] Though designated as a "dry" year by the DWR California Cooperative Snow Survey, MPG considered 2012 as a "normal" year. These findings were designated a normal year for the purposes of providing a conservative analysis (DWR 2016).

[2] Based on 33,395 AFY of pumping for Adjacent Overlying Use.

[3] For the purpose of analyzing predicted TDS concentrations, TDS thresholds for the Fresno Slough and MWA are based on DMC Initial Concentrations of 400 mg/L, specified in the Hydrogeologic Technical Analysis (Appendix E). Thresholds for analysis are as follows: 600 mg/L Monthly (January-August, December); 450 mg/L Monthly (September-November); and 450 mg/L Annual (Annual Average).

[4] Based on an average of 21,052 AFY of MPG pumping for exchange, and 14,000 AFY for Adjacent Overlying Use over the 20-year period. Approximately 10,066 AFY of pumping for exchange would flow into the Mendota Pool from the FWD.

Source: LSCE & KDSA 2015 (Appendix E), DWR 2016.

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Table 25: Predicted Average Monthly TDS concentrations at the MWA During Normal Years

Month	Existing Normal Conditions (2012)[1]	Exceedance of TDS Thresholds[3]	No Action Alternative[2]	Exceedance of TDS Thresholds[3]	Proposed Action[4]	Exceedance of TDS Thresholds[3]	Alternative 2[4]	Exceedance of TDS Thresholds[3]
January	458	No	447	No	448	No	448	No
February	525	No	425	No	424	No	424	No
March	692	**Yes**	426	No	480	No	479	No
April	927	**Yes**	439	No	485	No	485	No
May	747	**Yes**	425	No	464	No	460	No
June	458	No	394	No	388	No	386	No
July	558	No	317	No	310	No	307	No
August	565	No	389	No	402	No	398	No
September	628	**Yes**	415	No	411	No	410	No
October	538	**Yes**	335	No	399	No	399	No
November	--	--	352	No	351	No	351	No
December	--	--	409	No	409	No	409	No
Annual Average	508	**Yes**	398	No	414	No	413	No

Note: It is important to consider that the existing design constraints lower the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the non-Fall months, from 2,000 mg/L under the previous design constraints to 1,600 mg/L under the existing design constraints. The Surface Water Mixing Model is conservative when predicting TDS concentrations at the Mendota Dam because it assumes the previous limit of 2,000 mg/L.

[1] Though designated as a "dry" year by the DWR California Cooperative Snow Survey, MPG considered 2012 as a "normal" year. These findings were designated a normal year for the purposes of providing a conservative analysis (DWR 2016).

[2] Based on 33,395 AFY of pumping for Adjacent Overlying Use.

[3] For the purpose of analyzing predicted TDS concentrations, TDS thresholds for the Fresno Slough and MWA are based on DMC Initial Concentrations of 400 mg/L, specified in the Hydrogeologic Technical Analysis (Appendix E). Thresholds for analysis are as follows: 600 mg/L Monthly (January-August, December); 450 mg/L Monthly (September-November); and 450 mg/L Annual (Annual Average).

[4] Based on an average of 21,052 AFY of MPG pumping for exchange, and 14,000 AFY for Adjacent Overlying Use over the 20-year period. Approximately 10,066 AFY of pumping for exchange would flow into the Mendota Pool from the FWD.

Source: LSCE & KDSA 2015 (Appendix E), DWR 2016.

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Table 26: Predicted Average Monthly TDS concentrations at the MWA During Dry Years

Month	Existing Dry Year Conditions (2009)[1]	Exceedance of TDS Thresholds[2]	No Action Alternative[3]	Exceedance of TDS Thresholds[4]	Proposed Action[5]	Exceedance of TDS Thresholds[4]	Alternative 2[5]	Exceedance of TDS Thresholds[4]
January	--	--	447	No	448	No	448	No
February	--	--	425	No	424	No	424	No
March	--	--	426	No	487	No	486	No
April[6]	984	**Yes**	439	No	485	No	485	No
May	1000	**Yes**	440	No	487	No	483	No
June	462	No	398	No	392	No	390	No
July	--	--	323	No	315	No	313	No
August	393	No	431	No	455	No	450	No
September	596	**Yes**	428	No	425	No	424	No
October	514	**Yes**	336	No	405	No	404	No
November	555	**Yes**	352	No	351	No	351	No
December	565	No	410	No	409	No	409	No
Annual Average	634	**Yes**	405	No	424	No	422	No

Note: It is important to consider that the existing design constraints lower the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the non-Fall months, from 2,000 mg/L under the previous design constraints to 1,600 mg/L under the existing design constraints. The Surface Water Mixing Model is conservative when predicting TDS concentrations at the Mendota Dam because it assumes the previous limit of 2,000 mg/L.

[1] Though considered a "dry" year by MPG, DWR California Cooperative Snow Surveys designated the 2009 San Joaquin Valley water year as "below normal" (DWR 2016).

[2] Based on 33,395 AFY of pumping for Adjacent Overlying Use. This designation was used to provide a conservative analysis as a year considered "below normal" by the DWR would be considered to have greater runoff than one considered a "dry" year by MPG.

[3] For the purpose of analyzing predicted TDS concentrations, TDS thresholds for the Fresno Slough and MWA are based on DMC Initial Concentrations of 400 mg/L, specified in the Hydrogeologic Technical Analysis (Appendix E). Thresholds for analysis are as follows: 600 mg/L Monthly (January-August, December); 450 mg/L Monthly (September-November); and 450 mg/L Annual (Annual Average).

[4] Based on an average of 21,052 AFY of MPG pumping for exchange, and 14,000 AFY for Adjacent Overlying Use over the 20-year period. Approximately 10,066 AFY of pumping for exchange would flow into the Mendota Pool from the FWD.

Source: LSCE 2015 (Appendix E), DWR 2016.

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Trace Elements The Annual Reports indicate that the presence of arsenic, boron, molybdenum, and selenium have generally been lower than the thresholds identified for beneficial use of Mendota Pool water, with the exception of 2014. While concentrations of trace elements at Sample Locations 10 (James Irrigation District Booster Plant) and 11 (Tranquillity Irrigation District) have occasionally exceeded these thresholds, water quality at these locations is not influenced by MPG groundwater because they are located at least five miles from MPG input locations and are downstream from Fresno Slough and MWA when flows in the Slough are to the south.

The exceedance of boron concentrations in the MWA in 2014 represents a rare event in which a trace element has exceeded specific WQO for surface waters of the Mendota Pool and Fresno Slough. This exceedance is generally attributed to the extensive duration and effect of the 2012–2015 drought conditions, and is not expected to occur during normal conditions. Further, as discussed in Section 3.2, *Groundwater Quality*, trace elements have been observed in low concentrations, well below acceptable standards, within MPG groundwater throughout the MPG Pumping and Monitoring Program area. Therefore, MPG groundwater inputs have very little effect on trace element concentrations in the Mendota Pool, Fresno Slough, and MWA, and are not discussed in detail in this analysis.

Based on over 14 years of monitoring data, the potential for surface water quality impacts is likely entirely confined to salinity as long-term monitoring reveals that the presence of trace elements is uniformly low and well below adopted standards, with the exception of a couple of anomalous readings over the last decade in locations far removed from the MPG well fields. As such, impacts specific to trace elements related to MPG pumping under any considered alternative are not expected to be significant, and continuation of the monitoring of trace elements under the MPG Pumping and Monitoring Program would further ensure low levels of trace elements.

Impact SWQ-1: Effects of Water Quality in the Mendota Pool
No Action Alternative The amount of MPG groundwater introduced into the Pool (which is generally of lower quality than inflows from the DMC and FWD via the San Juaquin River) would be reduced. However, the TDS concentration of groundwater discharged into the Mendota Pool would be unmonitored; therefore, groundwater with TDS concentrations higher than those allowed under the proposed design constraints or under existing conditions could be introduced into surface waters at the Mendota Pool.

Input of MPG groundwater into the Fresno Slough would usually have little influence on water quality in the northern end of the Mendota Pool as the flow direction in the Fresno Slough is generally to the south. However, because no design constraints would be in place, MPG would also be able to deliver groundwater in times of northerly flow and input water from wells with higher salinity located to the south of the Mendota Dam. However, northerly flow in the Slough generally occurs during wet years at times of flooding; therefore, MPG would not likely pump a substantial volume of water into the Pool during these periods. While use of water from wells with higher salinity levels would no longer be monitored or regulated, the overall reduction in MPG groundwater entering surface waters and the mixing of this water with surface waters in the Mendota Pool would limit impacts.

As shown in Table 24, during normal years, TDS concentrations near the Mendota Dam are modeled to have a monthly average between 220 and 364 mg/L, with an annual average of 291 mg/L. During dry years, TDS concentrations near the Mendota Dam are modeled to have a monthly average between 317 and 447 mg/L under the No Action Alternative, with an annual average of 398 mg/L.

Under existing conditions, the average annual TDS concentration occurring at the Mendota Dam during exchange years is 303 mg/L (Table 17). As a result, the No Action Alternative would result in materially the same salinity concentration during normal years at the Mendota Dam; however, salinity levels at the Mendota Dam would increase during dry years as a result of increased MPG pumping, and decreases in DMC flows that would be diverted to Westlands. The modeled results show that TDS concentrations would be highest in winter and lowest in summer, following the same pattern observed in the Annual Reports. Further, these projected concentrations would be below TDS thresholds presented in Table 23 and implementation of the No Action Alternative would result in minimal changes in salinity at this location.

Proposed Action The Annual Reports indicate that groundwater quality from MPG well inputs in FWD along the San Joaquin River is generally higher than from those along the Fresno Slough, particularly when compared to those wells west of the Slough (Appendix D). MPG groundwater inputs within FWD would mix with high quality San Joaquin River flows before reaching the Mendota Pool, which would also mix with DMC flows at the Pool.

As shown in Table 24, implementation of the design constraints and continuation of the MPG Pumping and Monitoring Program would ensure that TDS concentrations at the Mendota Dam are below the stated thresholds during normal years. TDS concentrations at the Mendota Dam are materially the same as what would occur under the No Action Alternative (293 mg/L vs 291 mg/L), but lower than TDS concentrations that occur under exiting conditions (293 mg/L vs. 303 mg/L). Because the existing conditions consider the exchange that occurred during the abnormally dry 2013–2014 years, actual concentrations would be lower if these conditions were excluded.

MPG groundwater inputs into the San Joaquin River from wells in the FWD would be subject to maximum TDS concentrations as well. Further, MPG would be required to curtail wells if EC measurements at the Exchange Contractors' canal intakes exceed that of inflows from the DMC by 90 µmhos/cm for a period of three consecutive days or more. The design constraints only allow MPG inputs into the Fresno Slough during times of southerly flow. As such, groundwater from MPG wells along the Fresno Slough, which may have relatively high TDS concentrations, would not mix with surface waters to the north in the Mendota Pool. Implementation of design constraints and ongoing monitoring have proven to be effective at maintaining surface water quality standards at the Mendota Dam under the existing conditions, and continuation of these measures under the Proposed Action is expected to yield similar results.

The model anticipates that the continued migration of the naturally-occurring saline front west of the Fresno Slough would likely result in changes in the pumping distribution across MPG wells in order to conform to the design constraints. Specifically, the model projects that pumping from FWD inputs into the San Joaquin River would increase from an average of 7,485 to 10,066 AFY to compensate for wells affected by the continued migration of the naturally-occurring saline front. Even when considering the variation in individual well pumping over the 20-year

exchange period, the Proposed Action is not expected to exceed salinity thresholds at the Mendota Pool during normal or dry years (Table 24 and Table 25).

It is important to note that the existing design constraints lower the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the non-fall months, from 2,000 mg/L under the previous design constraints to 1,600 mg/L under the existing design constraints.[41] The Surface Water Mixing Model is conservative because it assumes the previous limit of 2,000 mg/L would also be used for the Proposed Action.

Further, as discussed in Section 3.2, *Groundwater Quality*, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) may also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. However, any change to the rate of migration is difficult to estimate until adoption of the GSPs. MPG groundwater pumping under the Alternative 2 would not significantly contribute to this migration.

Alternative 2 As shown in Table 24, salinity levels at the Mendota Dam during normal years are modeled to be identical to the Proposed Action (i.e., 293 mg/L). When compared to the No Action Alternative, Alternative 2 would still result in materially the same low TDS concentrations at the Mendota Dam during the normal year (Table 24; 293 mg/L vs. 291 mg/L). This is because the amount of recharge is not enough to offset the general reduction in MPG inputs and increase in CVP inflows that would occur under the No Action Alternative.

MPG groundwater inputs for exchange within FWD would mix with high quality San Joaquin River flows before reaching the Mendota Pool, which would also mix with DMC flows at the northern end of the Pool. The implementation of an expanded recharge basin under Alternative 2 also does not affect the existing design constraints under which MPG wells would be required to operate under. As with the Proposed Action, implementation of the design constraints and monitoring would be expected to yield similar water quality levels at the Mendota Dam as under the existing conditions and the Proposed Action (Table 24 and Table 25).

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact SWQ-2: Effects on Water Quality in the Fresno Slough and MWA
No Action Alternative Although the exchange of CVP water would not occur with Reclamation for use in Westlands, groundwater would likely continue to be pumped into the Pool and Slough for Adjacent Overlying Use. The Southern Surface Water Mixing Model conservatively estimates these inflows to be the full 33,395 AFY of groundwater pumped for Adjacent Overlying Use. However, the absence of pumping limits and design constraints that cap TDS concentrations in groundwater entering the Fresno Slough under the No Action Alternative could result in higher TDS groundwater inputs into the Fresno Slough than estimated in the model. Further, continued migration of the naturally-occurring saline front in groundwater along the

[41] The existing thresholds that set the maximum TDS concentrations allowed in MPG discharges to the Mendota Pool and Fresno Slough were first implemented in the 2018 irrigation season with the Additional One-Year Extension of the Mendota Pool Group Exchange Agreements (EA-17-053), which was finalized in May 2018.

Fresno Slough would continue to increase TDS concentrations within wells located west of the Slough (see Section 3.2, *Groundwater Quality*).

The results of Southern Surface Water Mixing Model indicates that average monthly TDS concentrations under normal conditions would not exceed monthly TDS thresholds. Simulated concentrations at the MWA range from 317 mg/L in July to about 447 mg/L in January (Table 25). Yearly average TDS concentrations are modeled to be 398 mg/L, below the average annual threshold for TDS concentrations. Adjacent pumping from MPG led to an average annual simulated increase of 36 mg/L at the MWA (Appendix E, pg. 73). These results represent projected monthly average TDS concentrations across all water years over the 20-year period, regardless of exchange, and are projected to result in slightly improved TDS concentrations compared to existing conditions, which were found to result in a TDS concentration of 508 mg/L during a normal year (i.e., 2012) (Table 25).

During dry year conditions, simulated TDS concentrations at the MWA ranging from about 323 mg/L in July to about 447 mg/L in January (Table 26). The annual average TDS concentration in surface waters at the MWA are predicted to be approximately 405 mg/L (Table 26). As with a normal year scenario, this is below the average annual threshold (450 mg/L). During a dry year, the increase in TDS concentrations at the MWA due to MPG pumping for Adjacent Overlying Use under the No Action Alternative is estimated to be 41 mg/L annually (Appendix E, pg. 73).

Proposed Action The Annual Reports have shown that annual TDS concentrations at the MWA have occasionally exceeded TDS thresholds, particularly during the abnormally dry 2009 and 2013–2014 years. These results indicate that the past implementation of the MPG pumping programs and monitoring is not, and would likely never be, independently influential enough to fully protect water quality within the MWA when considering other inputs to the Mendota Pool and Fresno Slough (Table 19). For instance, while MPG is the largest groundwater pumping entity along the Fresno Slough, other water sources introduced into the Fresno Slough, including groundwater inputs from other pumpers (e.g., Tranquillity Irrigation District, James Irrigation District), and irrigation water from the DMC, which has been experienced higher levels of salinity in the recent abnormally dry years, have contributed to elevated TDS levels that exceed annual TDS thresholds within the MWA. However, based on known salinity concentrations in MPG groundwater and the southerly direction of surface water flows, it is recognized that MPG groundwater is a contributor to high TDS concentrations within the Fresno Slough upstream from the MWA.

The Proposed Action's design constraints, and more frequent monitoring and reporting of salinity levels at MPG discharge points into the Mendota Pool and Fresno Slough, are intended to address identified deficiencies in the existing monitoring and reporting program. For instance, the existing pumping programs are generally administered by MPG at the beginning of the irrigation year and are designed to meet both supply needs and ensure consistency with the design standards. However, climatic factors and changes to irrigation needs have made fully implementing planned pumping programs difficult in the past. In addition, relatively infrequent collection of monitoring data at the MWA and resultant delays in shutting down wells with higher salinity levels further limited the effectiveness of existing design standards.

To address these deficiencies, the existing design constraints lower the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the months of January to August and December (the non-Fall months), from 2,000 mg/L to 1,600 mg/L. Further, the monitoring and reporting program has been revised to now include monthly field samples of salinity levels at MPG discharge points to the Mendota Pool and Fresno Slough, with the results of this effort being reported to Reclamation monthly, as opposed to being reported only with the Annual Reports under existing conditions.

The Southern Surface Water Mixing Model recognizes that the continued eastward migration of the naturally-occurring groundwater saline front is projected to result in increased TDS concentrations within MPG wells west of the Fresno Slough. However, because the proposed design constraints restrict inputs exceeding the revised TDS concentration, they somewhat negate the ability of the increasing salinity in these wells to incrementally degrade surface water quality at the MWA. The design constraints also require MPG discharge to respond to the proposed surface water thresholds. Based on coordination with Reclamation, MPG's monitoring team would be responsible for ensuring timely implementation of the pumping design constraints that require shut down of wells along the Fresno Slough. Effective application of this proposed design constraints would allow the MPG to respond to increased salinity within the MWA in a timely manner. Enforcement of this constraint by MPG's team would be coordinated with the MWA to aid in cooperative management of surface water resources in the vicinity, reducing the potential for exceedance of established salinity thresholds and the improvements of surface water quality within the Fresno Slough and MWA. Reclamation and the MPG would coordinate with other water users around the Pool in order to address water quality exceedances. However, it is important to note that the Proposed Action would have no authority to regulate the water quality of, or curtail, non-MPG flows into the Fresno Slough and MWA, including those from the DMC, the Tranquillity Irrigation District, the City of Mendota, or the San Juaquin River.

As indicated in Table 25, TDS concentrations expected to occur under normal conditions at the MWA are modeled to have a monthly average range of 310 to 485 mg/L, with an annual average of 414 mg/L. The contribution of TDS at the MWA from adjacent pumping and pumping for exchange averaged about 50 mg/L annually (28 mg/L for exchange pumping and 22 mg/L for adjacent pumping). The model results indicate that even in the event that CVP inputs exceed contractual water quality standards, MPG pumping would not result in a significant increase in TDS concentrations at the MWA. Under normal conditions, the Proposed Action represents a marginal increase in annual TDS concentrations at the MWA of 16 mg/L when compared to the No Action Alternative (Table 25).

Although past dry-year conditions have caused threshold exceedances at the MWA (Table 20, Table 26), the existing design constraints reduce the maximum salinity of MPG groundwater discharged into the Pool from 2,000 mg/L to 1,600 mg/L (during the non-Fall months). During dry year conditions, even when the previous design constraints are assumed in the modeling efforts, TDS concentrations are expected to incrementally increase with a modeled monthly average of 315 to 487 mg/L, and an annual average of 424 mg/L (Table 26). Assuming dry year conditions, pumping from MPG leads to a total average annual increase of 58 mg/L in TDS at the MWA. (32 mg/L for exchange pumping and 26 mg/L for adjacent pumping). The remainder of the relative increase in TDS concentrations in the MWA during a dry year is attributed to a 22,500 AFY reduction in inflows from the DMC to the MWA. As under normal conditions, the

Proposed Action represents a marginal increase in TDS concentrations of 19 mg/L during a dry year when compared to the No Action Alternative.

It is important to note that since the Southern Surface Water Mixing Model is based on the previous design constraint that restricts the input of groundwater exceeding 2,000 mg/L during the non-Fall months and does not reflect the existing design constraint to restrict inputs exceeding 1,600 mg/L during this period. It is estimated that the existing design constraints would somewhat reduce the MPG contribution to salinity levels at the MWA identified by the model. Even without a reduction in maximum TDS concentration from 2,000 mg/L to 1,600 mg/L and without the cessation of high salinity wells per the design constraints, TDS concentrations would be below the average monthly and annual average TDS concentration thresholds during both normal and dry years. Further, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area could also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. However, any change to the rate of migration is difficult to estimate until adoption of the GSPs. MPG groundwater pumping under the Proposed Action would not significantly contribute to this migration.

Alternative 2 Impacts would be similar to those described under the Proposed Action; however, TDS concentrations in the MWA would be marginally lower between May and September under normal conditions, and between May and October under dry conditions, when compared to the Proposed Action, as a result of a minor improvement in groundwater quality stemming from the recharge efforts. Specifically, recharge under Alternative 2 would limit or slow the continued migration of the naturally-occurring saline front and associated TDS increases within wells in the vicinity of Terra Linda Farms. While this would slightly lower TDS concentrations within some MPG wells west of the Fresno Slough, results of Southern Surface Water Mixing Model indicate that this would only incrementally affect TDS concentrations in surface waters at the MWA.

Although past dry-year conditions have caused threshold exceedances at the MWA (Table 20, Table 26),, similar to the Proposed Action, even when considering the previous design constraints, TDS concentrations under normal conditions are projected to be below the monthly thresholds for TDS concentrations and range between 307 mg/L and 485 mg/L in the winter, spring, and summer, and between 351 mg/L and 410 mg/L in the fall (Table 25). During normal conditions, the annual average TDS would be 1 mg/L less than under the Proposed Action (413 mg/L vs. 414 mg/L) under modeled conditions. During dry conditions, results would also be similar to the Proposed Action, ranging between 313 mg/L and 486 mg/L in the winter, spring, and summer, and between 351 mg/L and 409 mg/L in the fall (Table 26). During dry conditions, results would also be similar to the Proposed Action. During dry conditions, the annual average TDS would be 2 mg/L less than under the Proposed Action (422 mg/L vs. 424 mg/L). As with the Proposed Action, the results of the Southern Surface Water Mixing Model are made conservative by the fact that they are based on the previous design constraint restricting inputs exceeding a TDS threshold of 2,000 mg/L during the non-Fall months and not the existing design constraint to restrict inputs exceeding 1,600 mg/L during this same period. Further, as discussed in Section 3.2, *Groundwater* Quality, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) may also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. However, any change to the rate of migration is difficult to estimate until adoption

of the GSPs. MPG groundwater pumping under the Alternative 2 would not significantly contribute to this migration.

Construction of the River Ranch Recharge Basin has the potential to result in the discharge of pollutants to adjacent water bodies, adversely affecting water quality of the Fresno Slough. Construction would include excavation, grading, and other earthwork that would occur across most of the 86-acre basin area. Potential for substantial increases in soil erosion and sediment transport into adjacent water bodies could occur due to runoff waters moving over exposed areas and newly created slopes and entering the drainage system leading to the Fresno Slough. Construction runoff flowing into the Fresno Slough would also affect surface water quality at the MWA. However, issuance of a Section 402 permit may be required under Alternative 2 for the construction of the River Ranch Recharge Basin, depending on the discretion of the CVRWQCB. Otherwise, Alternative 2 would not generate point sources of pollution that would require issuance of a Section 402 permit. Construction activities may also be subject to the California SWRCB Construction Stormwater Program Construction General Permit Order (2009-0009-DWQ), requiring developed proposing disturbance of one (1) or more acres of soil to obtain coverage under the Construction General Permit Order. Acquisition of and compliance with necessary permits prior to construction of the River Ranch Recharge Basin would reduce potential for polluted runoff and degradation of receiving waters through implementation of required erosion and runoff control measures, best management practices to control spills, and a construction storm water pollution prevention plan. Compliance with the regulations of the CWA, RWQCB, and SWRCB would ensure construction activities associated with Alternative 2 would not substantially adversely affect surface water quality of the Fresno Slough or other downstream receiving waters.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Effects

Related projects identified as having potential impacts to surface water quality include those that would either transfer water or alter flows into or out of the Mendota Pool, Fresno Slough, or San Joaquin River. The Major Related Projects in the region that would affect surface water quality in the Mendota Pool, Fresno Slough, and MWA include:

- Tranquillity Irrigation District Transfers to the San Luis Water District;
- Meyers Water Bank;
- Firebaugh Canal Water District Transfers;
- CCID Transfers;
- DMC Pump-in Program
- SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project;
- Maintenance for the Mendota Dam;
- Increased flows in the San Joaquin River due to Restoration Flows; and

- Land taken out of agricultural production due to accommodate the floodplain and setback levees for the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project.

Details of these projects are provided in Section 3.0.3 *Related Projects*.

Many of these Related Projects involve CVP water management actions that may affect deliveries to the Mendota Pool and have the potential to affect the volume and timing of DMC flows that could either increase or decrease transfers or flows through the Mendota Pool. This in turn affects water quality in the Pool and Slough. Related Projects include short-term transfers lasting just two years, or sufficient information has not been developed at this time to assess potential surface water quality impacts. Related Projects that include transfers of small water volumes between water districts (less than 20,000 AF) are not expected to cumulatively impact surface water quality and flows as the conveyance of these waters is relatively small compared to the total volume of flows through the Mendota Pool and Fresno Slough. Related Projects that would substantially increase the volume of DMC flows through the Pool and Slough may have potentially negative effects as the DMC has experienced declines in water quality in recent years; however, this trend may be reversed during normal or wet years of precipitation. In addition, projects that involve groundwater inputs that feed into the Mendota Pool and Fresno Slough, such as Tranquillity Irrigation District Transfers and Exchange Agreements for the Conveyance of Groundwater in the DMC could further contribute to adverse water quality impacts. The extent and magnitude of cumulative effects resulting from related projects transferring water through the Mendota Pool is unknown at this time.

While the results of the Surface Water Mixing Models suggest that surface water quality under any of the alternatives may be slightly improved under cumulative conditions, the Surface Water Mixing Models assume the Mendota Pool would continue to be influenced by Restoration Flows. However, the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project would divert high quality Restoration Flows which would otherwise mix with waters in the Mendota Pool and Fresno Slough around the Mendota Pool and Mendota Dam to accommodate fish migration as required by the San Joaquin River Restoration Settlement Act of 2009. San Joaquin River flows for contract deliveries (i.e., 2,500 AFY) would continue to enter the Pool even following implementation of the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project. Following completion of this Related Project, surface water quality in the Mendota Pool and farther south in the Fresno Slough and MWA may experience increases in salinity concentrations beyond what was previously anticipated. However, this largely mimics existing San Joaquin River flows to the Mendota Pool and therefore, the Surface Water Mixing Models do not account for Restoration Flows beyond those contractually obligated to be delivered to the Mendota Pool. This is particularly true for the South Surface Water Mixing Model for the Fresno Slough and MWA, which accounts for no San Joaquin River flows under existing or future conditions.[42]

Furthermore, approximately 1,080 acres of land in FWD would be fallowed to accommodate the floodplain and setback levees for the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project. As part of the Reach 2B Improvements, a number of FWD wells would

[42] The 2,500 AF of water delivered into the Mendota Pool from the San Joaquin River for contract services would be intercepted in the northern portions of the Fresno Slough by various intake canals. These San Joaquin River flows would not reach the extent of the South Surface Water Mixing.

be replaced and a new canal would potentially allow MPG well inputs to enter the Mendota Pool. Under this scenario, MPG well inputs from FWD would no longer enter the San Joaquin River. Pumping for adjacent overlying use in FWD would be reduced. Therefore, impacts associated with groundwater pumping inputs into the San Joaquin River north of the Mendota Pool would be reduced under cumulative conditions.

This migration of the naturally-occurring saline front may also be slowed by implementation of GSPs under SGMA, which require groundwater basins to achieve sustainable yield within 20 years (i.e., by 2040). By reducing regional pumping to a sustainable yield, the major factor drawing the saline front northeastward would be mitigated, and may be halted or reversed in localized areas when combined with Restoration Flows or local recharge efforts. The regulations of management strategies that each regional GSPs chooses to achieve sustainable yield by 2040 and any effect they would have on regional migration of the saline front is challenging to predict at this time because full enforcement of a GSP approval of the GSP management strategies will not be realized until 2020 at the earliest. But there is a possibility that implementation of the adopted management strategies may result in higher quality groundwater being discharged into the Mendota Pool and Fresno Slough. Even so, it is important to note that the Proposed Action and Alternative 2, with specific design constraints that limit pumping and recharge components, provide examples of the programs that will likely be required to achieve SGMA's goal of sustainable groundwater yield by 2040. By contributing to the objectives of SGMA, the Proposed Action and Alternative 2 may incrementally slow the continued migration of the naturally-occurring saline front and improve the quality of groundwater discharged to surface waters when combined with others' efforts to implement the adopted GSPs.

Impact SWQ-3 (Cumulative): Effects on Water Quality in the Mendota Pool
Cumulatively when evaluating surface water quality within the Mendota Pool, the Surface Water Mixing Models predicted less severe impacts. This decrease in salinity was associated with the loss of MPG farmlands at the FWD and reductions in adjacent pumping resulting from the Reach 2B Improvements. Specifically, the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project would require well replacement and relocation south and away from the current river alignment, and possibly canal construction to accommodate groundwater from FWD being pumped directly into the Mendota Pool or Fresno Slough instead of the San Joaquin River. Water quality within the northern portion of the Mendota Pool would continue to be subjected to seasonal variations in both the quantity and quality of water deliveries from both the San Joaquin River and the DMC. However, MPG groundwater inputs into the Pool would not significantly degrade surface water quality. Therefore, MPG actions under cumulative conditions would not have a significant material effect on surface water quality with the Mendota Pool (Table 29).

No Action Alternative Prior to the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project, Restoration Flows would improve water quality at the Mendota Dam. Subsequent to the SJRRP – Mendota Pool Bypass and Reach 2 Improvements Project, these high-quality flows would bypass the Mendota Pool, except for 2,500 AFY which would be contractually obligated to be delivered to the Pool for use by the Exchange Contractors. This largely mimics existing San Joaquin River flows to the Mendota Pool and the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project and loss of lands along the San Joaquin River would not result in a

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Table 27: Predicted Average Monthly TDS concentrations at the Mendota Dam During Normal Years (Cumulative Impacts)

Month	Existing Conditions (2012)[1]	Exceedance of TDS Thresholds	No Action Alternative[2]	Exceedance of TDS Thresholds	Proposed Action[3]	Exceedance of TDS Thresholds	Alternative 2[3]	Exceedance of TDS Thresholds
January	458	No	346	No	346	No	346	No
February	416	No	374	No	374	No	374	No
March	388	No	242	No	245	No	245	No
April	365	No	156	No	160	No	160	No
May	189	No	218	No	222	No	222	No
June	265	No	205	No	205	No	205	No
July	223	No	239	No	239	No	239	No
August	--	No	262	No	262	No	262	No
September	407	No	302	No	303	No	303	No
October	383	No	289	No	290	No	290	No
November	237	No	209	No	209	No	209	No
December	255	No	270	No	270	No	270	No
Annual Average	295	No	259	No	260	No	260	No

Note: Under model conditions, none of the monthly and annual averages exceed Water Quality Standards for the Mendota Pool and Fresno Slough. Water Quality Standards for the Mendota Pool and Fresno Slough are as described in Table 24.

[1] Though designated as a “dry” year by the DWR California Cooperative Snow Survey, MPG considered 2012 as a “normal” year (DWR 2016).

[2] Based on 33,395 AFY of pumping for Adjacent Overlying Use.

[3] For the purpose of analyzing predicted TDS concentrations, TDS thresholds for the Fresno Slough and MWA are based on DMC Initial Concentrations of 400 mg/L, specified in the Hydrogeologic Technical Analysis (Appendix E). Thresholds for analysis are as follows: 600 mg/L Monthly (January-August, December); 450 mg/L Monthly (September-November); and 450 mg/L Annual (Annual Average).

Source: LSCE 2015 (Appendix E), DWR 2016.

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Table 28: Predicted Average Monthly TDS concentrations at the MWA During Normal Years (Cumulative Impacts)

Month	Existing Conditions (2012)[1]	Exceedance of TDS Thresholds	No Action Alternative[2]	Exceedance of TDS Thresholds	Proposed Action[3]	Exceedance of TDS Thresholds	Alternative 2[3]	Exceedance of TDS Thresholds
January	458	No	448	No	448	No	448	No
February	416	No	425	No	424	No	424	No
March	388	No	425	No	472	No	472	No
April	365	No	433	No	473	No	473	No
May	189	No	416	No	450	No	447	No
June	265	No	384	No	380	No	378	No
July	223	No	306	No	301	No	299	No
August	--	No	377	No	391	No	388	No
September	407	No	409	No	404	No	404	No
October	383	No	335	No	392	No	392	No
November	237	No	353	No	351	No	351	No
December	255	No	409	No	409	No	409	No
Annual Average	295	No	393	No	408	No	407	No

Note: Under model conditions, none of the monthly and annual averages exceed Water Quality Standards for the Mendota Pool and Fresno Slough. Water Quality Standards for the Mendota Pool and Fresno Slough are as described in Table 23 and Table 24.

[1] Though designated as a “dry” year by the DWR California Cooperative Snow Survey, MPG considered 2012 as a “normal” year (DWR 2016).

[2] Based on 33,395 AFY of pumping for Adjacent Overlying Use.

[3] For the purpose of analyzing predicted TDS concentrations, TDS thresholds for the Fresno Slough and MWA are based on DMC Initial Concentrations of 400 mg/L, specified in the Hydrogeologic Technical Analysis (Appendix E). Thresholds for analysis are as follows: 600 mg/L Monthly (January-August, December); 450 mg/L Monthly (September-November); and 450 mg/L Annual (Annual Average).

Source: LSCE 2015 (Appendix E), DWR 2016.

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Table 29: Predicted Average Monthly TDS concentrations at the MWA During Dry Years (Cumulative Impacts)

Month	Existing Conditions (2012)[1]	Exceedance of TDS Thresholds	No Action Alternative[2]	Exceedance of TDS Thresholds	Proposed Action[3]	Exceedance of TDS Thresholds	Alternative 2[3]	Exceedance of TDS Thresholds
January	458	No	447	No	448	No	448	No
February	416	No	425	No	424	No	424	No
March	388	No	425	No	478	No	478	No
April	365	No	432	No	473	No	473	No
May	189	No	430	No	471	No	467	No
June	265	No	388	No	384	No	382	No
July	223	No	311	No	307	No	304	No
August	--	No	415	No	439	No	434	No
September	407	No	421	No	417	No	416	No
October	383	No	336	No	398	No	397	No
November	237	No	353	No	351	No	351	No
December	255	No	410	No	409	No	409	No
Annual Average	295	No	399	No	417	No	415	No

Note: Under model conditions, none of the monthly and annual averages exceed Water Quality Standards for the Mendota Pool and Fresno Slough. Water Quality Standards for the Mendota Pool and Fresno Slough are as described in Table 23 and Table 24.

[1] Though designated as a “dry” year by the DWR California Cooperative Snow Survey, MPG considered 2012 as a “normal” year (DWR 2016).

[2] Based on 33,395 AFY of pumping for Adjacent Overlying Use.

[3] For the purpose of analyzing predicted TDS concentrations, TDS thresholds for the Fresno Slough and MWA are based on DMC Initial Concentrations of 400 mg/L, specified in the Hydrogeologic Technical Analysis (Appendix E). Thresholds for analysis are as follows: 600 mg/L Monthly (January-August, December); 450 mg/L Monthly (September-November); and 450 mg/L Annual (Annual Average).

Source: LSCE 2015 (Appendix E), DWR 2016.

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significant cumulative impact. Because MPG pumping is anticipated to be reduced under the No Action Alternative, the overall influence on Mendota Pool water quality would be reduced, although high-salinity inputs that are currently prohibited may be discharged into the Pool. As discussed above, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) may also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. This may result in an improvement in the quality of groundwater pumped from MPG wells, particularly those west of the Mendota Pool and Fresno Slough. However, any change to the rate of migration is difficult to estimate until adoption of the GSPs and is not considered in the models prepared for this Draft EIS/EIR. Nonetheless, because inputs would affect waters south of the Firebaugh Canal, implementation of the No Action Alternative would not result in cumulatively considerable impacts.

Proposed Action Even with the loss of high-quality Restoration Flows following implementation of the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project, MPG actions would not significantly contribute to surface water quality impacts in the northern portion of the Mendota Pool and proposed design constraints and monitoring under the Proposed Action would ensure that surface water quality would not exceed thresholds. Under implementation of the Proposed Action and Related Projects, impacts are not expected to be cumulatively considerable during periods of southerly flows and normal water conditions (Table 27).

In the event of consecutive dry years, when TDS in the DMC and other Mendota Pool inflow waters is expected to be higher, impacts associated with the cumulative Proposed Action scenario are expected to be greater than under normal water conditions. However, salinity concentrations in the northern portion of the Mendota Pool are expected to remain below established TDS concentrations; therefore, cumulative impacts would not be significant. As discussed above, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) may also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. This may result in an improvement in the quality of groundwater pumped from MPG wells, particularly those west of the Mendota Pool and Fresno Slough. However, any change to the rate of migration is difficult to estimate until adoption of the GSPs and is not considered in the models prepared for this Draft EIS/EIR.

Alternative 2 Impacts under this alternative are the same as the Proposed Action and are not anticipated to result in cumulatively considerable impacts to surface water quality.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact SWQ-4 (Cumulative): Effects on Water Quality in the Fresno Slough and MWA
When evaluating surface water quality under the cumulative scenario within the Fresno Slough and MWA, the Southern Surface Water Mixing Model shows an incremental degradation in surface water quality. This decrease in salinity is associated with the loss of MPG farmlands at the FWD and reductions in adjacent pumping resulting from the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project. Implementation of Related Projects would result in the loss of Restoration Flows which would otherwise introduce high-quality water into the Mendota Pool

and Fresno Slough. MPG pumping under all alternatives combined with pumping under cumulative conditions and other unregulated pumping actions in the Study Areas, would contribute toward a degradation of surface water quality at the MWA. While MPG remains the largest contributor of groundwater inputs into the Fresno Slough, high salinity inflows from other groundwater pumping entities and the DMC is expected to result in the further degradation of surface water quality, especially in the event of consecutive drought years. Regardless of MPG pumping and inputs, unregulated pumping and high salinity inflows are not likely to exceed MWA TDS thresholds (Table 28 and Table 29).

No Action Alternative Implementation of No Action Alternative under cumulative conditions would result in a net decrease in pumping, therefore reducing inputs of high TDS groundwater into the Fresno Slough and MWA (Table 28). However, the pumping of high salinity groundwater would be unmonitored, and coordination between pumping entities would expectantly be reduced. Further, as wells along the San Joaquin River may be removed due to the loss of lands associated with the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project, greater pumping may occur from wells along the Fresno Slough with poor groundwater quality. In the event of consecutive dry years, observed increases in DMC salinity levels, continued migration of the naturally-occurring saline front, and increases in groundwater pumping are expected to further degrade surface water quality within the MWA (Table 29). As discussed above, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) may also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. This may result in an improvement in the quality of groundwater pumped from MPG wells, particularly those west of the Mendota Pool and Fresno Slough. However, any change to the rate of migration is difficult to estimate until adoption of the GSPs and is not considered in the models prepared for this EIS/EIR.

Proposed Action Under implementation of the Proposed Action and Related Projects, surface water quality within the Fresno Slough and MWA is expected to decline due to the reduction of San Joaquin River flows into the Fresno Slough (Table 28). In the event of consecutive dry years, increases in TDS concentrations of inflow waters, the loss of Restoration Flows and the implementation of additional water transfer agreements is anticipated to degrade water quality, but water quality is still expected to remain below established TDS thresholds due to the introduction of high-quality groundwater from the FWD south of the Firebaugh Intake (Table 29). Exceedances of TDS thresholds are not expected to occur with implementation of MPG water quality monitoring and enforcement. As discussed above, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) may also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front. This may result in an improvement in the quality of groundwater pumped from MPG wells, particularly those west of the Mendota Pool and Fresno Slough. However, any change to the rate of migration is difficult to estimate until adoption of the GSPs and is not considered in the models prepared for this EIS/EIR.

Alternative 2 Implementation of Alternative 2 would result in similar cumulative impacts as the cumulative Proposed Action scenario.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

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3.4 Biological Resources

This section assesses potential impacts of the Proposed Action and Alternatives on biological resources with a focus on special-status species and the terrestrial and aquatic habitats that support these species. This section utilizes information from the Biological Resources Technical Report contained in Appendix H, an extensive literature and data review, and targeted fieldwork conducted at the site of construction of the proposed recharge basin under Alternative 2. Impacts to sensitive species and their habitats are evaluated based on the degree to which the Proposed Action or alternatives modify critical habitat, affect individuals of a species, affect water and sediment quality, and contribute to aquatic toxicity.

3.4.1 Environmental Setting/Affected Environment

Background

This section describes current land uses and wildlife habitats that could be affected by the Proposed Action and Alternatives. Plant and animal species analyzed in this document include those considered special-status or sensitive by the USFWS and CDFW, and listed under the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Because the primary element of the Proposed Action and Alternatives involves the conveyance of CVP and non-CVP water through existing manmade and natural water conveyance systems, aquatic habitats and associated sensitive species within the vicinity of these water bodies are of greatest concern.

Findings from Previous EIS

The 2004 Final EIS evaluated potential effects on biological resources associated with habitat modification, water and sediment quality, and aquatic toxicity. It concluded that although MPG pumping would increase salinity in surface waters and potentially affect special-status species, the design constraints would maintain salinity levels below applicable water quality criteria (TDS concentrations less than 600 mg/L monthly average, 450 mg/L monthly average in the fall). Further, analysis found that pumping would not expose plants and wildlife in the Mendota Pool or the MWA to significant bioaccumulation of selenium or toxicity of arsenic, molybdenum, or boron in surface water or sediments. Consequently, the 2004 Final EIS found that the effects of the Exchange Agreements on biological resources, including special-status species like the giant garter snake (*Thamnophis gigas*), would be less than significant as all applicable sediment and water quality criteria would continue to be met (Reclamation 2004). The 2004 Final EIS concluded that the design constraints and monitoring components of the program would be sufficient to minimize the effects on biological resources to less than significant.

The MPG Annual Pumping and Monitoring Program was initiated in its earliest form in 1989 and continues to the present. One component of the Monitoring Program is the collection of surface water quality data at MWA Sampling Location No. 9. The sampling data indicates that salinity within the Fresno Slough and MWA is highly variable, and identified periodic exceedances of the established annual TDS threshold at the MWA. Although TDS concentrations have periodically exceeded the annual threshold, the concentrations remained

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below the tolerance levels of plant and wildlife species in the MWA. A more detailed description of these exceedances is provided under the Impacts and Mitigation Measures section below.

Design Constraints Addressing Biological Resources

Nine of the design constraints included in the Existing Exchange Agreements, would be included in the Proposed Action and Alternative 2, as modified, and would specifically address potential impacts to biological resources due to delivery of groundwater to the Mendota Pool and Fresno Slough. The proposed design constraints would require MPG to:

1. Curtail MPG discharge into the Mendota Pool west of the Fresno Slough if EC measurements at the Exchange Contractors' canal intakes exceed that of the DMC by 90 μmhos/cm for a period of three consecutive days or more. If the MPG wells are shut off for this reason, they would not be turned back on until the EC at the canal intakes returns to a level that is that is no more than 30 μmhos/cm above the DMC inflow.

2. Implement annual pumping programs to comply with monthly and annual surface water quality criteria for water flowing into the MWA and measured at Sample Location 9 (Figure 36). The monthly and annual surface water quality criteria are described in Nos. 3-6 immediately below. The goal is to minimize overall surface water quality degradation, particularly with respect to salinity (TDS or EC) entering the MWA.

3. The quality of water flowing into the MWA and measured at Sample Location 9 shall not exceed a monthly average of 600 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.

4. During the Fall (September, October, and November) pumping period when water quality at the MWA is most critical, the quality of water flowing into the MWA and measured at Sample Location 9 shall not exceed a monthly average of 450 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.

5. The average quality of water flowing into the MWA and measured at Sample Location 9 in any given year shall not exceed an annual average of 450 mg/L. If an exceedance is recorded at Sampling Location 9, Reclamation and the MPG will coordinate with other users around the Mendota Pool to determine the cause of the exceedance and any applicable remedial actions needed.

6. Shut off wells with selenium concentrations equal to or greater than the water quality criterion of 2.0 μg/L.

7. Shut off wells with boron concentrations equal to or greater than the water quality criterion of 800 μg/L.

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8. Modify the pumping program based on the results of the surface water monitoring program to reduce overall surface water quality degradation, particularly with respect to salinity (TDS or EC). This will ensure that the quality of water supplied to the MWA and other users in the southern portion of the pool will meet applicable water quality criteria. MPG discharge points into the Mendota Pool with TDS concentrations greater than 1,600 mg/L will not be pumped for exchange into the Pool (or greater than 1,200 mg/L during September, October, and November).

Based on the results of the surface water and groundwater monitoring program, the pumping program will be modified to reduce impacts to biological resources, particularly with respect to salinity and trace elements at the MWA, associated with MPG exchange activities. The modifications would include measures such as reductions in total pumping, adjustments to timing of pumping, and reduction or discontinuation of pumping from specific discharge points to the Mendota Pool and Fresno Slough.

Biological Study Areas

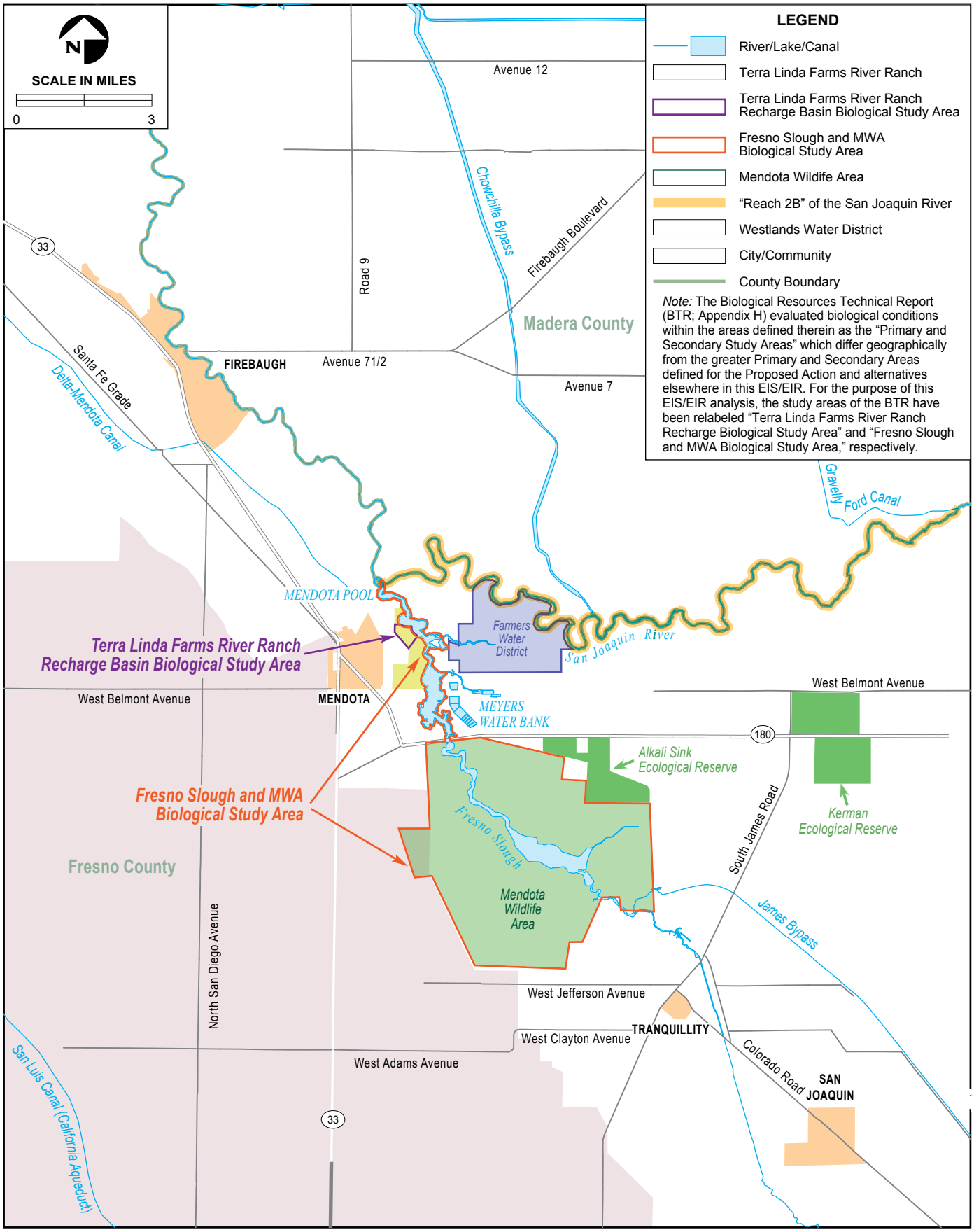
The Proposed Action and Alternatives may affect biological resources through habitat modification, changes in surface water quantity or quality, or subsidence. Impacts associated with groundwater input into the surface waters of the Mendota Pool and Fresno Slough, and irrigation canals are assessed, particularly as it relates to the water quality in the 12,425-acre MWA that provides habitat for native species including special-status plants and wildlife. For the purpose of this biological discussion, impacts to biological resources are described for changes in the terrestrial and aquatic environment as a result of the Proposed Action and alternatives.

Accordingly, the Biological Resources Technical Report (Appendix H) identified two separate study areas: the Terra Linda Farms River Ranch Recharge Basin Biological Study Area and the Fresno Slough and MWA Biological Study Area. The Terra Linda Farms River Ranch Recharge Basin Biological Study Area includes approximately 85 acres of fallow or disturbed MPG-owned farm lands that could be affected by recharge basin construction (Figure 37). The Fresno Slough and MWA Biological Study Area includes areas where existing aquatic and adjacent riparian habitat could be affected by changes in water flow and/or quality. This includes the section of the Fresno Slough that runs for approximately 4.4 miles from the Mendota Dam south to SR-180 and continuing south for approximately 6.6 miles to the southern perimeter of the MWA, including the land surrounding the Slough on either side. The Fresno Slough and MWA Biological Study Area includes the entirety of the MWA, which is supplied with water that flows south from the Fresno Slough, as well as other sources such as northerly flood flows from the Kings River during flood events.

In addition, soil management practices or well construction under the Proposed Action and Alternatives have the potential to alter habitats or impact sensitive species that may exist within MPG lands in Westlands. As such, the existing biological conditions of this area, and impacts to biological resources resulting from implementation of the Proposed Action or Alternatives are also discussed.

3.4.2 Regional Setting

Historically, the San Joaquin Valley contained diverse aquatic, wetland, riparian forest, and surrounding terrestrial habitats with associated populations of resident and migratory species of wildlife (Reclamation 2011). The habitats within the Biological Study Areas supported a wide



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Biological Study Areas

FIGURE 37

variety of wildlife species including large flocks of waterfowl. The dominant historic natural plant communities in the area included grasslands, vernal pools, marshes, valley salt scrub and riparian forests (Reclamation 2005, 2011).

The San Joaquin Valley has been significantly altered by changes in land and water use over the past century. Construction and operation of the CVP and other water management systems in the Central Valley contributed to significant changes to the Valley's natural hydrological systems, drying up streams and decreasing flooding. Levee and dam construction, land reclamation, and water diversions have resulted in the loss of approximately 90 percent of wetlands in the Valley and altered ecosystems to such an extent that many of the remaining wetlands depend on managed water (Reclamation 1994).

Natural processes associated with seasonal inundation that occur naturally in dynamic riverine, riparian, and wetland ecosystems have been largely eliminated (sediment deposition and scour, plant community succession, etc.). In addition, adverse effects to wildlife and their habitats have resulted from highly managed water regimes, the conversion of native habitats to agriculture, and urban development throughout the Central Valley (USFWS 1999, Reclamation 2012).

In particular, the construction of reservoirs and dams on the San Joaquin River (e.g., Friant Dam) diverted most of the river's flow to farms, substantially altering historic flows and habitats, extirpating native salmon runs upstream from the confluence with the Merced River (Reclamation 2011). Flows along the Kings River and into the Fresno Slough have been similarly altered through the construction of Pine Flat Reservoir, the subsequent dewatering and draining of Tulare Lake and changes in direction of Kings River flows. These changes have substantially reduced quality and availability of suitable habitat for native aquatic biota, leading to the decline of many native species and in some cases extirpation. Because of the reduction in available habitat, remnant fragments of habitats such as wetlands and riparian forests in the San Joaquin Valley are increasingly valuable to resident and migratory wildlife species (Reclamation 2005). In 1992, Congress enacted the CVPIA to address concerns over water pricing, CVP water management, and impacts on fish, wildlife, and associated habitat. Despite those efforts, ongoing water management efforts for aquatic habitat maintenance and agricultural purposes continue to fragment and isolate available habitat for upland biological resources.

Existing Conditions in the Biological Study Areas

The Biological Study Areas are within the Recovery Plan for Upland Species of the San Joaquin Valley, California (Recovery Plan), a regional plan that covers 34 sensitive species and outlines recovery strategies by geographic area. The majority of the species covered by the Recovery Plan occur in arid grasslands and scrublands. Conversion of natural habitat to agricultural uses has eliminated the majority of the historic range for these species; the remaining populations are found in fragmented and isolated marginal habitats (USFWS 1998).

The analysis below focuses on special-status species that are known to occur, or have a medium to high probability of occurring within affected study areas. For more detailed discussion of other special-status species with some potential to occur within these study areas, see the Biological Technical Report in Appendix H. Water quality in the Mendota Pool and Fresno Slough are affected by water flows from the DMC and San Joaquin River, diversions out of the Pool, return flows from adjacent agricultural land, groundwater pumped into the Pool and periodic flood flows from the North Fork of the Kings River. Flood flows from the Kings River

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cause the Fresno Slough to periodically flow north, although flow is typically to the south during the agricultural season. Consequently, the Fresno Slough can flow in either direction depending upon water withdrawals or rainfall and flood flows.

Wetland habitats within and bordering the Mendota Pool typically receive water from the CVP via the DMC, with input from the San Joaquin River and occasionally the Kings River. The MWA is contracted to receive 29,640 AF of CVP water from the Mendota Pool, with water delivered via the Fresno Slough (CDFW 2011); Westlands also provides small quantities of water to the MWA. Occasional dewatering events in the Mendota Pool reduce wetland habitat acreage until water is returned to the Mendota Pool (CDFW 2011).

San Joaquin River The San Joaquin River supports aquatic habitats within the riverbed and a narrow band of riparian woodland consisting of cottonwoods, elderberry, and willows along its banks. The segment of the San Joaquin River between the Mendota Dam and Chowchilla Bypass provides suitable habitat for the giant garter snake (Reclamation 2015). The San Joaquin River provides habitat for remnant populations of anadromous fish species, including Chinook salmon (*Oncorhynchus tshawytscha*) and Central Valley steelhead (*O. mykiss*) (DFG 1993). In 2006, the San Joaquin River Restoration Settlement and accompanying Federal legislation required release of water downstream of Friant Dam as well as channel and structural modification to restore the salmon fishery habitat within the San Joaquin River below Friant Dam, and support the reintroduction of Chinook salmon (Pitzer 2011).

Interim and Restoration Flows that began in 2009 and were released through December 2013 have seasonally reconnected dry river segments between the Chowchilla Bypass and the Mendota Dam (Pitzer 2011, SJRRP 2013). In April 2012, for the first time in 62 years, spring-run Chinook salmon were returned to the San Joaquin River when the SJRRP released 54,000 juvenile hatchery fish into the river south of Friant Dam. Of those, nearly 70 fish migrated into the upper river (NRDC 2012). SJRRP full Restoration Flows of 200 to 1,050 cfs began in January 2014. However, due to a critical low water year in 2014, Restoration Flows began to be reduced in February 2014 and kept being reduced until Restoration Flows were stopped in March 2014 (SJRRP 2016).[43]

The approximate five-mile long reach of the San Joaquin River upstream of the Mendota Dam to San Mateo Avenue supports a narrow, nearly continuous, 10- to 30-foot-wide band of riparian woodland and emergent wetland vegetation on either side of the river (Reclamation 2011). Several larger 5- to 10-acre areas of riparian woodlands and emergent wetlands exist within this reach as do many smaller one- or two-acre woodlands. Upstream of San Mateo Avenue, the San Joaquin River was historically drier, with more limited riparian woodlands and a somewhat wider, flatter, sandy riverbed. As a result, fish populations are generally confined to the Mendota Pool, with restricted migration between Mendota Dam and Gravelly Ford, which is located approximately 24 river miles upstream of the Mendota Dam (Reclamation 2011). Restoration Flows may now allow for downstream migration of fish through this segment, from Gravelly Ford into the Mendota Pool.

[43] Restoration Flows were restored in February 2016 and continue to be released.

The segment of the San Joaquin River adjacent to the Terra Linda Farms River Ranch Recharge Basin Biological Study Area is designated as Essential Fish Habitat by National Oceanic and Atmospheric Administration (NOAA) Fisheries (a.k.a., NMFS). Documented native fish species include the Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), trout (*O. mykiss*) and smallmouth bass (*Micropterus dolomieui*); introduced species include largemouth bass (*Micropterus salmoides*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*) (Revive the San Joaquin 2009).

Mendota Pool Located at the confluence of the Fresno Slough and San Joaquin River and included within the Fresno Slough and MWA Biological Study Area, the Mendota Pool is a small non-Federal reservoir formed by the Mendota Dam at the confluence of the San Joaquin River and Fresno Slough. The Pool supports open water habitat with water depths of 2 to 15 feet, both upstream along the river and to the south within the Fresno Slough. These open slow-moving waters behind the dam support aquatic plants such as duckweed (*Spirodela polyrhiza*), western water milfoil (*Myriophyllum hippuroides*), and waterweed (*Elodea* sp.). The margins of the Mendota Pool support seasonal and permanent emergent wetland vegetation, with more than 50 acres of emergent wetland vegetation in the immediate vicinity of the dam. The majority of herbaceous groundcover is dominated by cattails and tules and other native species, with some non-native invasive species such as giant reed (*Arundo donax*) that have likely become established through downstream dispersal of agricultural plants and seeds (Reclamation 2004, 2011).

Riparian habitat also occurs in the vicinity of the Mendota Dam in narrow bands of woodlands along the bank of the San Joaquin River and Fresno Slough; riparian forest is also scattered throughout areas of emergent floodplain wetland vegetation within and adjacent to the Pool. These woodlands are dominated by mature, widely spaced cottonwood and willow trees with decaying snags. Plant species observed near the dam include black willow (*Salix gooddingii*), sandbar or narrowleaf willow (*Salix exigua*), cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), button brush (*Cephalanthus occidentalis*), species of saltbush (*Atriplex* spp.), Sanford's arrowhead (*Sagittaria sanfordii*), and wildrose (*Rosa californica*) (Reclamation 2011). A 30-acre area of mixed emergent wetland and mature cottonwood/willow forest occurs approximately 200 feet east of the Mendota Dam along the San Joaquin River. Several other islands and floodplain wetlands along the Santa Joaquin River and Fresno Slough support similar habitats. Lands bordering the Mendota Pool and along the Fresno Slough are dominated by agricultural fields which are subject to frequent human disturbance, and much of the riparian zone has been cleared of vegetation.

Shallow backwater areas and perennially inundated open water aquatic habitat in the Mendota Pool and Fresno Slough support a sport fishery including largemouth bass and other sport fish species. When the Mendota Pool was drained in late November 2001 for dam inspection; a qualitative survey by two fisheries biologists found approximately 15 fish species, with threadfin shad (*Dorosoma petense*), bluegill (*Lepomis macrochirus*), and inland silverside (*Menidia beryllina*) being the most abundant species (Reclamation 2004). Many of the sport fish species are predatory and may impact the planned reintroduction of Chinook salmon spring-run migration through the Mendota Pool; which may potentially limit or interfere with downstream migrating juvenile Chinook. Recent studies in the San Joaquin Basin suggest that upwards of 93 percent of juvenile salmon perish from predation (SJRRP 2013).

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Open water aquatic habitat in the Mendota Pool also supports migratory ducks such as mallards (*Anas platyrhynchos*), gadwalls (*Anas stepera*), and ruddy ducks (*Oxyura jamaicensis*). Emergent vegetation provides habitat for marsh-dwelling bird species such as rails, herons, and various songbirds and provides breeding and foraging habitat for ground-nesting birds, such as pheasants, ducks, and shorebirds (Reclamation 2011).

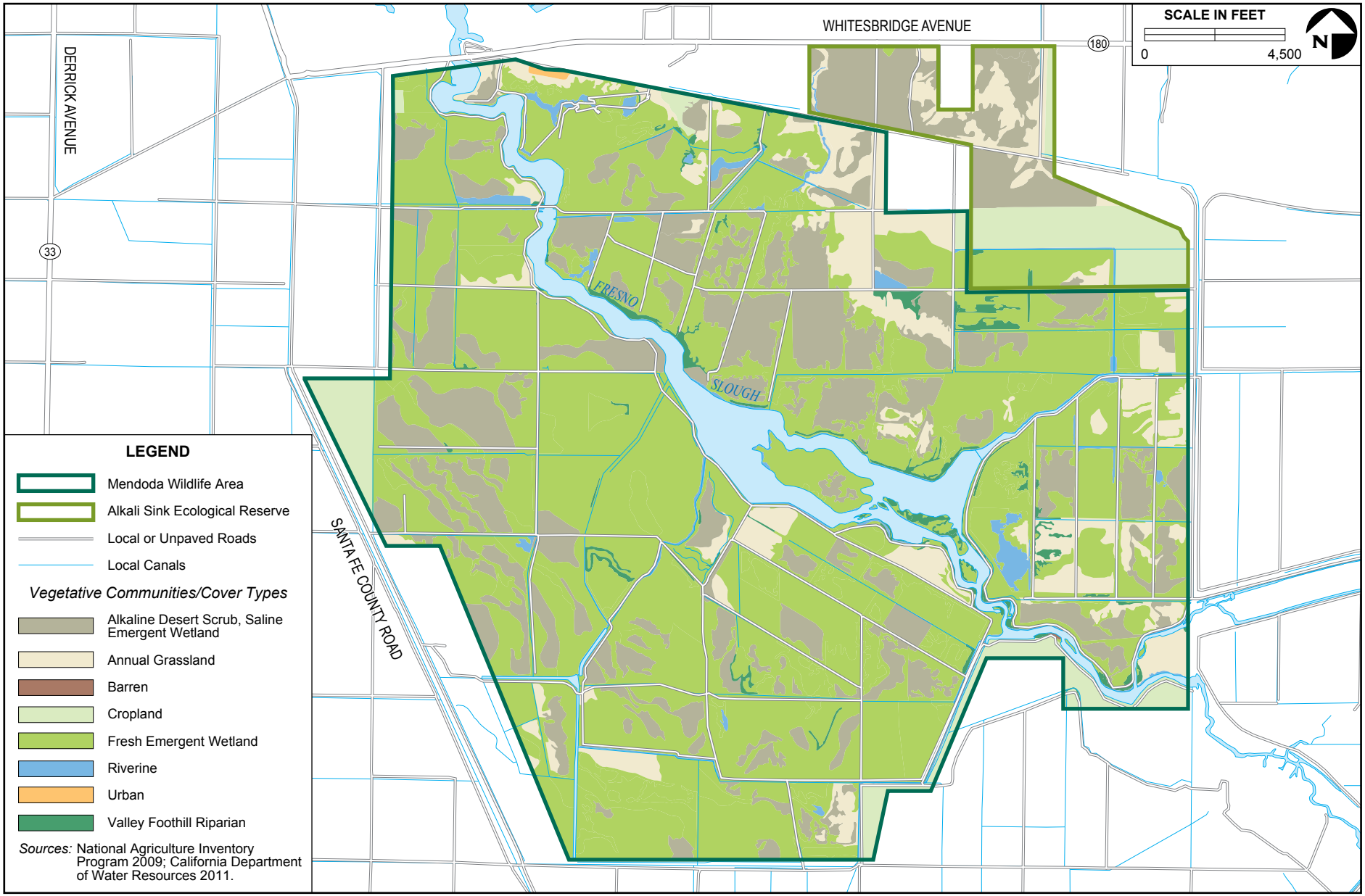
Several special-status wildlife species are recorded in or near the Mendota Pool, and include giant garter snakes, western pond turtle (*Actinemys marmorata*), Swainson's hawks (*Buteo swainsoni*), and bank swallows (*Riparia riparia*) (Jones and Stokes 1995, Reclamation 2004, Table 31). Yellow-billed cuckoos (*Coccyzus americanus occidentalis*) were sighted in 1950, and giant garter snakes and bank swallows were detected in 2001 and 1980, respectively; however, limited suitable habitat exists within the Pool and Fresno Slough for the species (Jones and Stokes 1995, Reclamation 2004, SJRRP 2011). Sanford's arrowhead (*Sagittaria sanfordii*) is the only special-status plant species recorded near the Mendota Pool (Jones and Stokes 1995, Reclamation 2004). Mature cottonwood trees along the banks of the Mendota Pool, Fresno Slough and San Joaquin River provide suitable nesting sites for Swainson's hawk and suitable foraging habitat exists with the vicinity.

Fresno Slough The Fresno Slough branches from the North Fork of the Kings River and periodically carries Kings River floodwaters north to the Mendota Pool.[44] The Fresno Slough, included within the Fresno Slough and MWA Study Area, stretches for approximately 15 miles south of the Mendota Pool and varies widely in habitat characteristics (Figure 39). Although the Slough is confined between levees and farmed in places, it also supports substantial areas of open water and native habitat.

In the vicinity of Jack's Resort north of SR-180, the Slough broadens to almost 2,000 feet in width, with several large islands and hundreds of acres of bordering emergent or seasonally flooded wetland habitat. Further south within the MWA, the Slough broadens further into an expansive body of shallow open water, reaching up to 0.5 miles in width. The Fresno Slough continues as a generally broad open body of water for over five miles to the southern end of the MWA. South of the MWA, the Slough is confined with levees, and supports an open water channel of 60 to 100 feet in width bordered by substantial areas of emergent or seasonally flooded wetlands for over two miles to South James Road. South of this location, the Slough becomes a narrow channel bordered by cultivated land until it broadens into a complex of wetlands northwest of Helm.

The Fresno Slough, south of the Mendota Dam is generally surrounded by agricultural lands to the east and west. However, the Slough provides perennial slow moving open water habitat, with vegetated banks and areas of emergent vegetation, including limited riparian vegetation and freshwater emergent marsh areas. Approximately 3.25 miles south of the Mendota Dam, just north of the MWA boundary, the Fresno Slough channel becomes more dendritic (i.e., branching), with more complex habitat including riparian and wetland habitats as well as annual and perennial grasslands.

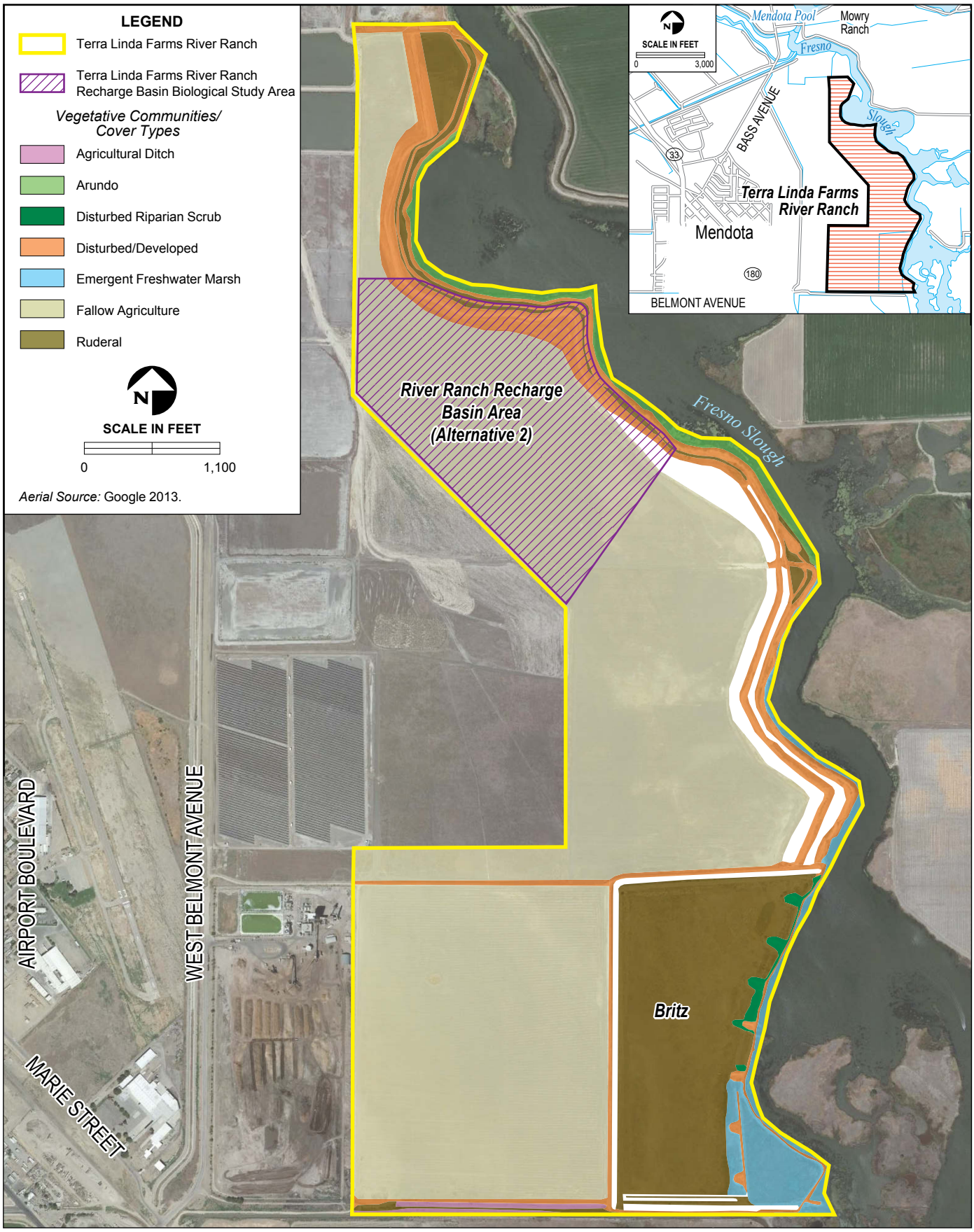
[44] Historically, the Kings River typically emptied into Tulare Lake far to the south; however, land reclamation for farming and changes in river channels and hydrology now cause flows in the Kings River to periodically be directed north through the James Bypass into the old San Joaquin River channel (Kings River Conservation District and Kings River Water Association 2009).



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Mendota Wildlife Area and Alkali Sink Ecological Reserve Vegetative Communities

FIGURE 38



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Vegetative Communities within Terra Linda Farms River Ranch

FIGURE 39

Mendota Wildlife Area The 12,425-acre MWA is an important, publicly owned and managed wetland located along the Pacific Flyway in San Joaquin Valley (Reclamation 2004). The MWA supports approximately 8,300 acres of wetlands, including 6,819 acres managed as seasonally flooded wetlands, 457 acres managed as semi-permanent wetlands, and 1,194 acres managed as permanent wetlands (Reclamation 2011). The MWA is bisected by a section of the Fresno Slough, which provides a body of open water of from 500 to 2,500 feet in width that traverses the MWA for more than 5 miles. The MWA is also bordered to the north by the 800-acre Alkali Sink Ecological Reserve (Reclamation 2004; Figure 38). The primary goals of the MWA include providing suitable habitat and living space for the preservation of native species, including nongame and sensitive plant and wildlife species (CDFW 2011). In addition to wetlands, the MWA includes riparian corridors, several hundred acres of upland and alkali sink habitat, and some farmland. The entirety of the MWA is included within the Fresno Slough and MWA Biological Study Area.

Historic natural water flows within the MWA have been significantly altered by large-scale farmland reclamation and diversion of historic river flows. As a result, many of the seasonal wetlands at the MWA are sustained directly by surface irrigation. A series of levees, ditches, culverts and pumps are used to maintain wetland habitats (CDFW 2011). Most of the MWA is seasonally flooded wetland, but attempts are made to keep year-round water on approximately 10 percent of the MWA, which provides valuable habitat for many species of ground-nesting birds and habitat for warm water fish populations (CDFW 2011). The MWA is dependent on water delivered to the Mendota Pool and Fresno Slough to sustain the refuges' wetlands (Reclamation 2011). Up to 29,640 AFY is delivered to the MWA through the Mendota Pool through various contracts, including a contract with Reclamation for up to 2,057 AFY of CVPIA Incremental Level 4 water deliveries. The sources of this delivered water include CVP water, purchases from the Exchange Contractors and NCR, and under the Existing Exchange Agreements, MPG groundwater exchanged for CVP water. Periodic flood flows from the Kings River also irregularly flush north through the Fresno Slough and MWA.

Vegetation in the MWA is primarily managed to encourage proliferation of native plants that provide food for waterfowl (Reclamation 2004). Important plant communities and habitat types within the MWA include seasonally flooded brackish emergent wetland, valley foothill riparian, and, to a lesser extent, alkali sink scrub (CDFW 2011). Other native communities at the MWA include valley sink scrub, valley sacaton grasslands, and heavily grazed scalds and vernal pools (Reclamation 2004). Upland habitat areas are limited in size, but are also important because they provide habitat for threatened and endangered terrestrial species.

The MWA provides valuable habitat for migratory waterfowl and shorebirds as well as year-round habitat for resident bird species (Reclamation 2011). Approximately 200 species of migratory and resident birds are known to use the area (CDFW 2011). During the winter and spring, thousands of shorebirds, white-faced ibis (*Plegadis chihi*), cattle egret (*Bubulcus ibis*), greater egret (*Adrea alba*), snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), and long-bill curlews (*Numenius americanus*) frequent the MWA and nest (Reclamation 2004). The Audubon Society reports that white-tailed kite (*Elanus leucurus*) and blue grosbeak (*Passerina caerulea*) maintain sizable populations near the MWA. Additionally, the adjacent Alkali Sink Ecological Reserve is regularly used by Greater and Lesser Sandhill cranes (*Grus canadensis tabida* and *Grus canadensis canadensis*), northern harriers (*Circus cyaneus*), Swainson's hawks, mountain plovers (*Eupoda montana*), burrowing owls (*Athene cunicularia*), and tricolored

blackbirds (*Agelaius tricolor*). Mammals commonly found within the MWA include coyote, muskrat, American beaver, mink, raccoon, long-tailed weasel, rabbit, skunk and squirrel (City of Mendota 2009). Additionally, common fish species found at the refuge include black crappie (*Pomoxis nigromaculatus*), bluegill and common carp (*Cyprinus carpio*) (City of Mendota 2009).

Several special-status wildlife species have been recorded at the MWA including giant garter snakes, white-faced ibis, Swainson's hawks, and tricolored blackbirds. Additionally, special-status species documented outside the MWA include Lost Hills crownscale (*Atriplex coronata* var. *vallicola*), blunt-nosed leopard lizard (*Gambelia sila*), burrowing owl, western mastiff bat (*Eumops perotis californicus*), Nelson's antelope squirrel (also known as San Joaquin antelope squirrel) (*Ammospermophilus nelsoni*), and San Joaquin kit fox (*Vulpes macrotis mutica*) (Reclamation 2011). Fresno kangaroo rats (*Dipodomys nitraoides exilis*) have been recorded at the adjacent Alkali Sink Ecological Reserve. Palmate-bracted bird's-beak (*Cordylanthus palmatus*) is a special-status plant that has been recorded at the MWA and also occurs at the Alkali Sink Ecological Reserve, along with the rare plants heartscale (*Atriplex codulata* var. *cordulata*) and Hoover's eriastrum (*Eriastrum hooveri*) (Reclamation 2004).

Agricultural Lands A variety of row, orchard, and vine crops are produced on MPG lands within the Terra Linda Farms River Ranch Recharge Basin Biological Study Area, which also include 2,284 acres of fallowed lands (Figure 5). Fallow agricultural land is typically disturbed and dominated by nonnative annual grasses and nonnative forbs and shrubs. Tilling and other management practices reduce the overall vegetation coverage, leaving fallow lands with relatively sparse vegetation. Within the Terra Linda Farms River Ranch Recharge Basin Biological Study Area, much of the fallowed land is characterized by bare ground with patchy nonnative annual grasses and forbs less than two inches in height. Sparse shrubs including alkali weed (*Malvella leprosa*), big saltbush (*Atriplex lentiformis*), and Chinese tamarisk (*Tamarix chinensis*) are also found adjacent to the disturbed roadsides.

Although fallow lands provide relatively low-quality habitat, wildlife, including sensitive, species use these habitats (Hopkins 1999). Fallow lands in the vicinity of protected habitats are likely to provide greater wildlife benefits (Rapport et al. 2003). For example, a Swainson's hawk has been observed foraging over fallow land on Terra Linda Farms, adjacent to the Fresno Slough. Other special-status species with potential to utilize fallow lands near the Fresno Slough include prairie falcon (*Falcon mexicanus*), burrowing owl, San Joaquin antelope squirrel (also known as Nelson's antelope squirrel), San Joaquin pocket mouse (*Perognathus inornatus*), giant kangaroo rat (*Dipodomys ingens*), Fresno kangaroo rat, Tipton kangaroo rat (*Dipodomys nitraoides nitraoides*), San Joaquin kit fox, and blunt-nosed leopard lizard (Jones and Stokes 1995). Many of these species have been observed in remnant habitat areas along levees and along the margins of roads and fields.

Special-Status Wildlife Species

A list of Federal and State threatened, endangered, proposed listed, candidate, rare, species of concern, and/or species of special concern in both the Terra Linda Farms River Ranch Recharge Basin Biological Study Area and the Fresno Slough and MWA Biological Study Area was provided by the CDFW on May 10, 2013. Additionally, a list of State endangered, threatened, proposed listed, candidate, rare, and species of special concern was obtained from a query of the California Natural Diversity Database (CNDDB) within the Mendota Dam, Firebaugh, and

Tranquillity 7.5-minute USGS quadrangles, which include both the Terra Linda Farms River Ranch Recharge Basin Biological Study Area and Fresno Slough and MWA Biological Study Area. In addition, Reclamation requested an official species list of the entire action area for the Proposed Action (Westlands and Mendota Pool area) from USFWS on January 12, 2018, by accessing their database: https://ecos.fws.gov/ipac/ (Consultation Code: 08ESMF00-2018-SLI-0870).

Based on the database search results, information within Reclamation's files, results of the Draft Biological Resources Technical Report for the Proposed 20-Year Extension of the 2005 Mendota Pool Exchange Agreements, and the CDFW comment letter dated May 10, 2013, 26 special-status wildlife species have been historically recorded within the Biological Study Areas or the Tranquillity USGS 7.5-minute quadrangle, or considered to have at least some potential to occur within the vicinity of the Biological Study Areas. Species that have been documented outside of the Tranquillity USGS 7.5-minute quadrangle or at a distance greater than five miles from the Biological Study Areas are not expected to be present due to range restrictions and are not addressed further in this document.

A total of 27 special-status species that have been historically recorded in the Biological Study Areas. In the interests of brevity, the discussion below focuses on the 20 special-status wildlife species identified by CDFW in their response letter to the NOP for the EIS/EIR on May 10, 2013, and that have been documented or have the potential to occur within the Biological Study Areas and are of greatest potential concern, including the Federal- and State-threatened giant garter snake. Several other special-status wildlife species could potentially occur within the Biological Study Areas, based on their known ranges and available habitat (Table 30). An account of each of these species and their suitable habitat is discussed below. See Appendix H for additional information on all sensitive species that could potentially occur within the Biological Study Areas.

Giant Garter Snake The giant garter snake is one of the largest and most amphibious garter snake species and can reach lengths up to 64 inches. This species is endemic to the valley floor wetlands of the Sacramento and San Joaquin Valleys and inhabits marshes, sloughs, ponds, small lakes, low gradient streams and other waterways as well as agricultural wetlands such as irrigation and drainage canals, rice fields and the adjacent uplands (USFWS 1999, 2012, Hansen & Brode 1980). The species are generally quite aquatic and primarily forage in and along streams, preying upon fish and amphibious species and larvae (CDFW 2014). However, most currently, giant garter snake may subsist primarily upon introduced species such as carp, mosquitofish, and bullfrogs due to the lack of presence of more native species such as blackfish, thick-tailed chub, and red-legged frog (*Rana draytonii*) (CDFW 2014). These snakes breed in March and April, and females give birth to live young from late July through early September. The giant garter snake greatly reduces their activities during the late fall and winter months (Wylie et al. 1997, USFWS 1993). During the dormant period, giant garter snakes inhabit small mammal burrows above flood elevations.

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Table 30: Special-Status Wildlife Species Known to Occur within the Biological Study Areas

Species Name	Common Name	Federal Status	State Status	Potential to Occur
Fish and Aquatic Species				
Oncorhybchus mykiss	Central Valley steelhead	T	-	Low
Oncorhynchus tshawytscha	Central Valley Spring chinook	T	T	Moderate
Birds				
Riparia	bank swallow	-	T	Low
Athene cunicularia	burrowing owl	-	SSC	Moderate
Falco columbarius†	merlin	-	WL	Low
Charadrius montanus	mountain plover	PT	SSC	Low
Buteo swainsoni	Swainson's hawk	-	T	High (foraging)
Agelaius tricolor	tricolored blackbird	-	SSC	Moderate
Coccyzus americanus occidentalis	western yellow-billed cuckoo	C	E	Low
Plegadis chihi	white-faced ibis	-	WL	Low
Reptiles				
Gambelia sila	blunt-nosed leopard lizard	E	E	Low
Phrynosoma blainvillii	coast horned lizard	-	SSC	Low
Thamnophis gigas	giant garter snake	T	T	Moderate
Masticophis flagellum ruddocki	San Joaquin whipsnake	-	SSC	Low
Anniella pulchra	silvery legless lizard	-	SSC	Low
Thamnophis hammondii	two-striped garter snake	-	SSC	Low
Actinemys marmorata	western pond turtle	-	SSC	Moderate
Spea hammondii	western spadefoot	-	SSC	Low
Mammals				
Taxidea taxus	American badger	-	SSC	Moderate
Dipodomys nitratoides exilis	Fresno kangaroo rat	E	E	Low
Ammospermophilus nelsoni†	Nelson's antelope squirrel	-	T	Low
Vulpes macrotis mutica	San Joaquin kit fox	E	T	Low
Perognathus inornatus†	San Joaquin pocket mouse	-	SA	Low
Eumops perotis californicus	western mastiff bat	-	SSC	Moderate (foraging)
Lasiurus blossevillii	western red bat	-	SSC	Moderate (foraging)
Myotis yumanensis†	Yuma myotis	-	SA	Moderate (foraging)

Notes: Information in this table is based on the CNDDB search in the primary area of potential effect which is limited to records from the Mendota Dam, Firebaugh, and Tranquility USGS 7.5-minute quadrangles

†Not identified in the CDFW letter dated 10 May 2013, but previously documented in either the Mendota Dam, Firebaugh, or Tranquility USGS 7.5-minute quadrangle

FEDERAL STATUS

E = Endangered = Danger of extinction throughout range

T = Threatened = Likely to become endangered in foreseeable future throughout range

C = Candidate = In process for listing or recommended for listing but currently precluded

PT = Potentially Threatened = A species or subspecies whose survival may potentially be subject to a threat

STATE STATUS

E = Endangered = Applies to a species whose survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors

T = Threatened = Applies to a species that is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens

SSC = CDFW Species of Special Concern = Species with declining population levels, limited ranges, and/or continuing threats which have made them vulnerable to extinction

WL = Fully Protected = Legal distinction which provides additional protection to species that are rare or faced with possible extinction

SA = California Special Animal = Species that are uncommon and tracked by the CDFW in the California Natural Diversity Database

Sources: CDFW 2018a, 2018b.

The USFWS published a proposal to list the giant garter snake as an endangered species on December 27, 1991 (USFWS 1991). The USFWS reevaluated the status of the species before adopting the final rule. The giant garter snake was listed as a threatened species under the ESA on October 20, 1993 (USFWS 1993), and was listed as Threatened under the CESA in 1971.

Essential habitat components for the giant garter snake consist of: (1) wetlands with adequate water during the snake's active season (March to September) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for overwintering habitat with escape cover and underground refugia (Hansen 1988). Riparian woodlands do not provide suitable habitat because of excessive shade, lack of basking sites, and absence of prey populations (Hansen 1988).

In agricultural areas, snakes were documented using rice fields in 19–20 percent of the observations, marsh habitat in 20–23 percent of observations, and canal and agricultural waterway habitats in 50–56 percent of the observations (Wylie 1998). Emergent vegetation grows within and along the banks of the Mendota Pool and particularly areas of the Fresno Slough to the south that may provide habitat for the giant garter snake. However, surrounding agricultural lands are intensively managed and are devoid of native vegetation. Consequently, areas around Mendota Pool are likely not suitable for the giant garter snake, which requires emergent herbaceous wetland vegetation for escape and foraging habitat as well as grassy banks and openings in waterside vegetation for basking (USFWS 2013b).

The current distribution and abundance of the giant garter snake is much reduced from its historic range. Giant garter snakes formerly occurred throughout wetlands that were extensive and widely distributed in the Sacramento and San Joaquin Valley floors (Fitch 1940, Hansen and Brode 1980). Upon Federal listing in 1993, the USFWS identified 13 separate populations of giant garter snakes, with each population representing a cluster of discrete locality records, including Mendota (USFWS 1993). Sub-populations in the San Joaquin Valley, including populations in Fresno County, are the most vulnerable, having suffered near-devastating declines and possible extirpations over the last two decades (Dickert 2003, Williams 2003, Hansen 1988). These sub-populations are extremely small, distributed discontinuously in isolated patches, and are therefore highly vulnerable to extinction by random environmental, demographic, and genetic processes (Goodman 1987).

Historically, the Mendota Pool and MWA supported robust populations of the giant garter snake (USFWS 1993). Since the late 1970s, the population levels in the Biological Study Areas have declined due to a variety of factors, including predatory fish, flooding, vehicular mortality, disturbance, and elevated levels of selenium and salinity (USFWS 2012). The most recent sighting recorded in the CNDDB of the giant garter snake within the Mendota Dam quadrangle was in 1995; however, the population at the MWA was found to still be extant when a single snake was found in a survey conducted in 2008 (USFWS 2013a).

Recovery criteria for the giant garter snake are defined for nine recovery units corresponding to nine genetically geographically and genetically distinct populations: the Butte Basin, the Colusa Basin, the Sutter Basin, the American Basin, the Yolo Basin, the Delta Basin, the Cosumnes-Mokelumne Basin, the San Joaquin Basin, and the Tulare Basin. Recovery criteria for the San

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Joaquin Basin and Tulare Basin – with which the Biological Study Areas overlap – include: a minimum of 12 habitat block pairs consisting of at least 539 acres of contiguous buffered perennial wetland habitat per block pair; reduction or removal of threats to the species from disease or predation, including the eradication of introduced predatory or competitive species; and protection from other natural or manmade factors affecting continued existence of the species (USFWS 2017).

Introduction of pollutants to the water supply, including selenium and salts, may also threaten the survival of giant garter snakes. Dietary uptake is the principal route of toxic exposure to selenium in wildlife, including the giant garter snake (Beckon et al. 2003). Levels of selenium exposure higher than 12 µg/L, caused by predation on contaminated fish, may have adverse effects on giant garter snakes (Saiki 1998).

Regulatory agency biologists have expressed concern over potential effects of salinity on the giant garter snake's prey base. Mosquitofish, one common prey item for giant garter snakes, can tolerate high levels of salinity, such as those found in evaporation ponds. Pacific tree frogs, however, may be adversely affected at 5,000 mg/L (Yohannes et al. 2005). Pacific tree frogs are unlikely to co-occur with mosquitofish, because mosquitofish would prey heavily upon tree frogs, even when other prey are present (Goodsell and Kats 1999). Although the presence of other prey species was not surveyed for, emergent marsh vegetation was present that could support common prey species for the giant garter snake, such as small fish and amphibians. But being a large Slough used for recreational fishing and with intentional or accidental release of non-native bait and fish, the Slough also provides habitat for predatory species such as large, invasive fish and bullfrogs which may prey upon tree frog and other preferred giant garter snake prey.

Central Valley Steelhead Distinct Population Segment The Central Valley steelhead Distinct Population Segment (DPS) were historically abundant in the San Joaquin River and spawning populations are known to occur in the San Joaquin River (McEwan 2001). Juvenile steelhead migrate towards the ocean, and mature at sea for one to four years before returning to their natal fresh water streams to spawn in the fall. Individuals typically spawn relatively soon after entering freshwaters, and peak spawning occurs from December through April. Migration is aided by high flows, and adult steelhead require a minimum of 7 inches of water for successful migration, although the distance a steelhead must travel through shallow water is also critical. Excessive flows and obstacles that impede swimming and jumping also significantly hinder or block migration (Barnhart 1986).

Recovery criteria for the Central Valley steelhead DPS are defined by four diversity groups within the Central Valley Domain: the basalt and porous lava diversity group composed of the upper Sacramento River (including watersheds upstream of Shasta Dam), Cow Creek and Battle Creek watersheds; the northwestern California diversity group composed of streams that enter the mainstream Sacramento River from the northwest, such as Clear Creek; the northern Sierra Nevada diversity group composed of streams tributary to the Sacramento River from the east, from Antelope Creek to the Mokelumne River; and, the southern Sierra Nevada diversity group composed of streams tributary to the San Joaquin River from the east. Recovery criteria for the southern Sierra Nevada diversity group – which most corresponds to the Biological Study Areas – include: biological criteria pertaining to DPS and population viability; and threat abatement criteria (NOAA 2014).

The Central Valley steelhead DPS is listed as threatened under the ESA. The San Joaquin River Basin is a designated critical habitat for these fish. Central Valley steelhead DPS includes individuals that historically occupied tributaries to the San Joaquin River that drain the western slopes of the Sierra Nevada Mountains, including those that drained into the Proposed Action Primary Study Area (NMFS 2012). The Central Valley steelhead DPS were extirpated from areas of the San Joaquin River after the construction of Friant Dam and associated water infrastructure development (McEwan 2001, McEwan and Jackson 1996).

Central Valley Spring-run Chinook Salmon Distinct Population Segment Chinook salmon are an anadromous fish that migrate through waterways in the Central Valley. As a result of the SJRRP, spring-run Chinook salmon DPS have been introduced into the San Joaquin River system south of Friant Dam. Spring-run chinook were historically the most abundant salmon run in the Central Valley; however, due to hybridization, limited non-hybridized populations, and low population sizes, Central Valley spring-run were listed as threatened under both the ESA and CESA in 1999 (DFG 2007). Spring-run chinook enter the river system from late March through September. Adults hold in cool water habitats through the summer and then spawn in the fall from mid-August through early October. Spring-run juveniles migrate soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings (DFG 2007). Chinook spawning generally occurs along the edges of fast flowing streams in areas of clean loose gravel. Spawning requires cool, well-oxygenated waters, at a water depth between six inches and five feet, and optimum water flows of 1.5 feet per second. Such habitat is present along upstream reaches of the San Joaquin River, but is absent from Mendota Pool and the Fresno Slough.

Similar to the recovery criteria for the Central Valley steelhead DPS, recovery criteria for the Central Valley Chinook Salmon DPS are defined by four diversity groups within the Central Valley Domain: the basalt and porous lava diversity group composed of the upper Sacramento River (including watersheds upstream of Shasta Dam), Cow Creek and Battle Creek watersheds; the northwestern California diversity group composed of streams that enter the mainstream Sacramento River from the northwest, such as Clear Creek; the northern Sierra Nevada diversity group composed of streams tributary to the Sacramento River from the east, from Antelope Creek to the Mokelumne River; and, the southern Sierra Nevada diversity group compose of streams tributary to the San Joaquin River from the east. Recovery criteria for the southern Sierra Nevada diversity group – which most corresponds to the Action Areas – include: biological criteria pertaining to DPS and population viability; and threat abatement criteria (NOAA 2014).

The DMC is located within Essential Fish Habitat (EFH) for Chinook salmon (NOAA 2013). However, the DMC in the vicinity of the Biological Study Areas is segmented by Check 21, located at the Mendota Pool, and Check 13, located at the O'Neill Forebay, approximately 45 miles up-stream, which prevent fish passage. Due to the historically dry condition of the San Joaquin River upstream of the Mendota Dam, fish populations within the vicinity of the Biological Study Areas have generally been confined to the Mendota Pool, with restricted movement between the Mendota Pool and upstream reaches of the San Joaquin River (Reclamation 2011). Consequently, Chinook salmon are not known to occur within the Fresno Slough. However, in 2006 the San Joaquin River Restoration Settlement and accompanying Federal legislation required the provision of water downstream of Friant Dam to restore the Chinook salmon fishery (Reclamation 2011). At present, the presence of Chinook salmon within the Biological Study Areas remains low. The installation of the SJRRP – Mendota Pool Bypass

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& Reach 2B Improvements Project will ensure that protected fish species are able to freely move up and down the river without becoming stranded in the Mendota Pool.

Blunt-nosed Leopard Lizard The blunt-nosed leopard lizard is endemic to the San Joaquin Valley and typically inhabits open, sparsely vegetated areas of low relief on the Valley floor and surrounding foothills. Blunt-nosed leopard lizards use small rodent burrows for shelter from predators and temperature extremes (USFWS 2010a). The blunt-nosed leopard lizard was listed as endangered under the ESA in 1967 and designated as fully protected by the State of California. The most recent 5-year review on the status of the species was published by the USFWS in 2010 and concluded that due to widespread agricultural development of natural habitat in the San Joaquin Valley, the current distribution of blunt-nosed leopard lizards is restricted to less than 15 percent of its historic range (USFWS 2010a). In the remaining habitat that exists, blunt-nosed leopard lizards occur in alkali sink scrub, saltbush scrub, as well as native and nonnative grasslands on the Valley floor and in the surrounding foothills areas (Stebbins 2003).

Recovery criteria for the blunt-nosed leopard lizard include: securing and protecting specified recovery areas from incompatible uses, consisting of five or more areas, each of about 2,428 hectares (5,997 acres) or more of contiguous, occupied habitat, including one each on the San Joaquin Valley floodplain in Merced or Madera Counties, the San Joaquin Valley floor in Tulare or Kern Counties, foothills of the Ciervo-Panoche Natural Area, foothills of wester Kern County, and the Carrizo Plain Natural Area; approval and implementation of a management plan for all protected areas; and, population monitoring in specified recovery areas (USFWS 1998).

Blunt-nosed leopard lizards are rarely observed within the Biological Study Area, with the last CNDDB-recorded sighting occurring in 1989 approximately 0.75 mile south of the Terra Linda Farms Recharge Canal. Further, over two-thirds of the MWA is seasonally flooded and does not support blunt-nosed leopard lizard habitat. Consequently, no blunt-nosed leopard lizards have been observed at the MWA (USFWS 2010a).

Swainson's Hawk Swainson's hawks are medium sized raptors with stout bodies and dark plumage. This species requires large, open grassland habitat with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands (DFG 1993). Swainson's hawks are listed as threatened under CESA and are protected under the Migratory Bird Treaty Act (MBTA). The majority of Swainson's hawk territories in the Central Valley are associated with riparian systems adjacent to suitable foraging habitats (DFG 1993). Swainson's hawk often nests peripherally to riparian systems, but also uses lone trees or groves of trees in agricultural fields and rangelands. The availability of nesting habitat, and therefore survival of the species, is strongly linked to the distribution and abundance of riparian forest in the Central Valley and therefore the loss of remnant areas of highly suitable riparian nesting habitat is considered threat to the species. Additional threats to the species include the reduction of prey in habitats dominated by exotic weedy plants (Woodbridge 1998). Breeding occurs late March to late August, with peak activity from late May through July (Woodbridge 1998). Swainson's hawks have been observed within the Mendota Dam quadrangle as recently as 2013, primarily along the San Joaquin River.

San Joaquin Kit Fox The San Joaquin kit fox is the larger of two subspecies of the kit fox (*Vulpes macrotis*), the smallest canid species in North America. This species, on average, weighs

approximately five pounds and has a small slim body, characterized by large close-set ears and a long bushy tail which tapers and has a distinctly black tip (USFWS 2010b).

Generalized recovery criteria for the San Joaquin kit fox include: securing and protecting specified recovery areas from incompatible uses for three core populations in the Carrizo Natural Area, western Kern County, and Ciervo-Panoche Area; approval and implementation of a management plan for all protected areas; and, population monitoring in specified recovery areas (USFWS 1998).

The San Joaquin kit fox was listed as endangered under the ESA in 1967 and as threatened under CESA in 1971. The most recent 5-year review on the status of the species was published by the USFWS in 2010. The San Joaquin kit fox occurs in areas characterized by sparse or absent shrub cover, sparse ground cover, and short vegetative structure (USFWS 2010b). Though the species may utilize agricultural lands adjacent to suitable habitat as corridors for movement, agricultural lands do not serve as suitable kit fox habitat and foxes will not den in saturated soils or in areas subject to periodic flooding such as those in most of the MWA (USFWS 2010a). The MWA serves as additional satellite habitat for San Joaquin kit fox; however, much of this area is comprised of surface water or floodplain that is not suitable for the kit fox (USFWS 2010b). Consequently, while San Joaquin kit fox have been observed within the Mendota Dam quadrangle as recently as 2006, it is unlikely that this species regularly utilizes agricultural habitat within the Biological Study Areas.

Nelson's Antelope Squirrel Nelson's antelope squirrel (also known as San Joaquin antelope squirrel) inhabits arid, sparsely vegetated plains and lower mountain slopes and requires minimally disturbed natural grass and shrub communities for habitat (CDFW 2005). The species was listed as threatened under the CESA in 1980. Present populations can be found on the floor of the San Joaquin Valley and the squirrel was last recorded within the Mendota Dam quadrangle in 2006, approximately 0.5 mile from the Terra Linda Farms Recharge Canal. While the potential exists for this state threatened species to occur within the Biological Study Areas, its habitat requirements make it unlikely to regularly occur in cultivated areas surrounding Mendota Pool.

Special-Status Plant Species

Nine special-status plant species have been identified by the CDFW as having the potential to occur within the Biological Study Areas (Table 31). However, several of these species require sensitive habitat that may not occur within the Terra Linda Farms River Ranch Recharge Basin Biological Study Area due to agricultural practices. Two species were not identified by the CDFW but are documented in the area of Mendota Dam, Firebaugh, or Tranquillity 7.5-minute USGS quadrangles, resulting in a total of 11 total documented special-status plant species with some potential to occur within the Biological Study Areas. Wetland/aquatic and riparian species are most likely to be affected by changes in water quality. These impacts could occur directly to the organism or their habitat or indirectly. No Federal or State-listed plant species were observed during the field visits of the Terra Linda Farms River Ranch Recharge Basin Biological Study Area on June 26, 2013. Following Reclamation's request for an official species list of from the USFWS on January 12, 2018, no Federal-listed special status plant species were identified as having the potential to occur in the Biological Study Areas. Provided below is an account of each of these special-status species most likely to occur, or those that have been recorded, within the Biological Study Areas.

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Table 31: Special-Status Plant Species Known to Occur in the Biological Study Areas

Species Name	Common Name	Federal Status	State Status	CRPR	Potential to Occur
Plants					
Cordylanthus palmatum	palmate-bracted bird's-beak	E	E	1B.1	Not Expected
Sagittaria sanfordii	Sanford's arrowhead	-	-	1B.2	Very Low
Layia munzii	Munz's tidy-tips	-	-	1B.2	Not Expected
Atriplex cordulata var. *cordulata*	Heartscale	-	-	1B.2	Not Expected
Atriplex coronata var. *vallicola*	Lost Hills crownscale	-	-	1B.2	Not Expected
Atriplex depressa	bittlescale	-	-	1B.2	Not Expected
Atriplex subtilis	subtile orache	-	-	1B.2	Low
Atriplex minuscula	saltscale	-	-	1B.1	Not Expected
Eriastrum hooveri	Hoover's eriastrum	-	-	4.2	Low
Delphinium recurvatum†	recurved larkspur	-	-	1B.2	Low
Monolopia congdonii†	San Joaquin woollythreads	E	-	1B.2	Very Low

Notes: The CNDDB search in the Biological Study Areas is limited to records from the Mendota Dam, Firebaugh, and Tranquility USGS 7.5-minute quadrangles
†Not identified in the CDFW letter dated 10 May 2013, but previously documented in either the Mendota Dam, Firebaugh, or Tranquility USGS 7.5-minute quadrangle
FEDERAL STATUS
E = Endangered = Danger of extinction throughout range
STATE STATUS
E = Endangered = Applies to a species whose survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors
CALIFORNIA RARE PLANT RANK
1B = Plants rare, threatened, or endangered in California and elsewhere
4 = Plants of limited distribution
0.1 = Seriously Threatened in California = Over 80% of occurrences threatened/high degree and immediacy of threat
0.2 = Fairly Threatened in California = 20%- 80% occurrences threatened/high degree and immediacy of threat
Sources: CDFW 2018a, 2018b.

Sanford's Arrowhead Sanford's arrowhead, a California Rare Plant Rank (CRPR) 1B.2 species, is a rhizomatous emergent perennial herb. This species grows in freshwater marshes, ponds, and ditches as well as various other shallow freshwater habitats (Hickman 1993; Skinner and Pavlik 1994). Sanford's arrowhead is distributed throughout the northern part of the north coast, Central Valley, and northern part of the south coast of California (Hickman 1993). Sanford's arrowhead has been documented in the Firebaugh, Mendota Dam, and Tranquillity 7.5-minute quadrangles. Further, one occurrence of Sanford's arrowhead has been recorded within the vicinity of the Mendota Pool; however, it has not been observed since 1948.

Hoover's Eriastrum Hoover's eriastrum, a CRPR 4.2 species, is characterized by thread-like leaves that often have two narrow lobes near the base. Hoover's eriastrum, which blooms between March and June, has small flowers ranging in color from white to pale blue that are nearly hidden in tufts of woolly hair. Populations of Hoover's eriastrum occur in alkali sinks and washes and a wide variety of plant communities. Hoover's eriastrum was last documented in the Biological Study Areas in 1986 when it was observed within the boundaries of the MWA; also, isolated populations occur in the Alkali Sink Ecological Reserve. However, potential for occurrence of this species within areas subject to potential direct disturbance is low due to the lack of optimal habitat and associated species being present within the boundaries of the Terra Linda Farms River Ranch Recharge Basin Biological Study Area.

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Recurved larkspur Recurved larkspur, a CRPR 1B.2 species, is a perennial herb that grows in seasonal alkali wetlands of chenopod scrub, grassland, and montane woodland communities, typically on valley bottoms on heavy clay alkali soils. It is widely distributed throughout elevations of approximately 100 to 2,000 feet in the Central Valley (Hickman 1993). Recurved larkspur was observed within the primary area in the vicinity of the Fresno Slough as recently as 2011.

Existing Conditions in the Farmed Lands of Westlands

Westlands is within the Recovery Plan for Upland Species of the Tulare Basin and supports a wide variety of agricultural croplands that includes field crops, orchards, pasture and fallow agricultural lands that are frequently plowed or covered by weedy non-native annual and biennial plants (USFWS 1998, City of Mendota 2009). Although agricultural lands can provide a source of food, water, and shelter to native wildlife species, the lack of hedgerows, shelter-belts, wind breaks, and natural vegetation buffers severely limits their habitat value (City of Mendota 2009). In addition, agricultural practices such as herbicide and pesticide application, monoculture cropping, and intensive tillage further reduces the habitat value of these agricultural areas (City of Mendota 2009). However, isolated lands within Westlands support unique biotic communities (Reclamation 2004). Pastures and fallow land provide forage for seed-eating birds and small mammals, as well as supporting some movement of species between habitat.

Special-Status Species

Many special-status plant and wildlife species with the potential to occur in the Biological Study Areas may also occur within agricultural lands of Westlands. These species include San Joaquin kit fox and San Joaquin woollythreads (*Monolopia congdonii*) among others. The CNDDB record search of this area indicated reported observations of the species in the Avenal, Broadview Farms, Chaney Ranch, Chounet Ranch, Coalinga, Coit Ranch, Domengine Ranch, Firebaugh, Five Points, Guijarral Hills, Harris Ranch, Huron, Kettleman City, La Cima, Laguna Seca Ranch, Levis, Lillis Ranch, Monocline Ridge, Stratford, Stratford SE, Tranquillity, Tres Picos Farms, Tumey Hills Vanguard, Westhaven, and Westside 7.5-minute USGS Quadrangles (Table 32). Eight wildlife species occur in the lands of Westlands but not within the Biological Study Areas, including, but not limited to, California horned lark (*Eremphilia alpestris actia*), long-eared owl (*Asio otus*), California glossy snake (*Arizona elegans occidentalis*), San Joaquin coachwhip (*Mesticophis flagellum ruddocki*), giant kangaroo rat (*Dipodomys ingens*), short-nose kangaroo rat (*Dipodomys nitratoides brevinasus*), and Tulare grasshopper mouse (*Onychomys torridus tularensis*). Additionally, five plant species occur in Westlands that do not occur in the Biological Study Areas, including California jewel flower (*Caulanthus californicus*) Hall's tarplant (*Deinandra halliana*), Indian valley bush-mallow (*Malaconthamnus aboriginium*), Panoche pepper-grass (*Lepidium jaredii* var. *vallicola*), and showy golden madia (*Madia radiata*).

3.4.3 Regulatory Framework

Biological resources are regulated by a number of authorities at the Federal, State, and local level. This section provides an overview of the regulatory agencies and specific regulations that are applicable to the Proposed Action and Alternatives.

Federal Policies and Regulations

Clean Water Act Refer to Section 3.3, *Surface Water Quality* for a summary discussion of the CWA.

Table 32: Special-Status Plant and Wildlife Species Known to Occur in Westlands

Species Name	Common Name	Federal Status	State Status	CRPR
Fish and Aquatic Species				
Branchinecta longiantenna	Longhorn fairy shrimp	E	-	-
Oncorhybchus mykiss	Central Valley steelhead	T	-	-
Oncorhynchus tshawytscha	Central Valley Spring chinook	T	T	-
Birds				
Athene cunicularia	burrowing owl	-	SSC	-
Riparia	bank swallow	-	T	-
Eremophila alpestris actia	California horned lark	-	WL	-
Asio otus	long-eared owl	-	SCC	-
Asio flammeus	short-eared owl	-	SSC	-
Buteo swainsoni	Swainson's hawk	-	T	-
Agelaius tricolor	tricolored blackbird	-	SSC	-
Xanthocephalus	yellow-headed blackbird	-	SCC	-
Toxostoma lecontei	Le Conte's thrasher	-	SSC	-
Lanius ludovicianus	loggerhead shrike	-	SSC	-
Falco columbarius	merlin	-	WL	-
Charadrius montanus	mountain plover	-	SSC	-
Falco mexicanus	prairie falcon	-	WL	-
Coccyzus americanus occidentalis	western yellow-billed cuckoo	C	E	-
Plegadis chihi	white-faced ibis	-	WL	-
Reptiles and Amphibians				
Gambelia sila	blunt-nosed leopard lizard	E	E	-
Phrynosoma blainvillii	coast horned lizard	-	SSC	-
Thamnophis gigas	giant garter snake	T	T	-
Masticophis flagellum ruddocki	San Joaquin whipsnake	-	SSC	-
Spea hammondii	western spadefoot	-	SSC	-
ArIzona elegans occidentalis	California glossy snake	-	SSC	-
Anniella sp.	California legless lizard	-	SSC	-
Mesticophis flagellum ruddocki	San Joaquin coachwhip	-	SSC	-
Anniella alexanderae	Temblor legless lizard	-	SSC	-
Actinemys marmorata	Western pond turtle	-	SSC	-
Mammals				
Taxidea taxus	American badger	-	SSC	-
Dipodomys ingens	giant kangaroo rat	E	E	-
Dipodomys nitratoides exilis	Fresno kangaroo rat	E	E	-
Ammospermophilus nelsoni	Nelson's antelope squirrel	-	T	-
Vulpes macrotis mutica	San Joaquin kit fox	E	T	-
Perognathus inornatus	San Joaquin pocket mouse	-	SA	-
Dipodomys nitratoides brevinasus	short-nosed kangaroo rat	-	SCC	-
Onychomys torridus tularensis	Tulare grasshopper mouse	-	SCC	-
Eumops perotis californicus	western mastiff bat	-	SSC	-
Dipodomys nitratoides	Tipton kangaroo rat	E	E	-
Plants				
Caulanthus californicus	California jewel flower	E	E	1B.1
Deinandra halliana	Hall's tarplant	-	-	1B.1
Malacothamnus aboriginium	Indian Valley bush-mallow	-	-	1B.2

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Table 33: Special-Status Plant and Wildlife Species Known to Occur in Westlands (Continued)

Species Name	Common Name	Federal Status	State Status	CRPR
Atriplex coronate var. *vallicola*	Lost Hills crownscale	-	-	1B.2
Layia munzii	Munz's tidy-tips	-	-	1B.2
Lepidium jaredii ssp. *album*	Panoche pepper-grass	-	-	1B.2
Delphinium recurvatum	recurved larkspur	-	-	1B.2
Monolopia congdonii	San Joaquin woollythreads	E	-	1B.2
Madia radiata	Showy golden madia	-	-	1B.1

Notes: The CNDDB search in Westlands is limited to records from the Avenal, Broadview Farms, Chaney Ranch, Chounet Ranch, Coalinga, Coit Ranch, Domengine Ranch, Firebaugh, Five Points, Guijarral Hills, Harris Ranch, Huron, Kettleman City, La Cima, Laguna Seca Ranch, Levis, Lillis Ranch, Monocline Ridge, Stratford, Stratford SE, Tranquillity, Tres Picos Farms, Tumey Hills Vanguard, Westhaven, and Westside USGS 7.5-minute quadrangles.
FEDERAL STATUS
E = Endangered = Danger of extinction throughout range
T = Threatened = Likely to become endangered in foreseeable future throughout range
STATE STATUS
E = Endangered = Applies to a species whose survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors
T = Threatened = Applies to a species that is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens
SSC = CDFW Species of Special Concern = Species with declining population levels, limited ranges, and/or continuing threats which have made them vulnerable to extinction
WL = Fully Protected = Legal distinction which provides additional protection to species that are rare or faced with possible extinction.
CALIFORNIA RARE PLANT RANK
1B = Plants rare, threatened, or endangered in California and elsewhere
0.1 = Seriously Threatened in California = Over 80% of occurrences threatened/high degree and immediacy of threat
0.2 = Fairly Threatened in California = 20%- 80% occurrences threatened/high degree and immediacy of threat
Sources: CNDDB 2018.

Federal Endangered Species Act Enacted in 1973, the ESA (United States Code [USC] Title 16, Chapter 35, Sections 1531-1544) provides for the conservation and management of federally listed threatened or endangered species and their designated critical habitats. Section 3 of the ESA defines threatened and endangered categories as:

Endangered – a plant or wildlife species that is in danger of extinction throughout all or a significant portion of its range.

Threatened – a plant or wildlife species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

The ESA prohibits the "take" of threatened and endangered species except under certain circumstances and only with authorization from the USFWS through a permit under Section 7(d), or 10(a) of the ESA. Under the ESA, "take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. USFWS is responsible for protecting terrestrial and non-anadromous fish species, and the NMFS is responsible for protecting anadromous fish.

The ESA requires Federal agencies to make a finding on all Federal actions, including approval by an agency of a public or private action, as to the potential to jeopardize the continued existence of any listed species.

Magnuson-Stevens Fisheries Act The Amended Magnuson-Stevens Fishery Conservation and Management Act, also known as the Sustainable Fisheries Act (Public Law 104-297), requires Federal agencies to consult with the Secretary of Commerce on activities that affect EFH. The

EFH provisions of the Magnuson-Stevens Fisheries Act are designed to protect fishery habitats from disturbance and degradation.

Migratory Bird Treaty Act The MBTA (USC Title 16, Chapter 7, Subchapter II, Sections 703-712), first enacted in 1918, provides for protection of international migratory birds and authorizes the Secretary to regulate the taking of migratory birds. Under the MBTA, it is unlawful, except as permitted by regulations, to purchase, pursue, hunt, take, capture or kill any migratory bird (Title 16, Section 703 of the USC). This prohibition includes direct and indirect acts, although harassment and habitat modifications are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA, which can be found in 50 CFR Section 10.13, includes several hundred species, essentially all native birds. Loss of non-native species, such as house sparrows, European starlings, and rock pigeons, is not covered by this statute.

Bald and Golden Eagle Protection Act The Bald and Golden Eagle Protection Act (Eagle Act), first enacted in 1940 and amended several times since then, prohibits the taking or possession of and commerce in bald and golden eagles, including their parts, nests, or eggs, with limited exceptions. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 USC 668–668d). USFWS has proposed new permit regulations to authorize the take of bald and golden eagles under the Eagle Act, generally when the take to be authorized is associated with otherwise lawful activities (72 FR 31141–31155, June 5, 2007). With the delisting of the bald eagle in 2007, the Eagle Act is the primary Federal law protecting bald eagles, as well as golden eagles.

Executive Order 11990 (Protection of Wetlands) This Executive Order directs Federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in implementing civil works.

Executive Order 13112 (Invasive Species) As directed by this Executive Order, a national invasive species management plan guides Federal agencies to prevent, control, and minimize invasive species and their ecological, health, and economic impacts in an environmentally sound and cost-effective manner. To support implementation of this plan, the USACE has recently released a memorandum describing the USACE Invasive Species Policy. This policy includes addressing invasive species effects in impact analysis for civil works projects.

Executive Order 13186 (Migratory Birds) This Executive Order directs Federal agencies that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding (MOU) with USFWS promoting the conservation of migratory bird populations. Implementation actions and reporting procedures identified in the MOU should be included in each agency's formal planning process, such as resource management plans and fisheries management plans.

Executive Order 13443 (Facilitation of Hunting Heritage and Wildlife Conservation) This Executive Order directs Federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.

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Recovery Plan for Upland Species of the San Joaquin Valley, California The Recovery Plan was released by USFWS in 1998. This plan focuses on species of plants and animals that occur within the San Joaquin Valley and that are either federally listed as threatened or endangered or are candidates for Federal listing or species of concern. The ultimate goal of the Recovery Plan is to delist the endangered and threatened species addressed in the plan and ensure the long-term conservation of the other species (USFWS 1998). The Recovery Plan provides for both an ecosystem approach and a community level strategy. While not regulatory in nature, the Recovery Plan needs to be taken into consideration when analyzing potential impacts on upland natural community habitats in the San Joaquin Valley to ensure that projects do not prevent or impair the plan's future long-term implementation success. It is also used by the USFWS to determine recommendations and requirements during endangered species consultation for these species.

Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segments of California Central Valley Steelhead The Recovery Plan was released by NOAA in 2014. The goal of the Recovery Plan is to recover the endangered Sacramento River winter-run Chinook salmon Evolutionary Significant Unit (ESU), the threatened Central Valley spring-run Chinook Salmon ESU, and the threatened California Central Valley steelhead DPS and the Central Valley, San Francisco Bay-Delta Estuary, and Pacific Ocean ecosystems that support them (NOAA 2014). While not regulatory in nature, the Recovery Plan needs to be taken into consideration when analyzing potential impacts on habitats in the San Joaquin Valley to ensure that projects do not prevent or impair the plan's future long-term implementation success. It is also used by the USFWS to determine recommendations and requirements during endangered species consultation for these species.

Recovery Plan for the Giant Garter Snake The Recovery Plan was released by USFWS in 2017. The objective of this Recovery Plan is to reduce threats to and improve the population status of the giant garter snake sufficiently to warrant delisting of the species through the identification, protection restoration, monitoring, and management of existing habitat and populations (USFWS 2017). While not regulatory in nature, the Recovery Plan needs to be taken into consideration when analyzing potential impacts on habitats in the San Joaquin Valley to ensure that projects do not prevent or impair the plan's future long-term implementation success. It is also used by the USFWS to determine recommendations and requirements during endangered species consultation for these species.

State Policies and Regulations

California Endangered Species Act Pursuant to CESA and Section 2081 of the California Fish and Game Code, a permit from CDFW is required for projects that could result in the take of a species that is State-listed as threatened or endangered. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species, but the definition does not include "harm" or "harass," as the Federal ESA does. As a result, the threshold for take is higher under CESA than under the ESA. The CESA parallels the ESA and is administered by the CDFW. Under the CESA, an "endangered species" is defined as a species of plant, fish, or wildlife that is "in serious danger of becoming extinct throughout all, or a significant portion of its range" and is limited to species or subspecies native to California. The CESA prohibits the "taking" of listed species, including species petitioned for listing (i.e., State candidates), except

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as otherwise provided in State law. State lead agencies are required to consult with the CDFW to ensure that any action it undertakes is not likely to jeopardize the continued existence of any endangered or threatened species or result in destruction or adverse modification of essential habitat.

California Fish and Game Code CDFW has authority under the California Fish and Game Code to regulate the take or possession of birds, mammals, fish, amphibian, and reptiles as well as natural resources such as wetlands and waters of the State. It includes the CESA (Sections 2050–2115) and Streambed Alternation Agreement regulations (Sections 1600–1616) as well as provisions for legal hunting and fishing, and tribal agreements for activities involving take of native wildlife. Statutes described in four sections of the California Fish and Game Code that list fully protected species (California Fish and Game Code 10 Sections 3511, 4700, 5050, and 5515) prohibit take or possession at any time of fully protected species. Additionally, Fish and Game Code Section 3503.5 protects birds of prey, their nests, and eggs against take, possession, or destruction, while Section 3503 protects California's native birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Fish and Game Code Section 5650.6 also states that it is unlawful to deposit in or pass into any substance or materials deleterious to fish, plant life, mammals, or birdlife.

California Department of Fish and Wildlife Species of Special Concern CDFW maintains an informal list of species called "species of special concern". These species are rare, restricted in geographic distribution, or declining throughout their geographic range. Sensitive species are also considered in resource planning and management. These species are inventoried in the CNDDB regardless of their legal status. Impacts on species of special concern may be considered significant, as CEQA provides protection not only for State-listed or Federally-listed species, but also for any species that can be shown to meet the criteria for listing (CEQA Guidelines Section 15380). Species that meet these criteria are often considered species of special concern by the CDFW.

Mendota Wildlife Area Refuge Water Management Plan The MWA Refuge Water Management Plan was adopted in 1994 and revised 2011, with the objective of managing the MWA to protect habitats of sensitive species, to restore or enhance wetlands, and to provide wildlife-oriented public uses. The MWA is owned by the State of California and managed by the CDFW. Under the Refuge Water Management Plan, MWA receives water from the Mendota Pool, which often includes groundwater discharged into the Pool from MPG. During flood events, water in the Kings River flows north into the MWA and either flows into or is pumped into the Fresno Slough.

Local Policies and Regulations

Fresno County General Plan The Fresno County General Plan was last updated in October 2000 and is undergoing revisions in 2017. The General Plan identifies primary land use designations and three overlay designations, including Agricultural. The General Plan also identifies as a priority the protection and enhancement of water quality and quantity in Fresno County's streams, creeks, and groundwater basins through the protection of floodplain lands. Policies in the General Plan also seek to protect natural areas, particularly riparian and wetland habitats, in the county, and to preserve habitat diversity in Fresno County through restoring and enhancing habitats that support fish and wildlife species so that populations are maintained at viable levels. One policy in the general plan directs the County to require riparian protection

zones around natural watercourses, recognizing that these areas provide highly valuable wildlife habitat. The General Plan prioritizes the protection of wetlands, riparian habitat, and meadows because they are recognized as essential habitats for birds and wildlife, and it requires a minimum 200-foot-wide wildlife corridor along particular stretches of the San Joaquin River and Kings River, whenever possible.

Madera County General Plan The Madera County General Plan, updated in 1995, provides a framework for development and physical growth in Madera County. The General Plan's Agricultural and Natural Resource Section contain various goals and policies that address forest, wetland, and riparian resources as well as fish and wildlife habitat. The General Plan's goals and policies are designed to conserve natural resources and enhance the quality of ecosystems, and reduce land use conflicts. The General Plan also contains specific policies to protect wetland habitats.

3.4.4 Impact Analysis/Environmental Consequence

Methodology for Analysis

The analysis of impacts from the Proposed Action or alternatives on biological resources is based on literature and data reviews performed to identify resources within the Biological Study Areas. Reviews included an examination of MWA management documents, Kings River water flow data, current and historical aerial photographs, USGS topographic maps, USDA soil survey maps, and the CDFW letter of comment on the NOP for the EIS/EIR dated May 10, 2013. Additionally, the USFWS and California Native Plant Society lists were reviewed for Madera County and the CNDDB was reviewed within a five-mile radius of the Biological Study Areas and within Avenal, Broadview Farms, Chaney Ranch, Chounet Ranch, Coalinga, Coit Ranch, Domengine Ranch, Firebaugh, Five Points, Guijarral Hills, Harris Ranch, Huron, Kettleman City, La Cima, Laguna Seca Ranch, Levis, Lillis Ranch, Monocline Ridge, Stratford, Stratford SE, Tranquillity, Tres Picos Farms, Tumey Hills Vanguard, Westhaven, and Westside USGS 7.5-minute quadrangles for the areas of Westlands to identify recorded and predicted occurrences of sensitive natural communities, plant species, and wildlife species within the area of potential effect of the Proposed Action and alternatives. The Biological Evaluation for the 2011 Amendment to the Meyers Groundwater Banking Exchange Agreement was also reviewed.

The baselines used for this analysis are the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA to provide a full disclosure of the potential impacts. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines for comparison used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Biological Resources Technical Report A field survey of the site and potential River Ranch Recharge Basin proposed under Alternative 2 was conducted on June 26, 2013 by Wood biologist. The survey included community-level vegetation mapping and a habitat assessment for sensitive plant and wildlife species. All distinct plant communities and wildlife habitats present within the survey area were described and mapped. The existing setting of the proposed location of the River Ranch Recharge Basin has not changed since the June 2013 field survey of the site.

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At the time of the survey, the northern portion of Terra Linda Farms (where the recharge basin would be located) was occupied by fallow farmland that was occasionally tilled and/or disked to control the growth of weeds and invasive species on the northern portion of Terra Linda Farms. This condition remains unchanged as of October 2018; no crops or other agricultural activity has been resumed in this area and the location is still occasionally tilled and/or disked to control the growth of weeds and invasive species. Detailed methodology and the findings of the field survey, literature and data reviews are recorded in the Biological Resources Technical Report in Appendix H.

Thresholds of Significance

The thresholds of significance for impacts to biological resources are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as amended. These thresholds also encompass factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. The Proposed Action and alternatives under consideration would result in a significant impact related to biological resources if they would do any of the following:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS;
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the CDFW or USFWS;
3. Have a substantial adverse effect on Federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

In determining potential impacts on biological resources, the analysis considers impacts to both terrestrial and aquatic habitats and species, but focuses the discussion on potential impacts from changes in water quality on affected species and habitats. Potential water quality impacts are primarily related to increases in salinity (TDS) associated with groundwater inputs into surface water. However, neither the USFWS or EPA have established water quality criteria for TDS related to protection of wildlife and habitats, and the CVRWQCB has not established TDS standards for surface waters within the Biological Study Areas (see Section 3.3, *Surface Water Quality*). In addition, the current and proposed MPG Pumping and Monitoring Program samples trace elements and general minerals in groundwater that is pumped from its wells, including

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arsenic, boron, molybdenum, and selenium. These elements occur naturally in the soils of California, and are also present in pesticides and, fertilizers, and animal waste that are applied to agricultural lands. The four trace elements of concern (arsenic, boron, molybdenum, and selenium) are monitored in surface waters under the MPG Annual Pumping and Monitoring Program due to their potentially harmful effects on plants and wildlife as established in the WQOs for the MWA. However, as mentioned above, in the context of the MPG exchange program, salinity is most closely monitored for its harmful effects on aquatic biological species if levels extend beyond their tolerance (SWRCB 2004). In addition, all MPG wells that participate in the exchange program are required to provide water quality data to Reclamation prior to introducing groundwater into the Mendota Pool in order to ensure that participating wells are not exceeding thresholds for water quality (e.g. selenium).

As previously discussed, surface water is supplied to the Mendota Pool and Fresno Slough through the DMC, San Joaquin River flows, groundwater pumped from the underlying groundwater basin, and periodic flood flows from the North Fork of the Kings River. Under the Proposed Action or alternatives, along with other pumping and exchange programs within the Mendota Pool area, local surface water supplies would be affected through these inputs and the capture of periodic flood flows for basin recharge. However, in comparison to the sources and quantity of supply, groundwater withdrawals and recharge under the Proposed Action and Alternatives would have a highly incremental and negligible effect on annual surface water supplies affecting wildlife habitat. Therefore, impacts to biological resources with regard to groundwater and surface waters is focused upon discussion of impacts to surface water quality.

Impacts and Mitigation Measures

Impacts to biological resources resulting from implementation of the Proposed Action and Alternatives would primarily be related to groundwater pumping and exchange leading to possible degradation of surface water quality within the Fresno Slough and Mendota Pool, and land use changes (e.g., fallowing or crop cultivation) that may occur. The amount of MPG groundwater pumped for use on Adjacent Overlying Lands (or discharged into the Mendota Pool and Fresno Slough for use on other nearby Adjacent Overlying Lands) is assumed to be slightly less under the No Action Alternative (33,395 AFY) than would be pumped under the Proposed Action or Alternative 2 (38,316 AFY). However, even this amount of MPG groundwater pumped under the Proposed Action and Alternative 2 represents a negligible portion of the contracts Reclamation has in place that facilitate the delivery of approximately 930,000 AFY of water through the Mendota Pool (Reclamation 2011a, 2011c). Reclamation also purchases water from the Exchange Contractors and NCR to deliver up to 29,640 AFY to the MWA via the Mendota Pool.

MPG, the City of Mendota, and Meyers Water Bank all pump groundwater into the Mendota Pool or Fresno Slough, with MPG discharging the largest amount. Potential changes to the physical environment would primarily result from high-salinity groundwater being discharged into the Mendota Pool and Fresno Slough, which could potentially create direct or indirect impacts on native habitats, vegetation, wildlife species, and particularly to aquatic habitats within the Fresno Slough and the MWA.

Monitoring results under the existing MPG Pumping and Monitoring Program, initiated in its earliest form in 1990, demonstrate that while water quality within the northern end of the Mendota Pool is generally good, salinity within the Fresno Slough and MWA is highly variable.

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For the period between 2007 and 2017, TDS concentrations at the MWA exceeded Reclamation's water quality standards five out of the eight years (Table 20), with increases in salinity occurring at the MWA (Sample Location 9) during the years 2007–2009 and 2013–2014, including a sustained period of increased salinity during 2009 (LSCE & KDSA 2015). The highest TDS concentration was recorded in 2014 (909 mg/L) as a result of extended drought conditions. Surface water quality in the Pool is affected by numerous factors, including MPG pump-ins, substantial non-MPG pump-ins, return flows from adjacent agricultural land, and recent higher salinity drought influenced levels in the DMC (e.g., 2012-2016), which is the largest input to the Mendota Pool at approximately 930,000 AFY. To help improve the quality of surface water entering the MWA and reduce the potential for future exceedances, MPG's existing design constraints now limit the maximum TDS concentration of each discharge to 1,600 mg/L (a maximum TDS concentration of 2,000 mg/L was previously allowed under the 2005 10-Year Exchange Program).

Plants and animals within freshwater aquatic communities can be affected by salinity. While many plant and wildlife species may have characteristics that provide capacity for tolerance and acclimatization, the rate, timing, pattern, frequency, and duration of such increases have the potential to impact sensitive species. However, the impacts from increased salinity on freshwater aquatic plants and animals over the long term in the San Joaquin Valley are poorly understood. Little is known about the effect of salinity on complex ecosystem processes involving microbes and microalgae, or the salinity thresholds that prevent semi-aquatic and terrestrial species from using aquatic resources. Compounding effects of salinity and other stressors are also poorly understood. However, the potential exists for adverse effects on species interactions, food-web structures and the integrity of communities. Careful management of salinity levels in freshwater ecosystems, particularly in reserves such as the MWA, is of great importance (James et. al 2003).

Concentrations of trace elements are generally low in the Fresno Slough. The CDFW has a target of 5 µg/L for arsenic concentrations at the MWA, and samples taken from the MWA were within this target. However, elevated concentrations of boron were found as samples taken at the MWA in 2014 (Table 21; LSCE & KDSA 2015). In the MWA, all eight samples taken during 2014 exceeded the MWA specific WQO for boron (300 µg/L) with concentration ranging from 400 to 600 µg/L (LSCE and KDSA 2015). With the exception of boron, which exceeded the WQO in every sample for the MWA, concentrations of trace elements were below the WQO for the MWA in 2014.[45] The exceedance of boron concentrations in the MWA in 2014 represents a rare event in which a trace element has exceeded specific WQO for surface waters of the Mendota Pool and Fresno Slough. This exceedance is generally attributed to the extensive duration and effect of the 2012–2015 drought conditions, and is not expected to occur during normal conditions. Further, as discussed in Section 3.2, *Groundwater Quality*, trace elements have been observed in low concentrations, well below acceptable standards, within MPG groundwater throughout the MPG Pumping and Monitoring Program area. Therefore, MPG groundwater inputs have very little effect on trace element concentrations in the Mendota Pool, Fresno Slough, and MWA (Appendix D; Appendix E).

It is unlikely that plants and wildlife in the Mendota Pool or the MWA, including special-status species, would be exposed to high concentrations of trace minerals that would result in

[45] WQO for boron in the MWA is set by the CDFW at 0.3 mg/L (300 µg/L)

significant bioaccumulation of selenium or toxicity of arsenic, molybdenum, or boron in surface water as a result of any of the alternatives. Within the Biological Study Areas, it was determined that MPG groundwater inputs have little influence on the levels of these trace elements, and impacts related to trace elements were determined to be less than significant (see Sections 3.3, *Surface Water Quality* and 3.5, *Sediment Quality*). Selenium and arsenic concentrations in both surface water and sediments have been consistently below detection limits in groundwater samples, and molybdenum in groundwater has historically been below applicable water quality criteria. Changes to these historic levels of trace elements are not expected to substantially change under any of the alternatives. Therefore, the potential for toxic effects from trace elements to aquatic life is considered to be less than significant.

Finally, potential impacts to terrestrial biological resources may result from limited ground disturbance from the potential continuation of well replacement in Westlands under the No Action Alternative and construction of a groundwater recharge basin under Alternative 2. Specific impacts related to well and recharge basin construction are described below in detail.

No significant effects to biological resources would occur associated with MPG's contribution to the four existing NCR Recharge Ponds under any alternative, as there would be no construction activities associated with MPG's use of the ponds. The four existing NCR Recharge Ponds are currently operational and would continue to be operational under all alternatives including the No Action Alternative (although no MPG contributions to the ponds would be made under the No Action Alternative), and operational activities of the ponds associated with the MPG 20-Year Program would be substantially similar to those currently occurring.

Impact BIO-1: Effects on Freshwater Habitat and Aquatic Species in the San Joaquin River and Mendota Pool from MPG Groundwater Inputs

No Action Alternative The No Action Alternative is assumed to result in a reduction of MPG groundwater entering the San Joaquin River from FWD when compared to existing conditions. Surface water quality would remain high with implementation of this alternative. As discussed in Impact SWQ-1 (Effects on Water Quality in the Mendota Pool), TDS concentrations are modeled to remain below water quality thresholds and well below thresholds which would harm habitat and aquatic species in the San Joaquin River and Mendota Pool. The No Action Alternative would result in materially the same salinity concentration during normal years (Table 24).

As water quality is expected to be similar to existing conditions under the No Action Alternative, there would be no adverse changes to the aquatic communities or species within the San Joaquin River and Mendota Pool within the Biological Study Areas. It is important to note that the findings in Impact SWQ 1 (Effects on Water Quality in the Mendota Pool) are conservative in that they do not include the management strategies required under SGMA to achieve sustainable yield by 2040. The individual management strategies of the GSPs may indirectly improve water quality as they may slow the migration of a naturally-occurring saline front that affects many wells in the Mendota Pool Area. Thus, the above findings are conservative.

Proposed Action The Proposed Action would result in continued groundwater inputs into the San Joaquin River from MPG pumping in FWD for indirect delivery to the Mendota Pool and the direct discharge of MPG groundwater along the west side of the Mendota Pool. The Proposed Action would also activate the Terra Linda Recharge Canal and provide MPG contributions to

the four existing NCR Recharge Ponds. As described in Impact SWQ-1 and in the Surface Water Mixing Models in the Hydrogeologic Technical Analysis (Appendix E), this is not expected to substantially degrade existing water quality along the San Joaquin River or at the Mendota Dam, and salinity would be materially the same as under the No Action Alternative (Table 24, 293 mg/L vs 291 mg/L), but lower than TDS concentrations that occur under exiting conditions (Table 24, 293 mg/L vs. 303 mg/L).

MPG pumping could contribute to the potential for surface water quality degradation and associated impacts to plant and wildlife species. Elevated salinity levels may result in short-term die off of less salt-tolerant species, but these species may re-establish during and immediately after flood years when salinity levels are lower. While such impacts associated with the Proposed Action would potentially adversely affect sensitive biological resources, as demonstrated in Impact SWQ-1, implementation of the proposed design constraints would minimize these impacts. The San Joaquin River provides suitable habitat for the giant garter snake; however, well inputs from FWD are generally of good water quality and as the giant garter snake has a high salinity tolerance, MPG well inputs into the San Joaquin River are not expected to significantly affect this species. In addition, selenium detection for MPG wells has been < 2 µg/L or non-detect (see Table E-1, Table E-2, and Table E-3 in Appendix D). As water quality is expected to be similar to existing conditions, there would be no adverse changes to the aquatic communities or species within the San Joaquin River within or adjacent to the Biological Study Areas.

In addition, the revised design constraints initiated by the current one-year extension and continued under the Proposed Action lowered the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the non-fall months, from 2,000 mg/L to 1,600 mg/L. The Surface Water Mixing Model is conservative because it retains the previous threshold of 2,000 mg/L.

Further, the adopted GSPs for the high-priority groundwater basins in the Primary Study Area and in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) could slow, stop, or possibly even reverse the migration of the naturally-occurring saline front, resulting in higher quality groundwater being discharged into the San Joaquin River and Mendota Pool. However, any change to groundwater quality is difficult to estimate until adoption of the GSPs.

Alternative 2 In addition to the recharge components of the Proposed Action, Alternative 2 would also construct the 85-acre River Ranch Recharge Basin. As discussed in SWQ-1, Alternative 2 would result in identical salinity levels in the San Joaquin River and at the Mendota Dam as under the Proposed Action. When compared to the No Action Alternative, Alternative 2 would still result in materially the same low TDS concentrations at the Mendota Dam during a normal year (Table 24; 293 mg/L vs. 291 mg/L). This is because the amount of recharge from the proposed River Ranch Recharge Basin is not great enough to offset the general reduction in MPG inputs and increase in high-quality DMC inflows that would occur under the No Action Alternative. As with the Proposed Action, implementation of the proposed design constraints would ensure TDS concentrations are below established standards. As water quality is expected to be similar to existing conditions, there would be no adverse changes to the aquatic communities or species within the San Joaquin River within the Biological Study Areas.

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As with the Proposed Project, the design constraints under Alternative 2 lower the maximum allowed TDS concentration of MPG discharges into the Mendota Pool during the non-fall months, from 2,000 mg/L to 1,600 mg/L.

Further, the adopted GSPs for the high-priority groundwater basins in the Primary Study Area and in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) could slow, stop, or possibly even reverse the migration of the naturally-occurring saline front, resulting in higher quality groundwater being discharged into the San Joaquin River and Mendota Pool. However, any change to groundwater quality is difficult to estimate until adoption of the GSPs.

Significance Determination before Mitigation

CEQA Significance Determination *Less than significant* for all Alternatives.

Impact BIO-2: Effects on Freshwater Habitat and Aquatic Species in the Fresno Slough and MWA from MPG Groundwater Inputs

Sustained increases in salinity levels or occasional substantial increases in salinity can impact plant and wildlife species and result in shifts in habitat type and species composition. Acute salinity impacts may result in short-term die off of less salt-tolerant species; however, these species may reestablish from the seed bed during and immediately following flood years when the salinity content is lower. Sustained increases in salinity levels could result in long-term changes in vegetation community composition with resulting impacts to existing plant and wildlife species.

Potential impacts on special-status aquatic species such as the giant garter snake are of particular concern and may be directly or indirectly caused by elevated salinity levels. Although the species occupies a range of habitats and is exposed to varying salinity levels, the direct effects of increased salinity on the giant garter snake are not well understood. In addition, concern also exists over the effects of increased salinity on this species' prey base, although primary prey such as mosquitofish and pacific tree frogs are both known to tolerate salinity levels far greater than those recorded in surface waters of the Fresno Slough (refer to discussion in Section 3.4.2, above). Although potential impacts on habitats and special-status species from the current and projected salinity levels of surface water entering the MWA are unclear, caution is warranted as the MWA is a protected State reserve and the giant garter snake is a threatened species known to occur locally.

No Action Alternative Introduction of pollutants in groundwater to the surface water supply of the Fresno Slough, including salts, may threaten the survival of special-status species that are susceptible to water quality changes. While the direct effects of increased salinity on aquatic species such as the giant garter snake and western pond turtle are unknown, such increases are known stressors in resident fish and amphibian populations, the major food source of giant garter snakes (USFWS 2012). As many fish and amphibians species cannot survive in highly saline waters, episodic increases in salinity within the MWA may impact giant garter snake populations over time by reducing the availability of prey species. Other plant and wildlife species may also be impacted by prolonged exposure to higher salinity either directly or to their preferred prey, with potential impacts to populations and habitats.

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As discussed in Impact SWQ-2 (Effects on Water Quality in the Fresno Slough and MWA) the Southern Surface Water Mixing Model indicates that the average monthly TDS concentrations under normal conditions would not exceed monthly TDS thresholds. Simulated concentrations at the MWA range from 317 mg/L in July to about 447 mg/L in January (Table 25). Yearly average TDS concentrations are modeled to be 398 mg/L, below the average annual threshold for TDS concentrations which would harm the giant garter snake's prey base. During a dry year, simulated TDS concentrations at the MWA ranging from about 323 mg/L in July to about 447 mg/L in January (Table 26). The annual average TDS concentration in surface waters at the MWA are predicted to be approximately 405 mg/L (Table 26). As with a normal year scenario, this is also below the TDS concentrations that would harm the giant garter snakes' prey base. MPG pumping for Adjacent Overlying Use is modeled to increase the average annual TDS concentration at the MWA by 36 mg/L during a normal water year and 41 mg/L under a dry year scenario (Appendix E, pg. 73). However, because the No Action Alternative removes the design constraints to diligently monitor TDS concentration, salinity within the Fresno Slough and MWA have the potential to experience occasional increases in TDS concentrations which may exceed daily thresholds. The No Action Alternative increases the potential for unregulated MPG groundwater inputs, which may pose a significant threat to biological communities of the MWA.

It is important to note that the findings in Impact SWQ-2 (Effects on Water Quality in the Fresno Slough and MWA) are conservative in that they do not include the management strategies required under SGMA to achieve sustainable yield by 2040. The individual management strategies of the GSPs may indirectly improve water quality as they may slow the migration of a naturally-occurring saline front that affects many wells in the Fresno Slough area.

Proposed Action Under the Proposed Action, impacts to freshwater habitats and the species that depend upon them could be impacted by discharge of groundwater into the Fresno Slough. In addition to the revised design constraints, the Proposed Action would include activation of the Terra Linda Recharge Canal and MPG water contributions to the four NCR Recharge Ponds, which would somewhat improve groundwater quality in the shallow zone, and therefore, somewhat improve MPG groundwater discharged into the Mendota Pool and Fresno Slough.

Therefore, as discussed in Impact SWQ-2 (Effects on Water Quality in the Fresno Slough and MWA), TDS concentrations expected to occur under normal conditions at the MWA are modeled to have a monthly average range of 310 to 485 mg/L, with an annual average of 414 mg/L (Table 25). The contribution of TDS at the MWA from adjacent pumping and pumping for exchange averaged about 50 mg/L annually (28 mg/L for exchange pumping and 22 mg/L for adjacent pumping). During dry year conditions, TDS concentrations are expected to incrementally increase with a modeled monthly average of 315 to 487 mg/L, and an annual average of 424 mg/L (Table 26). Assuming dry year conditions, pumping from MPG leads to a total average annual increase of 58 mg/L in TDS concentrations at the MWA. Of this, 32 mg/L is attributed to MPG exchange pumping and 26 mg/L is attributed to adjacent pumping. The remainder of the relative increase in TDS concentrations in the MWA during a dry year is attributed to a 22,500 AFY reduction in inflows from the DMC to the MWA. The Proposed Action represents a marginal increase in annual TDS concentrations at the MWA for both normal (increase of 16 mg/L) and dry (increase of 19 mg/L) when compared to the No Action Alternative. As result, TDS concentrations would remain within established thresholds and the projected fluctuations in salinity levels would not result in an adverse impact to the giant garter snake or its prey species. It is important to note that these findings are conservative because the

existing design constraints lower the maximum allowed TDS concentration of MPG groundwater discharged into the Mendota Pool during the non-Fall months, from 2,000 mg/L under the previous design constraints to 1,600 mg/L. However, the results of Southern Surface Water Mixing Model are based on the previous maximum TDS concentration of 2,000 mg/L and TDS concentrations would likely be less than modeled.

Nonetheless, the potential still exists that an unpredicted scenario could occur where the data from the continuous EC recorder at the MWA—which would allow for real-time measurement, transmission, and upload of salinity data specific to the Fresno Slough via installation of a datalogger at the MWA—shows an exceedance in TDS thresholds. It is at this point that the adaptive management component of the Proposed would be implemented, and the MPG pumping program and groundwater discharge locations into the Mendota Pool or Fresno Slough would be modified to bring TDS concentrations to below accepted thresholds to limit the severity of these impacts. Further, the proposed design constraints now include frequent field samples of salinity levels at MPG discharge points to the Mendota Pool and Fresno Slough, with the results of this effort being reported to Reclamation monthly, as opposed to being reported only with the Annual Reports under the 2005 10-Year Exchange Program. Therefore, implementation of this design constraint would allow MPG, in coordination with Reclamation and the MWA, to respond to increased salinity within the MWA in a timely manner, further reducing the potential for exceedance of established salinity thresholds. For additional discussion of impacts associated with salinity and surface water quality within the Fresno Slough and MWA, refer to Impact SWQ-2.

Further, the adopted GSPs for the high-priority groundwater basins in the Primary Study Area and in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) could slow, stop, or possibly even reverse the migration of the naturally-occurring saline front, resulting in higher quality groundwater being discharged into the Fresno Slough. However, any change to groundwater quality is difficult to estimate until adoption of the GSPs.

Alternative 2 Impacts under this alternative would be materially the same as under the Proposed Action. While recharge under Alternative 2 would limit or slow the continued migration of the naturally-occurring saline front and associated TDS increases within wells in the vicinity of Terra Linda Farms and slightly lower TDS concentrations within some MPG wells west of the Fresno Slough, results of the Southern Surface Water Mixing Model indicate that this would only incrementally affect TDS concentrations in surface waters at the MWA.

For instance, when compared to the Proposed Action, Alternative 2 is projected to reduce the annual average TDS concentration by 1 mg/L during normal years and 2 mg/L under dry years. As with the Proposed Project, TDS concentrations under Alternative 2 would remain within established thresholds and the projected fluctuations in salinity levels would not result in an adverse impact to the giant garter snake or its prey species. It is important to note that these findings are conservative because the existing design constraints lower the maximum allowed TDS concentration of MPG groundwater discharged into the Mendota Pool during the non-Fall months, from 2,000 mg/L under the previous design constraints to 1,600 mg/L. However, the results of Southern Surface Water Mixing Model are based on the previous maximum TDS concentration of 2,000 mg/L and TDS concentrations would likely be less than modeled.

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As with the Proposed Action and discussed above, implementation of the design constraints under Alternative 2 would allow MPG, in coordination with Reclamation and the MWA, to respond to increased salinity within the MWA in a timely manner, further reducing the potential for exceedance of established salinity thresholds. For additional discussion of impacts associated with salinity and surface water quality within the Fresno Slough and MWA, refer to Impact SWQ-2.

Further, the adopted GSPs for the high-priority groundwater basins in the Primary Study Area and in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) could slow, stop, or possibly even reverse the migration of the naturally-occurring saline front, resulting in higher quality groundwater being discharged into the Fresno Slough. However, any change to groundwater quality is difficult to estimate until adoption of the GSPs.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact BIO-3: Renewed Farming of Currently Fallowed Agricultural Lands within the Biological Study Areas
While fallowed agricultural lands support low-quality habitat, such areas do provide temporary or seasonal habitat for common or sensitive wildlife for nests, burrows, and foraging. In particular, fallow lands within the vicinity of the MWA are more likely to provide wildlife benefits and act as adjunct habitat, as compared to fallow lands adjacent to active agriculture (Rapport et al. 2003). For example, a Swainson's hawk was observed foraging on fallow lands within Terra Linda Farms and nesting opportunities exist in proximate cottonwoods (Appendix H).

No Action Alternative The conversion of approximately 1,530 acres of fallowed lands in the MPG Adjacent Overlying Lands to irrigated croplands under this alternative would eliminate any existing habitat value and potentially fragment and isolate suitable wildlife habitat.[46] However, these fallowed lands are already maintained with activities such as weed disking and cover crop planting, thereby limiting the potential for long-term, undisturbed natural habitat to develop. As crop idling and fallowing are standard farming practices, species that reside in agricultural areas are typically adjusted to these activities, and increases in farming activities may only modify habitat uses. Given the existing low value of these lands for biological resources, increased farming on these lands would not result in the long-term displacement of significant wildlife habitat.

Proposed Action No presently fallowed agricultural lands would be renewed and irrigated under the Proposed Action. Therefore, no impacts to biological resources would occur.

Alternative 2 Alternative 2 would construct and operate the 85-acre River Ranch Recharge Basin on currently fallow farmlands on the northern portion of Terra Linda Farms just west of

[46] Independent of the anticipated conversion of approximately 1,530 acres of fallowed lands in MPG's Adjacent Overlying Lands to irrigated croplands under the No Action Alternative, approximately 1,080 acres of land in FWD would be fallowed as a result of seepage impairment Restoration Flows resulting from completion of the SJRRP Mendota Pool Bypass & Reach 2B Improvements Project (Related Project No. 1).

the Terra Linda Recharge Canal. Construction of the recharge basin would permanently eliminate the potential for these fallowed farmlands to be renewed with agricultural uses. The potential biological impacts of construction and operation of the River Ranch Recharge Basin on special-status plant species and sensitive wildlife species are discussed in detail under Impact BIO-5 below.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact BIO-4: Habitat Modification from the Conversion of Irrigated Croplands to Fallowed or Idled Lands within the Agricultural Lands of Westlands
No Action Alternative The fallowing, idling, or retirement of 10,000 acres in Westlands would alter existing habitat and may result in a shift of species composition on those affected lands. Idled or retired lands (i.e., left without any maintenance) could be colonized by wildlife species and over the long term may provide improved habitat value, particularly if native plant communities become reestablished. However, MPG lands in Westlands exist within a patchwork of active agricultural lands and do not border major existing natural reserves or extensive areas of undeveloped native habitat. Westlands contains several thousand acres of cultivated land, only a small portion of which is managed by MPG and expected to be fallowed under the No Action Alternative. This landscape pattern reduces the potential for reestablishment of native plant communities due to the absence of adjacent source populations for native plant and animal species.

A range of special-status wildlife species are known to occur within Westlands (Table 32). These species may recolonize fallowed or idled lands, particularly mobile species such as the San Joaquin kit fox or blunt-nosed leopard lizard. However, ongoing maintenance of fallowed lands (e.g., disking and plowing for weed control) would limit habitat value, particularly for burrow/den creation which is required for breeding. Fallowing of active farmlands would alter vegetation type and cover, replacing crops with grasses. Idled lands may provide some quality foraging habitat over time and be colonized by both native plant and wildlife species, but provide limited benefits to such species. Further, extensive aquatic and wetland habitats within and adjacent to MPG lands in Westlands are limited, reducing the potential for occurrence of species such as the giant garter snake which is unlikely to utilize a patchwork of fallowed or idled lands removed from major wetlands or aquatic habitats.

Alternatively, if up to 25,000 AFY of groundwater is pumped within Westlands to support continue irrigation of MPG farmlands, the fallowing or idling of up to 10,000 acres of farmland would not occur, and no associated impacts to biological resources would result from implementation of this alternative. The continued routine replacement of groundwater wells as needed would have a negligible and localized effect on plant and wildlife resources in Westlands. As under existing conditions, this would result in temporary noise and construction vehicle disturbance to foraging wildlife species. Well replacement usually takes less than one week to implement and occurs on agriculturally developed land within low-quality habitat. As a result, no substantial long-term impacts to biological resources would occur.

Proposed Action Under this action, MPG farmlands in Westlands would continue to be irrigated. As such, the fallowing of up to 10,000 acres of MPG farmlands in Westlands would

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not occur, and no associated impacts to biological resources would result from implementation of the Proposed Action.

Alternative 2 Impacts under this alternative would be the same as under the Proposed Action.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact BIO-5: Effects on Biological Resources due to Construction of the River Ranch Recharge Basin
No Action Alternative Under this alternative, construction of the River Ranch Recharge Basin would not occur. Therefore, no associated impacts to biological resources would occur.

Proposed Action Under this alternative, construction of the River Ranch Recharge Basin would not occur. Therefore, no associated impacts to biological resources would occur. Impacts would be identical to both existing conditions and the No Action Alternative.

Alternative 2 The vast majority of habitat within the boundaries of the proposed 85-acre River Ranch Recharge Basin is characterized by fallow agricultural fields or disturbed areas with low potential to support special-status species. Development of the recharge basin would involve intensive vegetation removal and ground disturbing activities during construction, resulting in the removal of this low-value agricultural and disturbed habitat. Additionally, the basin would be subject to periodic flooding (e.g., once every three years on average given current hydrological conditions) and annual maintenance. However, these areas would provide additional open terrestrial habitat for the vast majority of the year.

Special-status plant species were not observed within the basin site during biological field investigations in June 2013 (site conditions are materially unchanged since these field investigations) and are unlikely to colonize the site as it is regularly disturbed through agricultural disking and other soil maintenance practices. Four special-status plant species have been recorded within the immediate vicinity (Sanford's arrowhead, recurved larkspur, lost hills brownscale, and heartscale), but have not been observed in at least 25 years. Any new vegetation that grows on the inside slopes and between vegetation clusters would be regularly removed with the use of farming equipment to ensure that the stability of the bank slopes is not compromised; however, these activities would be timed to minimize or avoid adverse effects on wildlife (e.g., bird nesting seasons). Therefore, the basin site would be unlikely to support these species due to the lack of natural vegetation and alkali habitat. Due to the lack of suitable habitat and large period of time since sensitive plant species have been observed in the vicinity, damage to special-status plant species is not expected to occur as a result of basin construction.

In addition, only seven of the recorded special-status wildlife species within the Biological Study Areas have a moderate potential to occur within the vicinity of basin site, and only Swainson's hawk has a high potential to utilize the site for foraging. These seven species may sometimes utilize fallow agricultural habitat or agricultural ditches and have the potential to be present in the adjacent Fresno Slough; therefore, they may forage or nest within the recharge basin site. Species include the following: burrowing owl, Swainson's hawk, giant garter snake, western pond turtle, American badger, and special-status bats. The potential for take of these species is limited due to the lack of high quality habitat for these species, and impacts could be further

reduced with the implementation of pre-construction surveys. Direct impacts to sensitive wildlife species would largely be limited to the loss of foraging and nesting habitat for avian species. The routine removal of shrubs and small trees that establish within the basin site would result in a loss of potential roosting and nesting habitat.

The continued maintenance of the recharge basin's berms and periodic impoundment of recharge water essentially exclude all freshwater emergent marsh or riparian habitats, which are suitable habitats for the western pond turtle, giant garter snake, and other aquatic species. However, given the site's proximity to the Fresno Slough, these species have a moderate potential to occur within the site. For example, although not recently recorded in the vicinity, the giant garter snake could utilize rodent burrows within the proposed basin site. Conducting pre-construction surveys and limiting basin maintenance work to the active season for the giant garter snake would avoid potential impacts. Ultimately, the potential for take of special-status species would be extremely limited due to the lack of high-quality habitat within the basin site (see Appendix H). Overall, based on the lack of suitable habitat, construction of a recharge basin is not expected to remove valuable habitat for special-status plant and wildlife species.

Construction and maintenance activities associated with the proposed River Ranch Recharge Basin under this alternative would create temporary impacts to wildlife due to increased noise and disturbance; however, such impacts would be similar ongoing maintenance activities conducted on this fallow agricultural land. Additionally, construction-related noise during this period would potentially disrupt wildlife in the immediate vicinity, interfering with wildlife foraging or reproductive activities. Implementation of **Mitigation Measures BIO-5a** and **Mitigation Measure BIO-5b** would minimize impacts by requiring pre-construction surveys, on-site biological monitoring, and the limitation of maintenance activities to periods which would avoid impacts to sensitive biological species. With implementation of these mitigation measures, impacts would be less than significant.

Significance Determination before Mitigation

CEQA Significance Determination Implementation of the No Action Alternative and Proposed Action would result in *less than significant* impacts. Alternative 2 would result in *potentially significant* impacts during initial construction and routine maintenance activities.

Mitigation Measures

Mitigation Measure BIO-5a: Pre-construction surveys and biological monitoring (Alternative 2). Surveys prior to initiation of construction-related activities shall be undertaken on the site of the proposed River Ranch Recharge Basin to determine the presence/ absence of the following species according to accepted agency protocols:

- Burrowing owl
- Swainson's hawk
- Giant garter snake
- Western pond turtle
- American badger

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- San Joaquin kit fox
- Special-status bats

Surveys shall cover areas of suitable habitat as defined in the Biological Resources Technical Report (Appendix H). In the event that special-status species are identified within the proposed basin site, the following would occur: 1) the appropriate agencies shall be notified; 2) the construction site shall be monitored by a qualified biologist who oversees all construction activities affecting sensitive habitat; 3) the site shall be relocated, if necessary; and/or 4) non-disturbance buffers shall be implemented. Pre-construction surveys shall conform to the appropriate CDFW- and/or USFWS-approved survey and monitoring protocols and guidelines for protection of threatened and endangered species, including but not limited to the *U.S. Fish and Wildlife Service Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance*. To the maximum extent feasible, the removal of trees and other potential nest or roost sites shall occur outside of the avian breeding season (i.e., February through August) and bat maternal roost seasons (i.e., March through August). Contractor education regarding sensitive species that have the potential to occur on and adjacent to the site shall also be conducted.

Mitigation Measure BIO-5b (Alternative 2). Maintenance activities for the River Ranch Recharge Basin shall only occur between October 1st and May 1st, outside of the active season for the giant garter snake.

Significance Determination after Mitigation
CEQA Findings *Less than significant* for all Alternatives.

Cumulative Effects

Related Projects that result in elevated salinity in surface waters may increase the potential for adverse impacts on biological resources in the Biological Study Areas. Related projects identified as having potential impacts to biological species include those that would either transfer water or alter flows into or out of the Mendota Pool, Fresno Slough, or San Joaquin River. Major Related Projects in the region include:

- Tranquillity Irrigation District Transfers to the San Luis Water District;
- Firebaugh Canal Water District Transfers;
- CCID Transfers;
- Meyers Water Bank;
- DMC Groundwater Pump-in Program;
- SJRRP – Mendota Pool Bypass & Reach 2B Improvements Project; and
- Maintenance for the Mendota Dam.

Many of these Related Projects have the potential to affect water quality within the Mendota Pool and downstream within the Fresno Slough and MWA; this includes the volume of DMC flows, San Joaquin River flows, and groundwater inputs into the Mendota Pool. The SJRRP

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Mendota Pool Bypass & Reach 2B Improvements Project is part of the SJRRP that would construct a bypass channel that would divert high quality Restoration Flows around the Mendota Dam, but would not reduce contractually obligated flows to the Mendota Pool (i.e., 2,500 AFY) or reduce discharges from farmlands adjacent to the river (e.g., FWD) for ultimate delivery into the Mendota Pool. Cumulatively, these projects could indirectly impact biological resources by affecting surface water quality and aquatic toxicity from changes to salinity levels or flow volumes/rates through the MWA. Under cumulative conditions, the potential exists for the Proposed Action and alternatives to contribute to considerable impacts to aquatic habitats in the MWA and Fresno Slough. As the MWA provides valuable habitat for special-status species, impacts here would be of the greatest concern. The extent and magnitude of cumulative effects to biological resources resulting from related projects transferring water through the Mendota Pool and Fresno Slough is unknown at this time, though as with the Proposed Action, management practices and water quality standards typically required by regulatory agencies approving such projects would likely limit the extent of these impacts.

The quality of groundwater pumped may also improve with the implementation of GSPs under SGMA, which require groundwater basins to achieve sustainable yield within 20 years (i.e., by 2040). By reducing regional pumping to a sustainable yield, the migration of the naturally-occurring saline may be halted or reversed in localized areas when combined with restoration flows or local recharge efforts, which would have an indirect improvement to groundwater quality in the Mendota Pool area. The GSP management strategies will not be realized until 2020 at the earliest. But there is a possibility that implementation of the adopted management strategies may result in higher quality groundwater being discharged into the Mendota Pool and Fresno Slough. Even so, it is important to note is that a carefully managed exchange program with design constraints that limit pumping under certain conditions, such as the one implemented by MPG over the last 30 years, when combined with the proposed recharge facilities under the Proposed Action and Alternative 2 actually represents an existing example of the programs that will likely be required to achieve SGMA's goal of achieving sustainable groundwater yield by 2040, which happens to be toward the very end of the 20 year exchange period. By contributing to the objectives of SGMA, MPG's Pumping and Monitoring Program, design constraints, and adaptive management program would ensure that the Proposed Action or Alternative 2 would not contribute to a cumulatively significant impact to biological resources.

Ongoing trends in changes to land use and agricultural soil management practices also impact plant and wildlife species that forage, burrow, or nest on agricultural lands. Fallowing or transitioning to less water-dependent crops on some farms has been a trend in Fresno and Madera Counties over the last 23 years as documented by the DWR and National Agricultural Statistics Service. These changes in agricultural land use activities can impact suitable nesting habitat for Swainson's hawks and other foraging bird and mammal species. Because of the complexity of these land use trends, it is not possible to reliably quantify cumulative impacts to suitable habitat that have resulted or will result from these changes. Further, agricultural lands, whether cultivated or fallow, generally do not provide high-value habitat for special-status species known to occur within the Biological Study Areas and Westlands. Therefore, collective changes to crop cultivation and fallowing on agricultural lands is not expected to cumulatively result in long-term significant impacts to biological resources in the region.

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3.5 Sediment Quality

This section analyzes the potential impacts of the Proposed Action and Alternatives on sediment quality in the Mendota Pool and in associated water bodies and conveyance facilities (e.g., the San Joaquin River, Fresno Slough, DMC). Sediment quality is influenced by existing sediment substrate within Mendota Pool and by inputs from overlying surface water. MPG groundwater introduced into the Mendota Pool has the potential to impact sediment quality. Information presented in this section is based on sediment quality sampling data from the MPG Pumping and Monitoring Program, which was initiated in August 2001 at the request of the USFWS and continues under the Existing Exchange Agreements. Data presented here was taken from Annual Reports prepared during the years 2002 through 2014.

3.5.1 Environmental Setting/Affected Environment

Background

Sediment quality is of concern because of its potential impacts on the ecological heath of aquatic systems, as heavy metals within sediments can be harmful to wildlife. These metals can bioaccumulate in aquatic species, increasing in toxicity at each level of the food chain, resulting in toxic levels in wildlife at the top of the food chain. Surface water contaminants, including salts and metals from pumped groundwater, and pesticides such as pyrethroids, contribute to sediment contamination. As discussed in Section 3.0.2, *Resources Areas Considered For Analysis,* of this EIS/EIR, the Proposed Action and Alternative 2 would not increase the use of hazardous materials or create a significant hazard to the public or the environment. Existing agricultural operations may involve the use of pesticides regulated by the California Department of Pesticide Regulation. Production would remain similar to existing conditions under the Proposed Action or Alternative 2. Use of pesticides would occur on existing agricultural lands commensurate with the level of production and would not have significant environmental effects on agricultural runoff to surface water bodies, including the Mendota Pool and Fresno Slough.

Findings from the Previous EIS

The 2004 Final EIS included measurements for sediment quality at eight sample locations in the Mendota Pool, and linked water bodies and conveyance facilities such as the Fresno Slough and DMC. These measurements, taken in August 2001, October 2001, and October 2002 (Table 34), are used as the baseline measurements for subsequent sediment quality monitoring that is required as part of the annual monitoring program for the Existing Exchange Agreements. The sediment monitoring program was designed to track spatial distribution of salts (measured as EC), arsenic, boron, molybdenum, and selenium in the sediment. At the time of the 2004 Final EIS, sediment quality guidelines were available from the EPA for only arsenic and selenium, and from the USFWS for selenium at the Grasslands Watershed.[47] The sediment quality for the samples taken in August 2001 was within EPA guidelines for arsenic at all sample locations and

[47] The Grasslands Watershed is located north of Mendota Pool and supports the Grasslands Wildlife Management Area, which is why USFWS has set specific water quality limits for the area. It contains one of the largest remaining blocks of wetlands in the Central Valley.

within USFWS guidelines for selenium at seven of the eight sample locations. In the following two sampling events (October 2001 and October 2002), all eight locations met guidelines for both arsenic and selenium.

The 2004 Final EIS concluded that delivering pumped groundwater under the Exchange Agreements would not degrade sediment quality as it would not contribute to elevated levels of arsenic, molybdenum or selenium in the Mendota Pool, and would not exceed water quality criteria for boron in surface water. Although the 2004 Final EIS stated that the 10-Year Exchange Program would contribute to higher levels of salinity in the Mendota Pool, it is not likely to accumulate in the sediments as these salts are highly soluble. The 2004 Final EIS concluded that impacts to sediment quality would be less than significant.

As demonstrated in the Annual Reports and discussed further below, the 10-Year Exchange Program did not cause an exceedance of thresholds for sediment quality of the Mendota Pool and Fresno Slough. MPP pumping has been properly managed so that MPG contributions have not contributed towards an exceedance of concentrations established by the previous design constraints and thresholds. No significant increases beyond the existing conditions of the 2004 Final EIS have been observed. An exceedance of arsenic and molybdenum were observed in 2013 and 2014, respectively. However, these high concentrations were determined to be unrelated to MPG pumping actions.

Study Areas

This Primary Study Area is the same as that used in this EIS/EIR for Section 3.3, *Surface Water Quality*. This area includes submerged land in the Mendota Pool and linked water bodies and conveyance facilities that may be affected by the introduction of MPG groundwater. This is based on two components: areas where groundwater is introduced into surface water bodies and the direction of flow. As discussed in Section 3.3, *Surface Water Quality*, MPG pumping from wells along the Mendota Pool and Fresno Slough is restricted to periods of southerly flow. Therefore, under the Proposed Action and Alternatives, sediment quality impacts would most likely occur in the areas where groundwater is delivered to the Mendota Pool and the southern portion of the Pool. Additionally, sediment quality at the north end of the Mendota Pool may be affected by water from FWD wells pumping into the San Joaquin River for indirect delivery to the Mendota Pool.

The Proposed Action and Alternative 2 would not affect sediments located in Westlands, as water from any potential MPG pumping would be applied directly to MPG lands in Westlands and would have no effect on sediment quality. Therefore, impacts to sediment quality in Westlands and within the Secondary Study Area are not discussed further.

3.5.2 Regional Setting

Existing Conditions in the Primary Study Area

The 2014 Annual Report includes sediment sampling data from the MPG Annual Pumping and Monitoring Program (Table 33). Sampling results are presented on a dry-weight basis except for EC, which is measured in a saturated paste, and pH, which is measured in a 1:1 solution. The influence of MPG pumping in the Primary Study Area is analyzed based on the spatial distribution of various constituents in the sediment. Any metals or salts introduced into the sediment due to MPG pumping would be expected to be found near MPG discharge points into

the Mendota Pool based on higher concentrations in local sediments than those observed in sediments from other areas of the Pool (Figure 40). Over the last 15 years of the monitoring program, sediment quality was monitored in the eight years in which an exchange occurred: 2002, 2007–2010, and 2012–2014.

Table 33: 2014 Maximum Values from Sediment Sampling Monitoring Results

	Sampling Station	EC (umhos/ cm)	Arsenic (mg/kg)	Boron (mg/kg)	Molybdenum (mg/kg)	Selenium (mg/kg)	TOC (%)	pH	CEC (meq/100g)
San Joaquin River	Columbia Canal	721	6.1	6.2	0.66	0.6 (J)	1.6	7.0	32.6
North & Central Fresno Slough	Mendota Dam	458	9.2	9.6	0.41	0.5 (J)	1.0	6.9	43.3
	DMC	537	5.7	12.5	0.90	0.5 (J)	0.5	7.4	41.9
	Firebaugh Intake Canal	848	5.6	11.6	0.45	0.7 (J)	1.4	6.9	38.9
	Etchegoinberry	1,790	7.9	21.6	0.57	0.9 (J)	1.9	7.5	91.7
Southern Fresno Slough	MWA	1,550	5.8	19.1	0.56	0.7 (J)	1.5	7.7	108.4
	James Irrigation District Booster Plant	1,190	2.8	10.6	0.22	<0.07	0.3	8.9	14.5
	Lateral 6	589	10.5	22.4	1.55	0.1 (J)	0.2	8.4	63.6

Abbreviations: TOC = total organic carbon; CEC = cation exchange capacity; J = the result is an estimated concentration that is greater than the Method Detection Limit but less than the Method Reporting Limit.

Notes: Three samples were tested at each location; results show maximum recoded value for each constituent. Data are expressed in a dry-weight basis for arsenic, boron, molybdenum, and selenium. Analysis performed on saturation extract for EC and pH. Data for grain size and moisture content not presented in this table, but available in Appendix B of the 2010 monitoring report.

Source: LSCE & KDSA 2015.

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Table 34: 2001–2002 Baseline Values from Sediment Sampling Monitoring Results

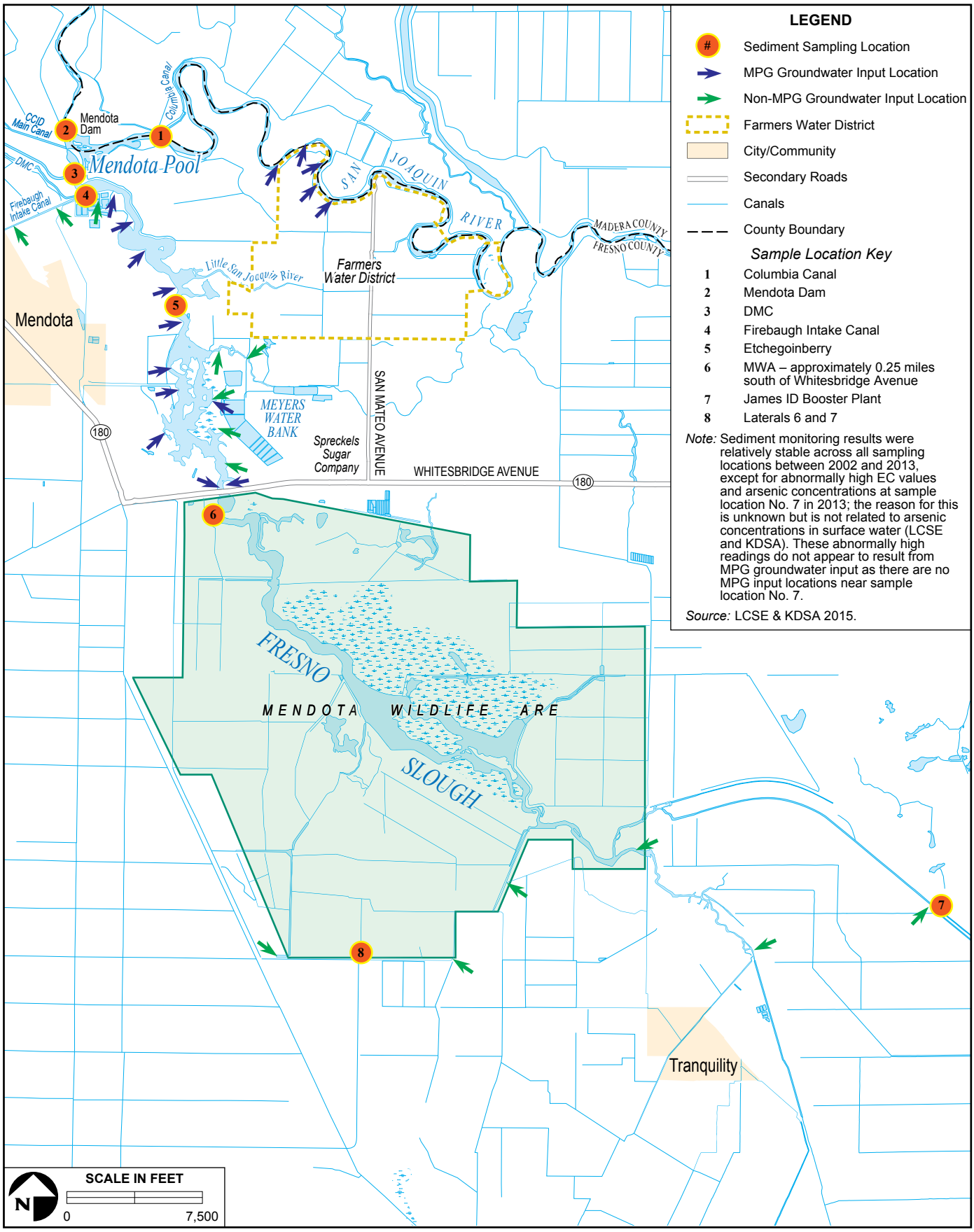
	Sampling Station	EC (µmhos/cm)	Arsenic (mg/kg)	Boron (mg/kg)	Molybdenum (mg/kg)	Selenium (mg/kg)
San Joaquin River	Columbia Canal	79	3.3	6.4	0.7 (B)	<1.1
North & Central Fresno Slough	Mendota Dam	156	4.6	11.8	0.8 (B)	<1.1
	DMC	223	7.1	35.5	2.4	1.1 (B)
	Firebaugh Intake Canal	89	4.7	12.3	1.2 (B)	<1
	Etchegoinberry	133	5.0	20.6	1.0 (B)	<1.1
Southern Fresno Slough	MWA	202	8.6	25.1	1.7 (B)	<1.1
	James Irrigation District Booster Plant	170	2.6	10.8	1.5 (B)	<1
	Lateral 6	271	3.2	28.1	1.0 (B)	<1.1

Abbreviations: TOC = total organic carbon; CEC = cation exchange capacity; B = the result is an estimated concentration that is greater than the Method Detection Limit but less than the Method Reporting Limit.

Notes: Three samples were tested at each location; results show maximum recoded value for each constituent. Data are expressed in a dry-weight basis for arsenic, boron, molybdenum, and selenium. Analysis performed on saturation extract for EC and pH. Data for grain size and moisture content not presented in this table, but available in Appendix B of the 2010 monitoring report.

Source: LSCE & KDSA 2015.

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Sediment Sampling Locations

FIGURE 40

Salts in Sediments

Sediment quality data for EC measurements ranged from TDS concentrations of 37 mg/L to 1,605 mg/L during the eight sediment quality monitoring years (LSCE & KDSA 2015; see Table 1 in Appendix J). EC measurements in sediments tend to be lowest near the San Joaquin River at the Columbia Canal (Sample Location 1) and highest at Lateral 6 of the Fresno Slough (Sample Location 8). The highest TDS concentration of 1,605 mg/L was an anomaly that occurred at the James Irrigation District Booster Plant (Sample Location 7) in 2013. Given that salts in water generally dissolve before accumulating as sediments, the data does not indicate that the spatial distribution of salinity in sediment is associated with the inflow of groundwater from MPG wells. However, the presence of salts in sediments allow sediments to bind with metals. EC measurements within sediments are also related to the water year type (e.g., wet or dry), as low flow and high evaporation rates in dry or extremely dry years may result in the accumulation of salt settlement.

Samples from seven monitoring stations, with the exception of the James Irrigation District Booster Plant (Sample Location 7), contained significantly higher EC measurements in 2014 than measurements taken during previous years of monitoring. These increases in EC measurements are thought to be associated with the lack of southerly flows and the pumping to the Fresno Slough by wells with high EC levels (LSCE & KDSA 2015).

Trace Elements in Sediments

Sediment quality monitoring also indicated that concentrations of trace elements such as arsenic, boron, molybdenum, and selenium have been generally low at all sampling locations; this was also true for most stations in 2014 (Table 33).

Arsenic Arsenic concentrations fluctuate slightly from year to year and were at slightly higher concentrations in 2014, compared to base measurements in 2001 and 2002. During the period from 2001 to 2014, arsenic concentrations only exceeded EPA guidelines once at the James Irrigation District Booster Plant location (Sample Location 7) in 2013 (LSCE & KDSA 2015; Table 2 in Appendix J). At this location, arsenic concentrations in 2013 were significantly higher than measurements in previous years (16.0 mg/kg) but had decreased to 2.8 mg/kg in 2014 and are below the target value of 14 mg/kg. Historic concentrations generally range from 0.8 to 2.7 mg/kg at this location. The reason for high arsenic concentrations at the sampling site in 2013 is unknown, but appears to be unrelated to surface water arsenic concentrations or related to MPG groundwater introductions (LSCE & KDSA 2015).

Boron Boron concentrations vary by location and tend to be lowest near the San Joaquin River at Columbia Canal (Sample Location 1) and highest south of the Fresno Slough near Lateral 6 (Sample Location 8; LSCE & KDSA 2015; Table 3 in Appendix J). Boron concentrations recorded in 2014 are generally less than those recorded in 2001 and 2002 (Tables 33 and 34).

Molybdenum Molybdenum concentrations between 2001 and 2014 ranged from <0.1 mg/kg (Etchegoinberry [Sample Location 5] in 2009) to 2.4 mg/kg (DMC [Sample Location 3] in 2002; Table 4 in Appendix J). Other than the measurements for Laterals 6 and 7 (1.55 mg/kg), molybdenum concentrations in 2014 were slightly lower than base concentrations (Tables 33 and 34). Laterals 6 and 7 can be utilized to transfer water between the Mendota Pool and the SLC

and/or farmlands in Westlands, but no wells discharge into Laterals 6 or 7.[48] The reason for high molybdenum concentrations at the sampling site in 2014 is unknown, but appears to be unrelated to MPG's exchange program and is appears to be a single-year anomaly.

Selenium Few guidelines are available for evaluation of sediment quality (LSCE & KDSA 2015). For the parameters of concern in this analysis, guidelines are only available for arsenic and selenium. The "effects range-low" value for arsenic identified by the EPA is 12.1 mg/kg dry weight. The USFWS established selenium screening criteria for the Grasslands Watershed, located north of the Mendota Pool. These screening criteria have established a target level of 2 mg/kg and a toxicity threshold of 4.0 mg/kg. The screen criteria have been adopted as thresholds of significance for this EIS/EIR (Table 35). Selenium concentrations ranged from 0.2 to 2.8 mg/kg throughout monitoring years between 2001 and 2014. These concentrations were within USFWS target values (2.0 mg/kg) except for three sampling locations in 2009 and one location in 2010; however, these values were well within the toxicity threshold of 4.0 mg/kg (LSCE & KDSA 2015; Table 5 in Appendix J). All monitoring locations showed lower selenium concentrations in 2014 than in previous years including the 2001–2002 baseline conditions (Table 33).

3.5.3 Regulatory Framework

There are no Federal, State, or local regulations related to sediment quality applicable to the Primary Study Area.

3.5.4 Impact Analysis/Environmental Consequence

Methodology for Analysis

The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA to provide a full disclosure of the potential impacts. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion of the baselines for comparison used in this analysis or the methods used for evaluation of the significance of various environmental effects, refer to Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Sediment Quality Monitoring The sediment quality monitoring component within the MPG Annual Pumping and Monitoring Program provides information about the concentrations for constituents of concern in the sediment in the Primary Study Area. The constituents that are monitored as part of this program in accordance with the Existing Exchange Agreements are selenium, arsenic, boron, molybdenum, and EC, among other sediment quality parameters that are sampled at the request of others for their own informational purposes (e.g., CDFW).

[48] Direct conveyance through Laterals 6 and 7 is severely limited due to hydrologic conditions, a limited conveyance network, and the amount of lands served by the laterals that are retired. The conveyance of water would continue to be subject to Westland's Canal Integration Program (CIP), which reverse Lateral 7 flows from the Mendota Pool into the SLC. This Program is limited to 30,000 AF and only when CVP allocations are 20 percent or less. The current 5-year Exchange Agreement and Warren Act Contract expires in 2020.

Information from this program was used to determine the potential contribution of these constituents to the sediment from the Proposed Action and alternatives by:

- Comparing constituent concentrations between areas that are potentially impacted by MPG groundwater inputs with areas that are not;
- Comparing constituent concentrations over time; and
- Measuring concentrations of constituents in source water

The two constituents of concern with guidelines regarding concentration levels are arsenic and selenium. These two constituents were analyzed based on their conformance with the following guidelines in the Annual Reports:

1. Exceedance of the Effective Range Low (ERL) value of 14.0 mg/kg dry weight for arsenic; or
2. Exceedance of the toxicity threshold of 4.0 mg/kg dry weight for selenium and target value of 2.0 mg/kg dry weight selenium.

The remaining constituents of concern do not have quantitative guidelines; however, they have the potential to result in impacts to biological resources in the Mendota Pool, and are therefore tracked as part of the Annual Pumping and Monitoring Program. Tracking these concentrations over time allows CDFW to observe any changes that may raise concerns in the future.

Sediment quality monitoring within the Annual Pumping and Monitoring Program includes a total of eight sample locations, located both in the vicinity of MPG groundwater pumping as well as in outlying areas. Monitoring was performed on an annual basis since 2001 for each year that the MPG performed exchange pumping. The following eight locations are monitored for sediment quality and are shown in Figure 40:

1. Columbia Canal
2. Mendota Dam
3. DMC
4. Firebaugh Intake Canal
5. Etchegoinberry
6. MWA, approximately 0.25 mile south of Whites Bridge
7. James Irrigation District Booster Plant
8. Laterals 6 and 7

These sampling locations include areas close to MPG groundwater discharge locations in the Mendota Pool and Fresno Slough, allowing for analysis of potential changes in sediment quality that may result from the actions authorized under the Existing Exchange Agreements and subsequent 3-Year Extension Exchange Agreements. Additionally, sampling locations include non-MPG input areas at the DMC and James Bypass, as well as the area where the San Joaquin River flows into Mendota Pool at the Columbia Canal. These sediment sampling locations allow analysis of inputs from sources other than MPG pumping.

Thresholds of Significance

Neither CEQA nor NEPA provide quantitative significance thresholds for sediment quality; therefore, the significance criteria for this EIS/EIR is based on guidelines for arsenic from the State of Washington, USFWS standards for selenium, and on concerns expressed by CDFW

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during the development of the Existing Exchange Agreements.[49] Accordingly, the Proposed Action And Alternatives would be considered to have a significant impact on sediment quality if it would:

- Result in the accumulation of salts or trace elements (arsenic, boron, molybdenum, and selenium) in sediments to concentrations that exceed the toxicity values stated in Table 35 below, or are otherwise considered toxic to aquatic life.

As the constituents of concern for the Primary Study Area are naturally occurring, little information is available describing the bioavailability and toxicity of these constituents from sediment to aquatic species; however, there are some studies regarding thresholds for arsenic. The State of Washington's Department of Ecology published proposed sediment quality standards for arsenic of 14 mg/kg in their November 2011 publication, *Development of Benthic SQVs [Sediment Quality Guidelines] for Freshwater Sediments in Washington, Oregon, and Idaho*; these thresholds have been applied to this analysis.[50] The USGS also published a range of proposed sediment quality guidelines for arsenic in their June 2000 publication, *Prediction of sediment toxicity using consensus-based freshwater sediment quality guidelines* (USGS 2000). These thresholds are substantially higher than the threshold proposed by the State of Washington, with the lowest threshold being 17 mg/L. Therefore, this analysis is based on the more conservative threshold for arsenic of 14 mg/kg (Table 35).

Additionally, the USFWS developed guidelines for selenium concentrations for the Grasslands Bypass Project, which is located north of the Study Area. The guidelines were developed to protect ecological resources from impacts due to elevated selenium levels in sediment. The screening criteria for selenium includes a target level of 2 mg/kg and a toxicity threshold of 4 mg/kg dry weight (Table 35; Reclamation 2009). However, there are no available standards for either molybdenum or boron in sediments.

Table 35: Sediment Quality Criteria

Constituent	Threshold[1]	Source for Threshold
Arsenic	Screening Level 1: 14.0 mg/kg[2]	The State of Washington's Department of Ecology threshold from their sediment quality guidelines document.
Selenium	Target Value: 2.0 mg/kg Toxicity Threshold: 4.0 mg/kg	Reclamation threshold from the Final EIS/EIR for Grassland Bypass Project, 2010-2019.

[1] Thresholds are measured on a dry weight basis.
[2] Screening Level 1 is comparable to ERL, Threshold Effects Levels (TELs), Threshold Effects Concentrations (TECs), and Lower Effects Levels (LELs).
Sources: State of Washington 2013 and Reclamation 2009.

[49] The State of Washington's Department of Ecology published thresholds for arsenic, which are the most applicable thresholds available for the Primary Study Area. These thresholds are available in Table IV (Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria) of the Department of Ecology's Sediment Management Standards (effective September 2013) and available at the website at https://fortress.wa.gov/ecy/publications/documents/1109054.pdf.

[50] Due to the lack of available sediment thresholds, the 2004 EIS for the Mendota Pool 10-Year Exchange Agreements used suggested thresholds for arsenic from the EPA's Assessment and Remediation of Contaminated Sediments (ARCS) Program for the Great Lakes region. These thresholds were developed in 1994 for an area far removed from the Proposed Action; therefore, this analysis is based on updated thresholds that are more recent and more applicable to the area.

Impacts and Mitigation Measures

Available sediment quality monitoring data indicate that groundwater from MPG wells has not substantially affected sediment quality. Sediment sampling data between 2001 and 2014 shows that analytes within the Mendota Pool and Fresno Slough fluctuate slightly from year to year but are generally in the range of baseline values taken in 2001 and 2002 for the MPG Annual Pumping and Monitoring Program.

Recorded arsenic concentrations at locations near MPG wells along the San Joaquin River, Mendota Pool, and north and central portions of Fresno Slough have always been below the arsenic concentration threshold. One instance of high arsenic concentrations were recorded in 2013 at James Irrigation District Booster Plant (Sample Location 7) in the southern portion of the Fresno Slough; this location is not in proximity to MPG wells or associated outfalls, indicating that arsenic concentrations in this location are not related to MPG groundwater inputs into the Mendota Pool. Acceptable arsenic concentrations at other sampling locations indicate that sediment quality near the James Irrigation District Booster Plant is not influenced by MPG groundwater inflows, and the high arsenic concentrations therefore are due to other factors.

Selenium sediment concentrations recorded between 2001 and 2014 have all been below the 4.0 mg/kg toxicity threshold. Selenium concentration values exceeded the 2.0 mg/kg target value in 2009 and 2010, and there may continue to be rare occasions where selenium concentrations could exceed this target value. However,, a correlation between areas containing elevated selenium in sediments and the source of the selenium is difficult to establish in water bodies which experience intricate and variable mixing actions. The highest reported selenium concentration occurred in 2009, prior to discontinuation of the Firebaugh Sumps, and was 2.8 mg/kg at the MWA. It should be noted that MPG wells that introduce water for exchange with Reclamation are required to meet a 2 µg/L criteria for selenium in compliance with the concurrence received from USFWS for the Existing Exchange Agreements. Water quality data for participating wells has been either less than this criteria or non-detect (see Table E-1, Table E-2, and Table E-3 in Appendix D).

Although no quantitative thresholds have been identified for concentrations of boron and molybdenum in sediments, recorded values between 2001 and 2014 have been stable and have not increased from baseline values taken in 2001 and 2002 (LSCE & KDSA 2015; see Tables 3 and 4 in Appendix J). This suggests that MPG groundwater inputs into the Mendota Pool have not greatly affected the presence of boron or molybdenum concentrations in sediments. Since these pollutants would be introduced into the sediments through surface waters in the Mendota Pool and Fresno Slough, the fact that their recorded values between 2001 and 2014 have been stable and have not increased from baseline values taken in 2001 and 2002 also indicates that their presence in surface waters is stable and would not impact agricultural uses and aquatic resources, the designated beneficial uses identified for the Lower Kings River (of which the north fork terminates in the Fresno Slough).

EC measurements in sediments have fluctuated greatly between 2001 and 2014, and show that 2014 EC measurements are higher than 2001–2002 baseline EC measurements (Tables 33 and 34). The value of EC in sediments is largely dependent on the type of water year, and in dry years, such as 2014, it can be expected that EC measurements in sediments would be higher due to higher rates of evaporation and greater groundwater inputs with generally high concentrations

of TDS and EC. While most salts would be diluted, dry or extremely dry years may result in salts settling and accumulating as sediments.

Impact SED-1: Sediment Quality Impacts associated with Delivery of Groundwater to the Mendota Pool

No Action Alternative Under the No Action Alternative, the volume of groundwater delivered to the Mendota Pool would be slightly reduced from existing conditions; however, sediment concentrations are expected to remain in the range of values historically taken at these locations.

Sediment concentrations of arsenic and selenium are anticipated to be below the quantitative thresholds (14.0 mg/kg for arsenic and 2.0 mg/kg for selenium) as sediment quality data since 2001 shows that arsenic and selenium concentrations have generally been below thresholds. Therefore, groundwater discharged into the Pool is not expected to result in an exceedance of arsenic concentrations under this alternative. Also, boron and molybdenum in sediments have been stable since 2001, boron and molybdenum concentrations are not expected to increase as a result of this alternative and would remain at acceptable concentrations.

As groundwater pumping is likely greater during dry years, this alternative would continue to contribute to high EC measurements during dry or extremely dry years. No quantitative threshold is available for EC measurements within sediments; however, these EC measurements are anticipated to be reduced during wet or normal years. See Section 3.4, *Biological Resources* for further analysis on the effects of salinity to biological resources.

Proposed Action Sediment quality monitoring data from the Annual Reports indicate generally consistent concentrations of salts and trace elements in sediments over the life of the 10-Year Exchange Program and subsequent 3-Year Extension of the Exchange Agreements. As the Proposed Action would involve similar levels of groundwater pumping into the Mendota Pool as under existing conditions, this alternative is expected to have similar impacts to sediment quality.

As discussed in Section 3.3, *Surface Water Quality*, the Proposed Action is not expected to contribute elevated concentrations of arsenic, boron, molybdenum or selenium to surface waters of the Mendota Pool; therefore, it is unlikely that the Proposed Action would increase concentrations of these analytes in sediments. In addition, Reclamation does not allow exchange of groundwater with selenium concentrations >2 µg/L. With implementation of the Proposed Action's revised design constraints, concentrations of these elements in sediments are expected to be similar to values historically recorded between 2001 and 2014.

MPG groundwater with TDS concentrations up to 1,600 mg/L would be permitted to discharge into surface waters for exchange under the revised design constraints, which is lower than the existing maximum TDS concentration of 2,000 mg/L under the existing design constraints. Salts are highly soluble and sediment quality monitoring data indicates that groundwater with high TDS values generally do not accumulate in salt sediments near the inflows from MPG groundwater pump-ins, except in extremely dry years such as 2014 and 2015. Careful tracking of EC measurements in sediments and implementation of the revised design constraints, would ensure that MPG groundwater deliveries into the Mendota Pool do not decrease sediment quality, particularly EC measurements. Sediment quality monitoring for EC measurements would continue under the Proposed Action.

Alternative 2 Given that MPG groundwater inputs under Alternative 2 are materially the same as those that would occur under implementation of the Proposed Action with regard to sediment quality, potential impacts to sediment quality would be the same as described under the Proposed Action.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Effects

Impact SED-2 (Cumulative): Sediment Quality Impacts associated with Delivery of Groundwater to the Mendota Pool
Surface waters introduced into the Mendota Pool from the DMC and James Bypass, and groundwater from the Exchange Contractors and James and Tranquillity Irrigation Districts may also contribute to sediment quality impacts. Recorded sediment EC measurements have historically been highest in the southern Fresno Slough, along Laterals 6 and 7 (Sample Location 8), and at the James Irrigation District Booster Plant (Sample Location 7), whereas EC measurements are typically lowest in sediments in the center of the Fresno Slough and Columbia Canal on the San Joaquin River. This pattern indicates that flows from the southern Fresno Slough and DMC contribute to sediment quality impacts within the Mendota Pool, Fresno Slough, and MWA. As discussed in Sections 3.2, *Groundwater Quality,* and 3.3, *Surface Water Quality,* MPG wells do not contribute significant levels of arsenic, boron, molybdenum or selenium into the Mendota Pool. As sediment quality data from the Annual Reports between 2002 and 2014 show generally low concentrations of trace elements in the Mendota Pool, any cumulative accumulation of these sediments resulting from the Proposed Action or alternatives would be incremental.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

3.5.5 References

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State of Washington (State of Washington's Department of Ecology). 2013. Sediment Management Standards. September 2013.

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3.6 Land Subsidence

This section analyzes the potential for groundwater pumping under the Proposed Action and alternatives to result in the lowering of the ground surface, referred to as land subsidence. Extracting groundwater from an underground aquifer system can result in compaction of the materials that make up the subsurface where the water was previously contained. When water is reintroduced to the aquifer system, these materials may expand back to their original state; however, in some cases the material cannot expand and the compaction is permanent, resulting in land subsidence. The potential for land subsidence to occur is analyzed using data from the MPG Annual Reports for the years 1999 through 2014 implemented under the Existing Exchange Agreements, including annual and cumulative subsidence measurements at the Yearout Ranch and Fordel extensometers on either side of the Fresno Slough. The results of these measurements are then used to estimate subsidence for the Proposed Action and Alternatives using the Subsidence Model in the 2015 Hydrogeologic Technical Analysis developed for this EIS/EIR (Appendix E). Where relevant to the discussion, information from the 2015 and 2016 Annual Reports is also used in the analysis of subsidence impacts.

3.6.1 Environmental Setting/Affected Environment

Background

Land subsidence is the lowering of the land surface elevation that results from changes that take place underground. The most common causes of land subsidence from human activity are: pumping water, oil, and gas from underground reservoirs; collapse of underground mines; drainage of organic soils; and initial wetting of dry soils. Findings of the 2004 Final EIS and more recent raw data from the two extensometers found that land subsidence in the western and southern parts of the San Joaquin Valley has resulted primarily from groundwater extraction from the region's lower aquifer (Reclamation 2004, LSCE & KDSA 2015). Compaction can be "elastic" or "inelastic", as defined below:

- "Elastic" compaction is a relatively immediate response to water level decline that can be reversed by expansion when groundwater levels recover. Elastic compaction is temporary in nature and does not contribute to long-term land subsidence.
- "Inelastic" compaction occurs when compaction during the irrigation season or other event(s) is greater than the subsequent expansion that occurs when groundwater levels recover. Inelastic compaction generally occurs over a longer time horizon and is not reversible, resulting in permanent land subsidence.

As described in Section 3.1, *Groundwater Levels*, the Primary Study Area is divided into the upper and lower aquifer by the Corcoran Clay layer (refer to Figure 13), which is present at depths of 380 to 420 feet bgs. The Corcoran Clay layer is a significant geological feature composed primarily of clay that forms a generally impermeable barrier to the downward movement of percolating groundwater that divides the water bearing layers into the two distinct aquifers: the upper aquifer and the lower aquifer. Based on raw data from the MPG-operated Fordel Extensometer and CCID-operated Yearout Ranch Extensometer, the substrate below the

Corcoran Clay layer is composed of fine sediments that are susceptible to inelastic compaction with the removal of groundwater, which could result in irreversible subsidence. In contrast, the raw data from the two extensometers indicate that sediment above the Corcoran Clay layer is composed of coarser grain sediments that are primarily susceptible to elastic compaction; subsidence in these layers is able to recover correspondingly when groundwater levels recover (Reclamation 2004, LSCE & KDSA 2015). Therefore, groundwater pumping from above the Corcoran Clay layer has a low potential to cause irreversible subsidence.

In some parts of the Primary Study Area, there is an additional semi-permeable A-Clay layer within the upper aquifer between the Corcoran Clay layer and the ground surface. In these areas, the A-Clay layer divides the upper aquifer into the shallow zone (above the A-Clay layer) and the deep zone (below the A-Clay layer but above the Corcoran Clay layer). In the areas where the A-Clay layer is present, the land is much more susceptible to subsidence from inelastic compaction than surrounding sediments. For modeling purposes, the Subsidence Model in the Hydrogeologic Technical Analysis estimates based on geologic knowledge of the study areas that the A-Clay layer makes up ten percent of the saturated area. Both the 2004 Final EIS and more recent results of raw data from the MPG-operated Fordel Extensometer and CCID-operated Yearout Ranch Extensometer validate this assumption and indicate that these areas are more susceptible to potential subsidence and inelastic compaction from groundwater withdrawals from this depth zone than areas where the A-Clay layer is absent (Reclamation 2004, LSCE & KDSA 2015).

Findings from the Previous EIS

The 2004 Final EIS identified potential subsidence impacts associated with groundwater pumping, but with the implementation of the design constraints the potential for subsidence would be reduced. Beginning in 1999, prior to the 10-Year Exchange Program, subsidence monitoring was conducted on both sides of the Fresno Slough to ensure that MPG groundwater extraction does not result in subsidence beyond specified thresholds. The monitoring program outlined in the 2004 Final EIS established a baseline against which to compare future measurements of subsidence, while the design constraints required that subsidence attributed to MPG groundwater pumping for exchange be limited to less than an average of 0.005[51] foot per year over the 10-year period.

Reclamation approved the groundwater exchange program with the design constraints outlined in the 2004 Final EIS. Reclamation weighed the potential effects of the Proposed Action on land subsidence against the benefits of increased water supply at the Mendota Pool when making this determination. The 2004 Final EIS concluded that the design constraints' monitoring components required in support of the Existing Exchange Agreements would be sufficient to minimize impacts, including potential effects on water management infrastructure, and to ensure subsidence is limited to an acceptable range.

As demonstrated in the annual monitoring reports and discussed further below, the 10-Year Exchange Program has been shown by comprehensive monitoring to not significantly contribute

[51] The established threshold for MPG pumping related subsidence applies only to permanent (e.g., inelastic) compaction. This threshold applies to inelastic compaction as elastic compaction temporary, and reversible. As such, elastic compaction does not result in structural impacts.

to local or regional subsidence. Over the course of operation under the 10-Year Exchange Agreement, MPG has remained within the subsidence threshold of an average of 0.005 foot per year over the 10-year period, with cumulative inelastic compaction averaging 0.0037 feet per year attributable to MPG pumping (Table 37).

Design Constraints Addressing Land Subsidence

One of the design constraints included in the 2004 Final EIS and Existing Exchange Agreements would be retained and modified in the Proposed Action and Alternative 2 to better control subsidence based on the results of the Annual Monitoring and Reporting Programs due to MPG groundwater extraction. Land subsidence measurements are performed as part of the Annual Reports. These measurements help to track changes in water levels and resulting compaction, as well as provide monitoring data to ensure compliance with design constraints. The design constraints require MPG to implement the following measures:

1. Exchange pumping from the deep zone of the upper aquifer shall not exceed an amount that will cause subsidence at the Mendota Dam from data collected from the Yearout Ranch and Fordel Extensometers due to exchange pumping to average more than 0.005 feet per year; and

2. Before the end of the 20-year period of the Proposed Action, MPG would no longer withdraw water from the lower aquifer, having either successfully sealed the lower aquifer portion of the remaining composite wells or discontinuing production due to potential subsidence impacts. It is currently anticipated the remaining composite wells would be plugged prior to the start of the 2020 irrigation season

Study Areas

Potential subsidence impacts are directly related to groundwater levels in the area affected; therefore, the Primary Study Area for this analysis is the same as that for Section 3.1, *Groundwater Levels*. In order to encompass potential area-wide subsidence impacts attributed to MPG pumping, the Primary Study Area includes a 6-mile radius around the approximate center of MPG deep zone groundwater pumping for exchange, and is coterminous with the MPG Pumping and Monitoring Program Study Area (see Figure 4). This area includes all MPG-owned and/or operated wells in the Mendota Pool area, the potential locations of recharge facilities under the Proposed Action or Alternative 2, and potentially affected areas of both Fresno and Madera Counties. For this analysis, land subsidence has been evaluated based on raw data collected at the Yearout Ranch and Fordel extensometers from 1999 to 2014.

The Secondary Study Area extends to the western edge of the Groundwater Basin along I-5 and includes much of western Fresno County, including Westlands, as well as large areas of Madera County south of the Chowchilla River and west of SR-99 (Figure 4). This area was selected to capture the potential of MPG pumping to affect areas of major groundwater drawdown and subsidence in Madera County. This area also includes all MPG lands in Westlands that would potentially receive water under the Proposed Action and Alternative 2, or under the No Action Alternative (would turn to alternate water supplies or alternative land uses in response to a cessation of the Exchange Agreements). In the event that new wells are drilled to compensate for reductions in water supplies, these wells would be drilled on MPG lands within this area.

3.6.2 Regional Setting

Subsidence in the San Joaquin Valley

The majority of subsidence in the San Joaquin Valley has occurred due to groundwater extraction from below the Corcoran Clay layer, present at depths of 100 to 500 feet bgs, resulting in compaction and eventual subsidence in and below this layer (Ireland et al., 1984, and Faunt et al., 2009). This is an ongoing concern in Westlands, where most groundwater wells are perforated below the Corcoran Clay layer, potentially contributing to continued compaction and subsidence in this depth zone. However, in the Mendota Pool area, all but two composite wells in FWD are perforated above the Corcoran Clay layer and do not draw from the lower aquifer.

In the early 1970s, groundwater pumping in the San Joaquin Valley was reduced when CVP surface water imports were brought to the region. The shift from using local groundwater to CVP surface water resulted in a steady recovery of groundwater levels and a reduced compaction rate. However, reduced availability of CVP water during drought events in 1976–77, 1986–92, and 2007–09 temporarily increased groundwater pumping in the Valley, which led to reduced groundwater levels that reached near-historic lows and associated compaction (USGS 2013). The 2013–2015 drought conditions have also resulted in a temporary increase in groundwater pumping throughout the San Joaquin Valley and subsidence increased in areas around Pixley and El Nido (Faunt et al, 2015). The seasonal compaction in 2016 was 0.035 foot. As of March 15, 2017, the elastic rebound was 0.034 foot (but it did not appear to have reached full recovery). This results in 0.002 foot of inelastic compaction in 2016. Extensive rain events in January and February of 2016 and January through March 2017 made the extensometer measurements during this time period potential outliers that would not accurately represent long-term trends. Thus, dial indicator readings were used instead for both winter 2016 and winter 2017, but these were only taken once per month and may not capture the maximum rebound resulting in conservative estimates of elastic rebound and inelastic subsidence. The cumulative inelastic compaction at the Fordel site during the 17-year period beginning in March 2000 and ending January 2017 was 0.051 foot. This amounts to an average inelastic compaction of about 0.003 foot per year, which is less than the "do not exceed" amount (average 0.005 foot per year) specified in the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements.

Subsidence in the Mendota Pool Area

Based on the findings of the 2004 Final EIS and the more recent results of raw data from the MPG-operated Fordel Extensometer and CCID-operated Yearout Ranch Extensometer, most historic subsidence (inelastic compaction) in the Mendota Pool area has been the result of regional pumping from the lower aquifer below the Corcoran Clay layer (Reclamation 2004, LSCE & KDSA 2015). The 2004 Final EIS and more recent data from extensometer readings indicate that the effect of this regional groundwater pumping extends far enough away from the Mendota Pool area in the lower aquifer that it has also historically caused water-level declines and compaction in the Corcoran Clay and other clays in the Mendota Pool area (Reclamation 2004, LSCE & KDSA 2015). MPG pumps very little groundwater from the below the Corcoran layer (3 percent of total MPG pumping), and pumping from the lower aquifer would cease near the end of the 20-year project under the Proposed Action and Alternative 2, so most subsidence (inelastic compaction) is caused by non-MPG pumping in these identified areas. Subsidence in the Mendota Pool area has followed trends of surrounding areas, with the introduction of CVP water to the Valley in 1968 resulting in reduced compaction and subsidence; correspondingly,

increased pumping during dry years with lower CVP deliveries resulted in increased compaction and subsidence.

In the Mendota Pool area, the majority of groundwater pumping is from the aquifers above the Corcoran Clay; these aquifers are composed primarily of sands with interbedded silt and clay layers. In 1965, the DWR installed the Yearout Ranch extensometer to monitor compaction and groundwater levels above the Corcoran Clay in the Mendota Pool area; these measurements were logged continuously for a 17-year period (1966 to 1982). The total inelastic compaction above the Corcoran Clay layer between 1966 and 1982 was reported to be 0.265 foot, and there is evidence that approximately 0.25 foot of additional compaction above the Corcoran Clay layer may have occurred at the Yearout Ranch site between 1982 and 1999. The majority of the subsidence is due to annual drawdowns of less than approximately 35 feet in the upper aquifer system which occurred during historic periods of lower groundwater tables. As a result, compaction due to groundwater withdrawal of less than 35 feet at Yearout Ranch is considered primarily elastic and reversible as the water table recovered each winter (Reclamation 2004).

During the years 1926 to 1970, approximately eight feet of subsidence occurred near the western edge of the City of Mendota. Historically, the area southwest of the City of Mendota was one of the most severely subsidence-impacted areas in the San Joaquin Valley (Reclamation 2004). However, as discussed above, while not reversed, that historic trend has slowed dramatically since 1970 due to CVP water imports as well as careful monitoring and groundwater management through the MPG program. The cumulative inelastic compaction at the Fordel site during the 17-year period beginning in March 2000 and ending January 2017 was 0.051 foot, and so subsidence is occurring at a far slower rate than occurred prior to CVP water deliveries (LSCE & KDSA 2016). Land subsidence in the Mendota Pool area has been closely monitored since 1999 as part of the MPG Annual Pumping and Monitoring Program; subsidence information is included in Annual Reports prepared by the MPG (see Appendix D for 2014 Annual Report).

Subsidence in Westlands

Annual groundwater extraction ranged from 800,000 to 1,000,000 AF during the period between 1950 and 1968, when the delivery of CVP water to Westlands began, resulting in substantial compaction and subsidence (Westlands 2014). Because most wells in Westlands are perforated below the Corcoran Clay layer, the majority of this groundwater extraction was from the lower aquifer, causing groundwater levels in the lower aquifer to reach the lowest recorded average elevation of 156 feet below msl by 1968. The large quantity of groundwater pumped prior to delivery of CVP water caused compaction in the Corcoran Clay and other fine-grained sediments, resulting in land subsidence, which ranged from 1 to 24 feet between 1926 and 1970 (USGS 1988, as cited in Westlands 2008).

Within the Primary and Secondary Study Areas, six extensometers were installed by the USGS between 1958 and 1969 to monitor compaction in depth intervals ranging from about 900 to 2,300 feet bgs. Total land subsidence may be greater than the measured compaction, particularly as measured by the shallower extensometers, as a result of unmeasured compaction below the monitored depth intervals. The greatest compaction was recorded at extensometer T16S/R15E-34N1, which is located about 20 miles south of Mendota, with a total measured compaction of more than 11 feet between 1958 and 1976. Annual compaction measured at the other extensometers prior to 1976 ranged from less than one foot to about four feet (Reclamation 2004).

Beginning in 1968, surface water deliveries from the CVP largely replaced groundwater extraction to support irrigation, resulting in a reduction in the rate of compaction and in some periods allowing expansion (recovery) of the compacted materials. However, pumping increased during periods of reduced CVP deliveries related to droughts in 1976–77 and 1986–92, resulting in reduced water tables and periods of renewed subsidence (USGS 2013). Significant periods surrounding these dates are summarized below (Reclamation 2004):

- **1976–1977, Pumping and Compaction:** The 1976–77 drought resulted in a reduction by up to 75 percent in Westlands' allocation of CVP water. In response, annual groundwater extraction increased from about 100,000 AF in 1976 to 470,000 AF in 1977. Groundwater levels in the lower aquifer decreased by almost 100 feet in 1977, and compaction measured at the extensometers during 1976–77 ranged from 0.10 to 0.53 foot.

- **1977–1979, Expansion:** Significant water level recovery occurred in the two years following the drought, resulting in expansion ranging from 0.02 to 0.20 foot at five of the extensometers. Only one extensometer continued to record compaction, with a measurement of 0.03 foot.

- **1979–1983, Data Gap:** In the early 1980s, responsibility for operation and maintenance of many extensometer sites was transferred to DWR. Due to difficulties during this transition, there is a data gap between 1979 and 1983.

- **1983–1986, Expansion:** Between 1983 and 1986, continued expansion was measured at four of the six extensometers.

- **1987–1992, Pumping and Compaction:** During the drought that began in 1987, extraction in Westlands increased to 600,000 AFY in 1991 and 1992. Compaction measured during the 1987–92 drought ranged from 0.12 to 0.95 foot.

- **1993–1998, Expansion:** Following the drought, four of the six extensometers indicated slight expansion between 1993 and 1998.

- **Total Compaction:** The cumulative recovery measured at these extensometers for the entire period of record starting from between 1958 to 1969 and ending in 1998 (with all extensometers missing data from 1979 to May 1983) ranged from about 1.5 feet to almost 12 feet.

CVP deliveries to MPG farmers in Westlands was originally intended as the supplemental source, but continued drought conditions and other factors have resulted in CVP water being a primary water source. Similarly, the amount of groundwater pumping that occurs in Westlands is primarily related to both drought conditions and the availability of water from the CVP. However, since 1990, CVP water supplies have been reduced annually due to drought and regulatory actions resulting from the CVPIA, the ESA, Bay/Delta water quality requirements, and Court orders. When CVP deliveries are reduced, groundwater pumping is increased, particularly below the Corcoran layer, where water quality is good, thus increasing subsidence. The data from the extensometers in Westlands show a clear correlation between the periods of compaction and expansion, and the amount of groundwater pumping that occurs and the resulting groundwater levels in Westlands. These relationships show that reductions in water

supplies from the CVP generally result in a chain of events that leads to subsidence in Westlands.

Subsidence in Madera County

The western portion of Madera County, which does not receive CVP deliveries and relies solely on groundwater (and occasional surface water flows), is experiencing significant subsidence due to continued heavy pumping and associated declines in groundwater levels. According to Madera County's Integrated Regional Water Management Plan (IRWMP), the County is experiencing 250,000 AFY of groundwater overdraft (Madera Regional Water Management Group 2014). Substantial subsidence impacts are occurring in the western areas of the County, where the Corcoran Clay layer is present, with some areas experiencing more than 21 inches of subsidence during the two-year period from 2008 to 2010. This rate of subsidence is among the highest ever measured in the San Joaquin Valley (USGS 2013), and could threaten public and private infrastructure in the vicinity, particularly flood control and water supply conveyance facilities.

The area of greatest subsidence is located in the Red Top area (LSCE et al., 2014), approximately 15 miles north of the MPG groundwater well field, which includes wells that pump some groundwater from above the Corcoran Clay layer, but an increasing amount of groundwater pumping is occurring below the Corcoran Clay layer. Specifically, the current land use and crops grown in the area have caused irrigation demands to be greater than current groundwater replenishment in the area. In turn, increased water demand has resulted in increased groundwater pumping from wells below the Corcoran Clay (Schmidt & Associates 2012), likely causing the subsidence in the area. This subsidence has resulted in levees that are shorter than designed, increasing the likelihood of overtopping and flooding of adjacent lands during heavy rainfall. Additionally, structures built in the area to control water deliveries and flows are no longer at their design elevations. Large cones of depression have formed in Madera County in both the upper and lower aquifer in the Red Top area in the vicinity of the Eastside Bypass (Schmidt & Associates 2012).

As a result, the direction of groundwater flow in each of these aquifers has shifted toward the cone of depressions from all sides, as the hydraulic gradient pulls water toward this void. Consequently, some of the groundwater that flows into this area is drawn from the south, in the direction of the MPG groundwater pumps (Schmidt & Associates 2012).

In March 2011, a study completed by LSCE evaluated the potential impacts of MPG pumping on declining groundwater levels in Madera County. The study found that most historical declines in groundwater levels in Madera County were the result of pumping within the County rather than by MPG pumping; however, pumping of deep wells in FWD does capture some of the water that would otherwise flow toward the cone of depression in Madera County and incrementally reduces the amount of water that would otherwise reach these areas. The study found that groundwater pumping in FWD associated with the Exchange Agreements would reduce groundwater flow from FWD toward Madera County by approximately 1,400 AFY, which amounts to 1.4 percent of the estimated annual overdraft in Madera County.[52] The study

[52] This estimate is based on the expected difference between total deep-zone pumping by the MPG with and without exchange pumping. Although 12,000 AFY of deep-zone extraction is permitted under the Exchange Agreements, an additional 6,000 AFY would likely be pumped for Adjacent Overlying Use in the absence of the Exchange Agreements; therefore, the analysis considered impacts associated with the 6,000 AFY difference between the two scenarios.

concluded that although pumping in Fresno County has the potential to reduce the amount of groundwater available to flow toward cones of depression in the Red Top area of Madera County, the primary cause of overdraft and resulting subsidence impacts in the Red Top area are associated with pumping within Madera County (LSCE 2011).

Existing Conditions in the Primary Study Area

Withdrawals and Subsidence in the Upper and Lower Aquifer

The upper aquifer is comprised of coarse-grained sediments and is therefore substantially less susceptible to subsidence than the lower aquifer; however, drawdown in the upper aquifer can result in some level of subsidence. Under the 10-Year Exchange Program and subsequent 3-Year Extension of the Exchange Agreement, the vast majority of MPG's groundwater withdrawals (97 percent) occurred in the upper aquifer (Appendix D). As the MPG's pumping primarily occurs in the upper aquifer, the analysis in the monitoring program, discussed below, closely monitors subsidence as a result of drawdowns in this depth zone.

The lower aquifer below the Corcoran Clay layer is composed of fine sediments and is highly susceptible to inelastic compaction, resulting in subsidence. In the Mendota Pool area, there are some composite wells that draw from both the upper and lower aquifer. These include two MPG wells in FWD, and 13 non-MPG wells north of the San Joaquin River. Because most of the groundwater pumped in the Mendota Pool area is from the upper aquifer, the lower aquifer is generally unaffected in the Primary Study Area as it relates to compaction and resulting subsidence in the upper aquifer.

MPG Composite Wells Prior to 2015 four composite wells in FWD were perforated above and below the Corcoran Clay layer, with perforated intervals predominately above the Corcoran Clay layer. Since 2015, perforations in the lower aquifer at two of the wells have been sealed. The other two composite wells are planned to either have the well perforations sealed below the Corcoran Clay or be destroyed as part of the SJRRP. Most of the water pumped by these wells is drawn from the perforated interval in the upper aquifer; therefore, only a small portion of water is drawn from the lower aquifer. In total, approximately three percent (670 AFY in 2014) of MPG exchange pumping withdrawals for the Exchange Agreements are from the lower aquifer, which represented 3 percent of total MPG pumping in 2014 (LSCE & KDSA 2015; Appendix D).

Non-MPG Composite Wells in the Mendota Pool Area Non-MPG wells that draw from the lower aquifer in the Mendota Pool area include 11 composite wells operated by Wonderful Orchards that pumped about 1,200 AFY (4 percent of Wonderful Orchards 2014 pumping); these wells draw the majority of groundwater from the upper aquifer (LSCE & KDSA 2015; Appendix D).

Land Subsidence Monitoring

Compaction and resulting subsidence in the Primary Study Area is measured continuously as part of the MPG Annual Pumping and Monitoring Program at two extensometers: (1) the

Yearout Ranch extensometer, located approximately two miles east of the Fresno Slough within FWD; and (2) the Fordel extensometer, located approximately one mile west of the Fresno Slough at the eastern edge of the City of Mendota (Figure 6). These extensometers were installed to measure compaction in the upper aquifer, located between the ground surface and the top of the Corcoran Clay layer.

The Yearout Ranch extensometer was installed at a depth of 428 feet and is located in an area where the A-Clay layer is present, while the Fordel extensometer was placed at a depth of 418 feet and is located adjacent to the City of Mendota in an area where the A-Clay layer is not present and the upper aquifer consists almost entirely of sands. Therefore, the area surrounding the Yearout Ranch extensometer is more susceptible to compaction and resulting land subsidence. The Fordel extensometer was installed by the MPG in 1999 to measure potential subsidence impacts west of the Fresno Slough from MPG groundwater pumping associated with the Exchange Agreements. Data collection from the Yearout Ranch extensometer, which was originally installed by DWR in 1965, was reinitiated by CCID in 1999 and has continued since.

Data from both extensometers is included in the analyses performed in the Annual Reports. March 2000 was assigned a zero value as the aquifer reached its maximum recovery after the 1999 irrigation season; all subsequent measurements are reported relative to that period. The extensometers measure total compaction above the Corcoran Clay layer, which is the sum of elastic and inelastic compaction. Because inelastic compaction occurs over the long-term, exact measurements of true inelastic compaction can only be determined over a multi-year period.

Both elastic and inelastic compaction at the Fordel and Yearout Ranch extensometers are shown in Table 36. Inelastic compaction is generally considered to be permanent; however, extensometer measurements over the last 10 years of the monitoring program have shown additional expansion in years of rising groundwater levels, indicating that some of the compaction thought to be inelastic can be reversible. These expansions are represented by negative numbers for the inelastic portion of the annual compaction in Table 36.

Calculations are also performed to estimate the portions of inelastic compaction at the Yearout Ranch extensometer that can be attributed to MPG groundwater pumping versus pumping by other users. Historical data available for the Yearout Ranch site was used to determine the relationship between water levels and compaction. Based on this information, the groundwater flow model is used to estimate how much of the annual and cumulative inelastic compaction and resulting subsidence is caused by MPG pumping for the Existing Exchange Agreements versus other pumping (see Table 37).

In addition to the extensometer measurements, subsidence data are available from a high-definition GPS monitoring station located west of the Fresno Slough on land owned by Meyers Farming. This monitoring station was installed in 2004 by the Plate Boundary Observatory (PBO) division of UNAVCO, a non-profit university-governed consortium that facilitates geoscience research and education. The station provides subsidence information based on the total displacement of the ground surface due to compaction occurring in all depth zones, including within and below the Corcoran Clay layer, and does not differentiate between subsidence in the upper and lower aquifer. Although the station does not differentiate between subsidence in the upper and lower aquifer, it provides an additional data point to supplement and confirm the measurement data from the Fordel and Yearout Ranch extensometers.

The 2014 Annual Report found that the MPG has remained within the subsidence threshold of an average of 0.005 foot per year over the 10-year period, with a maximum allowable compaction of 0.05 foot over the 10-year period, at both extensometers. During the period from 1999 to 2014, the cumulative inelastic compaction measured by the Yearout Ranch extensometer amounted to an annual average of 0.013 feet per year; however, the portion of inelastic compaction that was attributed to MPG pumping amounted to an average of 0.0037 feet per year (Table 37). The inelastic compaction attributed to all sources as measured at the Fordel extensometer, including MPG pumping as well as other sources, amounts to an average of 0.0026 feet per year during the period between 1999 and 2014 (Table 36).

Table 36: Total Subsidence at the Fordel and Yearout Ranch Extensometers (in feet)

Year	Fordel Extensometer				Yearout Ranch Extensometer			
	Annual Compaction[1]			Cumulative Inelastic Compaction[2]	Annual Compaction[1]			Cumulative Inelastic Compaction
	Total	Elastic	Inelastic		Total	Elastic	Inelastic	
1999	NA	0.035	NA	NA	NA	0.098	NA	NA
2000	0.043[3]	0.041[3]	0.002	0.002	0.112	0.097	0.015	0.015
2001	0.035	0.032[4]	0.003[4]	0.005	0.109	0.088	0.021	0.035
2002	NA	0.024	0.001[4]	0.006[4]	0.095[4]	0.084[4]	0.011[4]	0.046[4]
2003	0.020	0.019	0.000	0.006	0.073[4]	0.058[4]	0.015[4]	0.061[4]
2004	0.018	0.020	-0.002	0.005	0.075	0.074	0.001	0.062
2005	0.015	0.021	-0.007	-0.002	0.082	0.083	-0.001	0.061
2006	0.009	0.017	-0.007	-0.010	0.074	0.073	0.001	0.062
2007	0.044	0.022	0.023	0.013	0.106	0.088	0.018	0.081
2008	0.030	0.022	0.008	0.021	0.088	0.068	0.020	0.100
2009	0.031	0.018	0.013	0.034	0.098	0.085	0.013	0.113
2010	0.011	0.024	-0.013	0.021	0.056	0.065	-0.009	0.104
2011	0.008	0.013	-0.005	0.016	0.073	0.066	0.007	0.111
2012	0.034	0.024	0.010	0.026	NA[5]	NA[5]	NA[5]	NA[5]
2013	0.034	0.025	0.009	0.034	0.101	0.067[6]	0.034[6]	0.163[6]
2014	0.032	0.027	0.005	0.039	0.079	0.061	0.019	0.182

Notes: NA = not available. March 2000 is used as the reference date with a zero value.

[1] Total compaction is calculated as the difference between the measurement of greatest compaction in a given year and the preceding measurement of least compaction; elastic compaction as the difference between the measurement of greatest compaction in a given year and the subsequent measurement of least compaction; and inelastic compaction as the difference between total compaction and its elastic component. This is equal to the difference between the recovered compaction levels at the end of one compaction cycle and the preceding recovered compaction levels at the beginning of a compaction cycle.

[2] Cumulative inelastic compaction is the sum total of compaction which has occurred annually since 1999.

[3] Values increased by 0.003 foot to correct for unmeasured periods (based on drawdown between July 11 and August 17, 2000).

[4] Estimated value due to foundation washout, new reference datum, or malfunction of logging equipment.

[5] 2012 Yearout Ranch compaction data questionable due to data logger failure.

[6] Estimated value. 2013 Yearout Ranch compaction data incomplete due to lack of data recording full recovery Jan/Feb 2014.

Source: LSCE & KDSA 2015. MPG Annual Pumping and Monitoring Program: 2014 Annual Report.

Table 37: Distribution of Compaction at the Yearout Ranch Extensometer (in feet)

Year	Measured Inelastic Compaction (in feet)	Annual Distribution of Inelastic Compaction[1]		Cumulative Inelastic Compaction (in feet)	Cumulative Distribution of Inelastic Compaction	
		MPG Exchange Pumping	Other Pumping		MPG Exchange Pumping	Other Pumping
2000	0.0145	0.0023	0.0122	0.0145	0.0023	0.0122
2001	0.0208	0.0081	0.0127	0.0353	0.0104	0.0249
2002	0.011[2]	0.0036	0.0074	0.046[2]	0.014	0.0323
2003	0.015	0.000	0.015	0.061[2]	0.014	0.047
2004	0.001	0.000	0.001	0.062	0.014	0.048
2005	-0.001	0.000	-0.001	0.061	0.014	0.048
2006	0.001	0.000	0.001	0.062	0.014	0.048
2007	0.018	0.004	0.014	0.081	0.018	0.062
2008	0.020	0.010	0.010	0.100	0.028	0.072
2009	0.013	0.007	0.006	0.113	0.035	0.078
2010	-0.009	-0.005	-0.004	0.104	0.031	0.074
2011	0.007	0.000	0.007	0.111	0.031	0.081
2012	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]	NA[3]
2013	0.034[4]	0.015[4]	0.019[4]	0.163[4]	0.052[4]	0.111[4]
2014	0.019	0.007	0.011	0.182	0.059	0.122

Notes: NA = not available. March 2000 is used as the reference date with a zero value.
[1] Calculated as measured value multiplied by the percentage based on simulation.
[2] Estimated value due to foundation washout, new reference datum, or malfunction of logging equipment.
[3] 2012 Yearout Ranch compaction data questionable due to data logger failure.
[4] 2013 Yearout Ranch compaction data incomplete due to lack of data recording full recovery Jan/Feb 2014.
Source: LSCE & KDSA 2015. MPG Annual Pumping and Monitoring Program: 2014 Annual Report.

As seen in Table 38, the MPG remained within the design constraint limit of an average of 0.005 feet per year of compaction associated with MPG pumping over the 10-year term of the program. In the period between 2005 and 2014, the inelastic compaction measured at the Fordel extensometer attributed to all sources (including MPG pumping and other sources) had an average of 0.0035 feet per year, roughly two-thirds of the design constraint limit for MPG pumping alone. Additionally, the inelastic compaction that was attributed to MPG pumping at the Yearout Ranch extensometer amounted to an average of 0.0044 feet per year, and is below the design constraint limit.

Table 38: Inelastic Compaction at the Fordel and Yearout Ranch Extensometers (in feet)

Year	Fordel (all pumping)[1]		Yearout Ranch (MPG pumping)[1]	
	Annual	Cumulative	Annual	Cumulative
2005	-0.007	-0.007	0.000	0
2006	-0.007	-0.014	0.000	0
2007	0.023	0.009	0.004	0.004
2008	0.008	0.017	0.010	0.014
2009	0.013	0.030	0.007	0.021
2010	-0.013	0.017	-0.005	0.016
2011	-0.005	0.012	0.000	0.016
2012	0.009	0.021	0.006	0.022
2013	0.009	0.030	0.015[2]	0.037[2]
2014	0.005	0.035	0.007	0.044
Average	0.0035		0.0044	

[1] The compaction figures at the Fordel extensometer represent measurements for subsidence attributed to all groundwater pumpers in the area, while the compaction figures at the Yearout Ranch extensometer represent the modeled subsidence attributed to MPG pumping.
[2] 2013 Yearout Ranch compaction data questionable due to data log failure. Values back calculated using 2013 total and annual compaction data.
Source: LSCE & KDSA 2015. MPG Pumping and Monitoring Program: 2014 Annual Report.

Measurements using high-definition GPS equipment on the Meyers Farm property indicate about 0.53 feet of total inelastic compaction between 2004 and 2014, 12 to 15 times greater than measurements recorded at the Yearout Ranch and Fordel extensometers (both measuring subsidence above the Corcoran Clay) for this same period. The GPS station monitors the total displacement of the ground surface, which shows how much cumulative compaction is occurring in all depth zones and aquifers, including the Corcoran Clay and underlying clays in the lower aquifer. This suggests the additional compaction is occurring below the Corcoran Clay layer, indicating that it would not be attributed to MPG pumping, which occurs almost entirely (about 97 percent) above this layer. Based on data collected from the Yearout Ranch and Fordel Extensometers since 1999, inelastic compaction occurring in and below the Corcoran Clay in the Mendota Pool area is believed to be caused primarily by pumping from the lower aquifer west of Mendota in Westlands and Panoche Water Districts and north and east of the Wonderful Orchards service area in Madera County (LSCE & KDSA, 2015). As mentioned above, over 97 percent of MPG groundwater pumping occurs from above the Corcoran Clay layer, which generally rebounds during periods of groundwater recharge. Data collected from the Yearout Ranch and Fordel Extensometers since 1999 indicates that, in the Mendota Pool Area, compaction in either the upper or lower aquifer hasn't exceeded the design constraints established in 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements.

3.6.3 Regulatory Framework

Federal Policies and Regulations

There are no Federal regulations pertaining to subsidence.

State Policies and Regulations

Sustainable Groundwater Management Act SGMA encourages local agencies to work cooperatively in managing groundwater resources, and is intended to increase local control and

protection of groundwater basins and minimize adverse impacts to basins, including those caused by, and resulting in, significant and unreasonable land subsidence that substantially interferes with surface land uses. In the context of statewide concerns about mismanaged groundwater resources and poor groundwater quality, the act provides a framework and guidance for developing GSPs and designates management authority to local GSAs. As subsidence is caused by groundwater extraction, a required element of each GSP is the inclusion of monitoring components for subsidence that promote the efficient use of groundwater resources. The DWR has designated groundwater basins within Fresno and Madera Counties as high-priority basins. As such, these basins are required to adopt a basin-specific GSP by 2020. Refer to Section 3.1, *Groundwater Levels* for additional information on the implementation of SGMA within the Mendota Pool area.

Local Policies and Regulations

Westlands Water District Groundwater Management Plan Westlands developed a Groundwater Management Plan in 1996 pursuant to AB 3030 and the CVPIA. The Groundwater Management Plan contains goals intended to preserve groundwater resources and quality, ensure the long-term availability of high-quality groundwater, to maintain local control of groundwater resources, and to minimize the impacts of groundwater use including subsidence, a long-term decline in groundwater levels, and reduced soil productivity. The Groundwater Management Plan establishes a perennial yield of 200,000 AFY in Westlands. However, a 2017 National Aeronautical and Space Administration (NASA) report prepared for DWR (Farr et al. 2017) has documented that the two main subsidence bowls in the San Joaquin Valley (centered on Corcoron and El Nido) previously identified in 2015 has grown wider and deeper between March 2015 and September 2016 and that a third area, near Tranquillity in Fresno County has also intensified. The maximum total subsidence in these areas during that time was: 22 inches near Corcoran, 16 inches southeast of El Nido, and 20 inches in the new area near Tranquillity. In addition, the report found that the section of the San Luis Canal/California Aqueduct located in Westlands near the City of Avenal in Kings County has dropped two feet due to subsidence caused by excessive groundwater pumping (Farr et al. 2017). Given the severity of the subsidence referenced in the 2017 NASA report, it is unknown what level of groundwater pumping in the Westlands area is sustainable and as such any associated assumption(s) would be speculative.

Water Quality Control Plan for the Tulare Lake Basin Westlands is located within the Tulare Lake Basin. The Tulare Lake Basin Plan (most recently updated in July 2016) establishes procedures to ensure achievement of all the functions required by the Porter-Cologne Water Quality Control Act as described in Section 3.3, *Surface Water Quality*, of this EIS/EIR, including identifying designated beneficial uses for groundwater resources, defining applicable water quality objectives necessary to support these beneficial uses, and establishing programs that protect water quality. The Tulare Lake Basin Plan identifies overdraft as a concern because it leads to subsidence, and the Plan provides a goal to alleviate overdraft within the basin.

3.6.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

The impact analyses is based primarily on the results of the Hydrogeologic Technical Analysis developed for this EIS/EIR (Appendix E) and data from the MPG Annual Reports (LSCE &

KDSA 2002–2015). The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA. The existing setting includes water exchanges under the 10-Year Exchange Program and subsequent 3-Year Extension Exchange Agreement, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion of the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, refer to Section 3.0.1, *Environmental Review under NEPA and CEQA*.

As summarized above, subsidence in the upper aquifer can be elastic or inelastic. Elastic compaction is temporary and can be reversed when groundwater levels recover, while inelastic compaction results in permanent subsidence of the land surface. Elastic compaction does not result in land subsidence; therefore, the focus of this analysis is on potential inelastic compaction that could result from MPG pumping. Since 97 percent of MPG pumping in 2014 was from the upper aquifer and with implementation of the Proposed Action, by the end of the 20-year exchange period 100 percent of MPG pumping will be from the upper aquifer, subsidence analysis will focus on the upper aquifer.

Subsidence Monitoring under the MPG Annual Pumping and Monitoring Program
Subsidence monitoring provides information about subsidence in the Mendota Pool area as measured at the Yearout Ranch and Fordel extensometers. Data collected includes groundwater levels and resulting elastic and inelastic compaction at each of the extensometers, as well as the portion of inelastic compaction at Yearout Ranch that can be attributed to MPG pumping. Information from this monitoring program was used to determine the potential contribution of the Proposed Action and alternatives to subsidence in the Primary Study Area. In addition to the measurements from the two extensometers, subsidence data is also available from a high-definition GPS monitoring station located west of the Fresno Slough on land owned by Meyers Farming. Although the station is not used as an input to the Subsidence Model in the Hydrogeologic Technical Analysis, it does provide an additional data point to supplement and calibrate the measurement data from the Fordel and Yearout Ranch extensometers.

Subsidence Modeling and Analysis Modeled subsidence is based on the Hydrogeologic Technical Analysis (Appendix E), as well as local historic subsidence rates. The primary factors affecting the conceptual subsidence model are hydrologic and climatic conditions, and those years in which pumping exchange occurred as part of the existing 10-year Exchange Program, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements (1997 to 2002, 2007 to 2010, 2012 to 2014). For the Proposed Action and Alternative 2, it is assumed that MPG would pump 16 years out of the 20-year exchange period. A single long-term drought condition similar in nature to the conditions California recently experienced is conservatively assumed to occur for 7 years in the middle of the 20-year exchange period. These results were used to forecast trends and changes in ground surface elevations within the Study Areas, especially those areas most directly affected by the Proposed Action and alternatives in the vicinity of the Mendota Pool and Fresno Slough. The Hydrogeologic Technical Analysis assesses potential subsidence trends in the Primary Study Area from Year 1 through Year 20.

The model quantifies hydraulic responses of the Proposed Action and alternatives on groundwater conditions, including subsidence. Initial conditions were defined for each aquifer at the beginning of the simulation period with consideration to regional trends and aquifer water

level data. Changes in compaction over time are simulated using the Subsidence Model in the Hydrogeologic Technical Analysis, which calculates changes in hydraulic conditions based on predictive scenarios, preconsolidation stress, and coefficients governing elastic and inelastic compaction. Potential subsidence impacts in Westlands are evaluated qualitatively based on an analysis of historical subsidence data in Westlands and predictive hydraulic conditions. This is because there are no extensometers or high-definition GPS monitoring stations in Westlands that share data with MPG. Further, the quantitative calculation of compaction in the Mendota Pool Area is done to ensure that MPG-related subsidence doesn't lower the existing elevation of the Mendota Dam and associated conveyance infrastructure, thus compromising the functional operation of these facilities. Pumping in Westlands is not located close enough to the Mendota Dam to warrant a quantitative analysis of Westlands impacts on compaction at the dam.

Thresholds of Significance

There are no quantitative thresholds for land subsidence in CEQA, NEPA, or any other Federal, State, or local regulations. Therefore, the significance thresholds used for this analysis are based on the thresholds used in the Existing Exchange Agreements, and on comments received during the public scoping process for this EIS/EIR. According to the Existing Exchange Agreements, the subsidence threshold of an average of 0.005 foot per year (or total of 0.05 foot over 10 years) at either the Yearout Ranch or Fordel extensometers is based on the following factors:

1. The minimum subsidence amount that could be detected over the given period;
2. The Yearout Ranch extensometer is located near FWD and Spreckels Sugar Company in an area that has historically experienced relatively large drawdowns; and
3. The Yearout Ranch extensometer has a relatively long dataset against which to compare current and historic subsidence rates (this criterion was also applied to compaction measured at the Fordel extensometer west of the Fresno Slough).

The original Exchange Agreements were for a period of 10 years, and the Proposed Action would occur over a 20-year period; therefore, thresholds for subsidence have been adapted to account for an additional 20-years of exchange. Under this analysis, land subsidence impacts would be considered significant under NEPA and CEQA if the Proposed Action or Alternatives would cause subsidence that:

1. Result in subsidence rates greater than an average of 0.005 foot per year at either the Fordel and Yearout Ranch extensometers (or total inelastic compaction of 0.1 foot over 20 years at either the Fordel and Yearout Ranch extensometers);
2. Result in damage to structures such as canals, levees, well casings, or buildings;
3. Substantially alter flood patterns; or
4. Result in compaction in the lower aquifer below the Corcoran Clay layer.

These subsidence thresholds are designed to reflect long-term basin-wide patterns rather than localized variation. The subsidence threshold of 0.005 foot per year at either the Fordel or Yearout Ranch extensometers (or total inelastic compaction of 0.1 foot over 20 years at either the Fordel or Yearout Ranch extensometers) was established to ensure that MPG-related pumping does not result in compaction that would damage or compromise the functional operation of

water conveyance structures, particularly the Mendota Dam. Because strata below the Corcoran Clay layer is more susceptible to inelastic compaction, any compaction in the lower aquifer would be considered a significant impact, and is thus, the primary driver for the cessation of MPG pumping from the lower aquifer under the Proposed Action and Alternative 2.

Impacts and Mitigation Measures

For this analysis, potential subsidence impacts associated with the Proposed Action and alternatives are related to inelastic compaction resulting from groundwater withdrawals. This could potentially occur in the Mendota Pool area under the Proposed Action and alternatives, as well as in Westlands under the No Action Alternative. Land subsidence can result in structural damage to buildings as well as damage to other infrastructure such as canals and levees; additionally, subsidence is known to cause an increase in the potential for flooding.

Under the Proposed Action and Alternative 2, the MPG would continue monitoring of MPG-related land subsidence. The proposed adaptive monitoring program details annual land subsidence measured by the Yearout Ranch and Fordel extensometers, and would supply locally designated GSAs with detailed information regarding MPG-related groundwater activities. Monitoring under the current program and the inclusion of additional design constraints would be in line with SGMA rules or restrictions for groundwater monitoring programs and sustainable groundwater management practices.

Subsidence was modeled for the Proposed Action and alternatives and then compared to the level of subsidence projected to occur under the No Action Alternative (Table 39).

Table 39: Modeled Annual Average Inelastic Compaction (in feet)

Extensometer	Alternative	Annual Subsidence (Total Over 20 Years)	Portion Due to Exchange Pumping (Total Over 20 Years)	Difference From No Action (Total Over 20 Years)	Portion Due to Adjacent Pumping /Non-MPG Actions (Total Over 20 Years)
Yearout Ranch	No Action	0.015 (0.295)	NA	NA	NA
	Proposed Action	0.016 (0.329)	0.005 (0.099)	0.002 (0.035)	0.011 (0.230)
	Alternative 2	0.016 (0.327)	0.005 (0.099)	0.002 (0.032)	0.011 (0.228)
Fordel	No Action	0.004 (0.074)	NA	NA	NA
	Proposed Action	0.004 (0.087)	0.003 (0.058)	0.001 (0.013)	0.001 (0.029)
	Alternative 2	0.004 (0.081)	0.003 (0.058)	0.000 (0.007)	0.001 (0.023)

Notes: Annual average simulated inelastic compaction over proposed 20-year exchange period. Total inelastic compaction shown in parenthesis.
See Appendix E.

These modeling results show that projected future subsidence may exceed rates experienced from 1999 to 2014. This increase may be attributed to water levels that are projected to decline below historic lows, mostly due to regional actions associated with the large cone of depression in Madera County (refer to Section 3.1, *Groundwater Levels*). The increased rate of subsidence is projected to occur under all alternatives, including the No Action Alternative, due to regional pumping. Although the rate of subsidence is projected to increase, modeled subsidence is relatively small. The margin of error within the model, calculated to be 0.02 foot at Yearout Ranch extensometer and 0.0018 foot at Fordel extensometer, combined with the lack of sensitivity in modeled compaction, produces difficulty in projecting compaction in comparison

to the threshold of 0.005 foot per year (average) or 0.1 foot over 20 years (LSCE & KDSA 2015). Subsidence is also largely a result of external variables including climatic conditions, flows in the San Joaquin River, regional non-MPG pumping, and recharge from various sources (e.g., percolation of rainwater and use of recharge facilities). Given the variability of external factors and the margin of error in the model, the below discussion represents a conservative analysis.

Impact SUB-1: Subsidence in the Upper Aquifer of the Mendota Pool Area
No Action Alternative Reduced pumping under the No Action Alternative would reduce the potential for subsidence impacts in the Mendota Pool area; however, the Hydrogeologic Technical Analysis projects that the total rate of subsidence in the upper aquifer would increase from existing conditions. Over the 20-year period, total compaction attributed to all pumping actions in the Primary Study Area would be 0.295 foot at the Yearout Ranch extensometer and 0.074 foot at the Fordel extensometer. Therefore, the 0.1 foot subsidence threshold is exceeded at the Yearout Ranch Extensometer. Projected subsidence under this alternative would occur at an average rate of 0.015 foot per year at the Yearout Ranch extensometer and 0.004 foot per year at the Fordel extensometer. Over the very long term, this has the potential to affect operations at the Mendota Dam. The cessation of subsidence monitoring that occurs under the existing exchange program under the No Action Alternative could potentially result in more adverse effects than projected in the model because there would no longer be annual monitoring and reporting to confirm the model results. As a result, impacts under the No Action Alternative would be more adverse than under existing conditions.

The regulations of SGMA would eventually be applied to the disbanded MPG farmers even without the proposed design constraints of the Proposed Action and Alternative 2. At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are not developed enough to be quantitatively modeled. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. Whatever management strategies are ultimately chosen, by achieving sustainable groundwater yield, the regulations of SGMA would reduce the potential for inelastic compaction even without implementation of proposed design constraints. Thus, the above findings are conservative.

Proposed Action According to the Hydrogeologic Technical Analysis, subsidence impacts resulting from the Proposed Action have the potential to increase beyond those experienced to date. This increase is due to climatic factors and regional pumping, including pumping under the Proposed Action. Although the Proposed Action includes pumping limits similar to the existing program, and would include an additional recharge component, regional pumping and continued groundwater decline would reduce water levels such that the aquifer is more susceptible to inelastic compaction and subsidence.

Total subsidence resulting from all groundwater pumping actions in the Mendota Pool area over the 20-year exchange period is projected at 0.329 feet at Yearout Ranch and 0.087 feet at Fordel extensometers, with average annual subsidence occurring at a rate of 0.016 foot per year and 0.004 foot per year, respectively (Table 39). The total annual average rate of compaction attributed to MPG exchange pumping would result in 0.005 foot per year at Yearout Ranch and

0.003 foot per year at Fordel. This level of subsidence would be equal to and within the defined threshold of an average of 0.005 foot per year. If the Annual Monitoring Program identifies a rate of subsidence that exceeds this threshold, the following year's pumping program would be revised as part of the adaptive management strategies. However, MPG pumping for both exchange and Adjacent Overlying Use is modeled to result in an exceedance of the average 0.005 foot per year threshold at the Yearout Ranch extensometer. While average annual compaction attributed with MPG exchange pumping would be within this design constraint, total MPG pumping (including for Adjacent Overlying Use) would result in levels of subsidence that have the potential to affect operations at the Mendota Dam and other conveyance facilities over the very long term (i.e., 50–100 years).

Implementation of the design constraints and continued subsidence monitoring would help to limit MPG's contribution to subsidence impacts. However, the Proposed Action proposes a greater amount of pumping than the No Action Alternative (38,316 AFY vs. 33,395 AFY), which would cause subsidence to occur at a faster rate than under the No Action Alternative or under existing conditions. Since the deep zone of the upper aquifer is more susceptible to subsidence than the shallow zone, the design constraints limit MPG deep zone pumping to 12,000 AFY to minimize impacts. Additionally, the design constraints require that subsidence caused by MPG exchange pumping at the Yearout Ranch and Fordel extensometers is below an average of 0.005 foot per year. If subsidence exceeds this rate, the MPG pumping program would be modified at the beginning of each exchange year in accordance with the results of the Annual Monitoring Program and adaptive management strategies. Implementation of the Annual Monitoring Program and the design constraint requiring that subsidence related to exchange pumping be maintained at or below an average of 0.005 foot per year would ensure that MPG curtails pumping until groundwater levels recover and subsidence effects are reduced.

The regulations of SGMA would eventually be applied to the Delta-Mendota Groundwater Subbasin. At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are not developed enough to be quantitatively modeled. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. Whatever management strategies are ultimately chosen, by achieving sustainable groundwater yield by 2040, toward the end of the 20-year exchange period, the management strategies would reduce the potential for inelastic compaction beyond that which would occur with implementation of the Proposed Action's design constraints and recharge components. Thus, the above findings are conservative.

Alternative 2 This alternative could result in subsidence beyond levels experienced to date under the existing exchange agreements due to groundwater declines. Although this alternative includes an additional 20,000 AF of recharge over the 20-year period, the regional effect of non-MPG pumping means that this recharge results in only an incremental reduction in subsidence when compared to the Proposed Action (Table 39).

The Hydrogeologic Technical Analysis projects total subsidence resulting from all groundwater pumping actions in the Mendota Pool area under Alternative 2 at 0.327 foot and 0.081 foot at the Yearout Ranch and Fordel extensometers, respectively. Average annual subsidence would be a

total of 0.016 foot per year at Yearout Ranch and 0.004 foot per year at Fordel extensometers. Of the total projected subsidence, approximately 0.005 foot per year at Yearout and 0.003 foot per year at Fordel would be attributable to MPG exchange pumping. This level of subsidence would be within the established threshold of 0.005 foot per year. However, MPG pumping for both exchange and Adjacent Overlying Use is modeled to result in an exceedance of the 0.005 foot per year threshold at the Yearout Ranch extensometer and 0.1 foot over the 20-year period. Total subsidence over the 20-year period of this alternative in the very long term (i.e., 50–100 years) may have the potential to affect operations at the Mendota Dam.

Approximately 40,000 AF of recharge would occur in the upper aquifer over the 20-year period through the River Ranch Recharge Basin, Terra Linda Farms Recharge Canal, and NCR Recharge Ponds and would incrementally reduce anticipated impacts to subsidence. Additionally, the design constraint requiring that subsidence related to exchange pumping be maintained at or below an average of 0.005 foot per year would apply to this alternative, as would the 12,000 AFY limit on deep zone pumping. Application of these design constraints would ensure the MPG curtails pumping until groundwater levels recover and subsidence effects are reduced.

The regulations of SGMA would eventually be applied to the Delta-Mendota Groundwater Subbasin. At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are not developed enough to be quantitatively modeled. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. Whatever management strategies are ultimately chosen, by achieving sustainable groundwater yield by 2040, toward the end of the 20-year exchange period, the management strategies would reduce the potential for inelastic compaction beyond that which would occur with implementation of the Alternative 2's design constraints and recharge components. Thus, the above findings are conservative.

Significance Determination before Mitigation
CEQA Significance Determination *Significant and unavoidable* for the No Action Alternative. *Less than significant* for the Proposed Action and Alternative 2.

Impact SUB-2: Subsidence in the Lower Aquifer in the Mendota Pool Area
No Action Alternative Under the No Action Alternative, the discontinuation of existing design constraints may result in increased lower aquifer pumping from composite wells. As the lower aquifer is particularly susceptible to inelastic compaction, this pumping could result in greater subsidence than under existing conditions. Further, new wells that pump from the lower aquifer could be installed under this alternative as there is no design constraint that would restrict the installation of composite or lower aquifer wells. These wells could potentially contribute to additional groundwater declines and subsidence in the lower aquifer. As a result, impacts under the No Action would be more adverse than under existing conditions.

The regulations of SGMA would eventually be applied to the disbanded MPG farmers even without the proposed design constraints of the Proposed Action and Alternative 2. At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are

not developed enough to be quantitatively modeled. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. Whatever management strategies are ultimately chosen, by achieving sustainable groundwater yield, the regulations of SGMA would reduce the potential for inelastic compaction even without implementation of the proposed design constraints. Thus, the above findings are conservative.

Proposed Action Similar to existing conditions, MPG pumping from the lower aquifer under the Proposed Action is estimated to be approximately three percent of the total volume of MPG pumping; this amounts to a maximum total amount of 670 AF in an exchange year (Appendix E). As the lower aquifer is particularly susceptible to inelastic compaction, pumping from composite wells under the Proposed Action would contribute towards subsidence.

However, the Proposed Action would seal the lower aquifer portion of the two remaining composite wells prior to the end of the proposed 20-year exchange period and cease withdrawals from the lower aquifer. Further, the Proposed Action would restrict new wells from being completed below the Corcoran Clay layer. Implementation of this design constraint would effectively restrict MPG groundwater withdrawals from the lower aquifer under the Proposed Action and eliminate MPG's contribution towards subsidence in the lower aquifer. As a result, impacts related to subsidence in the lower aquifer under the Proposed Project would be less than under the No Action Alternative and existing conditions.

The regulations of SGMA would eventually be applied to the Delta-Mendota Groundwater Subbasin. At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are not developed enough to be quantitatively modeled. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. Whatever management strategies are ultimately chosen, by achieving sustainable groundwater yield by 2040, toward the end of the 20-year exchange period, the Proposed Action would discontinue pumping from the lower aquifer and not contribute to additional subsidence.

Alternative 2 Potential subsidence in the lower aquifer under Alternative 2 would be similar to that described under the Proposed Action. Recharge activities from the River Ranch Recharge Basin at Terra Linda Farms would not have a substantial effect in the lower aquifer as recharge would not reach this aquifer. Subsidence associated with changes in the lower aquifer occurs as a result of groundwater withdrawals from below the Corcoran Clay layer. Implementation of the proposed design constraints would restrict withdrawals from the lower aquifer, seal the remaining two composite wells, and prohibit completion of new wells below the Corcoran Clay layer. While MPG pumping from the lower aquifer would continue during the first few years of exchange, full implementation of the proposed design constraints would effectively eliminate MPG's contribution to subsidence in the lower aquifer.

The regulations of SGMA would eventually be applied to the Delta-Mendota Groundwater Subbasin. At this time, the management strategies of the individual GSPs to achieve sustainable

groundwater yield are not developed enough to be quantitatively modeled. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. Whatever management strategies are ultimately chosen, by achieving sustainable groundwater yield by 2040, toward the end of the 20-year exchange period, Alternative 2 would discontinue pumping from the lower aquifer and not contribute to additional subsidence.

Significance Determination before Mitigation
CEQA Significance Determination *Significant and unavoidable* for the No Action Alternative. *Less than significant* for the Proposed Action and Alternative 2.

Impact SUB-3: Subsidence in Westlands
No Action Alternative Under this alternative, increased groundwater pumping in Westlands could occur and result in subsidence in the region. Without the Exchange Agreements, under the No Action Alternative, farmers who choose to continue crop production at levels made possible by exchange water would need to supplement their water supplies with water from other sources (i.e., groundwater). This alternative could result in pumping up to 25,000 AFY in Westlands. The magnitude of cones of depression resulting from pumping up to 25,000 AFY of water would depend on their depths and distribution throughout Westlands. Groundwater supplies in the upper aquifer in Westlands are generally of poor quality, so most wells in this region draw from the lower aquifer, below the Corcoran Clay layer. Withdrawals from the lower aquifer would have widespread impacts to water levels and would likely result in substantial inelastic compaction and subsidence.

The degree of inelastic compaction and resulting subsidence would intensify if groundwater levels are reduced below historic lows. Given total historic pumping rates across Westlands, the pumping of up to 25,000 AFY could increase groundwater withdrawals by 5 to 10 percent in this area in years of low CVP allocations and high pumping (Appendix E, page 69). The most recent groundwater level data in Westlands show depths of 58 feet below msl. If the two feet of subsidence that occurred during the late 1980s to early 1990s is representative of what occurs when groundwater elevations decline to 50 to 100 feet or more below msl, and the 0.5 feet per year subsidence rate returns, then the proportional annual subsidence attributed to this additional pumping would be approximately 0.020 to 0.065 feet per year. This is substantially greater (4 to 13 times greater) than the threshold of 0.005 feet per year.

The regulations of SGMA would eventually be applied to the former MPG farmers in Westlands even without the proposed exchange program under the Proposed Action and Alternative 2. At this time, the management strategies of the individual GSPs to achieve sustainable groundwater yield are not fully developed. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, the use of groundwater recharge facilities, more efficient irrigation techniques, and spot water purchases would likely be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. However, if a reduction in groundwater pumping is required to meet pending sustainability objectives under SGMA, farmers would likely be forced to replace high-value long-term crops with lower-value row crops, which can be more easily

idled in dry years, or fallow substantial portions of their farmlands entirely in the absence of exchange water.

Proposed Action This alternative would not result in additional groundwater pumping in Westlands and the Proposed Action would not contribute to subsidence in this region.

Alternative 2 This alternative would not result in additional groundwater pumping in Westlands and Alternative 2 would not contribute to subsidence in this region.

Significance Determination before Mitigation
CEQA Significance Determination *Significant and unavoidable* for the No Action Alternative. *Less than significant* for the Proposed Action and Alternative 2.

Impact SUB-4: Subsidence in Madera County
No Action Alternative The Red Top area of Madera County in the vicinity of the Eastside Bypass has experienced substantial subsidence due to continued heavy pumping and associated decline in groundwater levels in both the upper and lower aquifer. As a result of these conditions, groundwater is pulled into this area from all directions, including from the south, where MPG groundwater wells are located. Because groundwater is flowing northeastward toward the cone of depression in Madera County, MPG pumping has the potential to intercept and redirect some of the water that would otherwise flow to this area and help to reduce subsidence impacts in the Red Top area.

A study completed by LSCE in March 2011 estimated that only 1.4 percent of the annual decline in groundwater levels in the Red Top area of Madera County could be attributed to groundwater pumping for the Exchange Agreements in FWD. As the No Action Alternative is anticipated to result in reduced groundwater pumping by MPG, MPG's contribution to overdraft conditions and subsidence in Madera County is expected to be incrementally less than under existing conditions. However, with the lack of design constraints and loss of a management approach to regional groundwater supplies, there is the possibility that MPG pumping may increase above existing conditions and exceed that currently permitted. In this case, the No Action Alternative may result in potentially greater contributions to impacts in Madera County. Nonetheless, MPG's highly incremental contribution and further reductions in MPG groundwater pumping under this alternative are not expected to result in significantly adverse effects.

Under SGMA, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area (i.e., the Madera and Chowchilla Subbasins) would be required to identify mechanisms to mitigate overdraft and achieve sustainable groundwater yield. Since overdraft in these subbasins has the greatest influence on groundwater drawdown in the lower aquifer, the implementation of the approved GSPs for those subbasins could also slow, stop, or possibly even reverse any subsidence in the Mendota Pool area.

Proposed Action Despite continued pumping of groundwater for exchange and overlying use, the Proposed Action is expected to continue to have incremental, but less-than-significant impacts on overdraft and resultant subsidence in Madera County. Further, the revised design constraints that would be established with the Proposed Action would potentially reduce impacts to local groundwater levels and associated subsidence. Therefore, subsidence impacts in Madera County associated with MPG pumping activities would be negligible.

It is important to note that the Proposed Action, with specific design constraints that limit pumping and recharge components, provide examples of the programs that will likely be required to achieve SGMA's goal of sustainable groundwater yield by 2040.

Alternative 2 Potential impacts to subsidence in Madera County associated with Alternative 2 would be similar to those under the Proposed Action. Recharge from the River Ranch Recharge Basin would incrementally reduce subsidence in the Mendota Pool area, but would not result in regional effects in Madera County. Nonetheless, subsidence impacts in Madera County associated with MPG pumping activities would be negligible.

It is important to note that Alternative 2, with specific design constraints that limit pumping and recharge components, provide examples of the programs that will likely be required to achieve SGMA's goal of sustainable groundwater yield by 2040.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Effects

The Hydrogeologic Technical Analysis (Appendix E) is cumulative in nature because it considers groundwater subsidence on a regional basis. Any compaction associated with the Proposed Action or Alternative 2 would be in addition to cumulative compaction to date as well as cumulative compaction due to other groundwater pumping activities in the Primary and Secondary Study Areas. Compaction is a result of total area groundwater pumping, which includes ongoing groundwater pumping by local groundwater users such as the City of Mendota, Fresno Slough Water District, CCID, Meyers Farm Water Bank, and James and Tranquillity Irrigation Districts as well as pumping for other groundwater transfer programs, such as the Exchange Contractors 25-Year Water Transfer Program. The Restoration Flows may help to reduce potential cumulative subsidence impacts due to restoration of flows between Gravely Ford and Mendota Dam, increasing the amount of water that percolates into the groundwater supply and allow for the recovery of compaction.

The existing cumulative inelastic compaction in the upper aquifer at each of the extensometers since the period of record starting in 1999 has been 0.011 foot per year at Yearout Ranch and 0.002 foot per year at Fordel. Due to projected groundwater recharge and the loss of irrigated agricultural lands, the Hydrogeologic Technical Analysis projects that cumulative subsidence will occur at rates lower than historical rates due to additional recharge flows at the Meyers Water Bank, increased infiltration resulting from Restoration Flows, and any additional sustainability efforts that would result from the GSPs required under SGMA. These levels of subsidence projected in Table 40 are below the levels projected in Table 39 particularly due to additional recharge expected as a result of the Restoration Flows and Meyers Water Bank; and are below the threshold of 0.005 foot per year for all alternatives.

Table 40: Modeled Annual Average Cumulative Compaction (in feet)

Extensometer	Alternative	Annual Subsidence (Total Over 20 Years)	Portion due to Exchange Pumping	Difference from No Action	Portion due to Adjacent Pumping /Non-MPG Actions
Yearout Ranch	No Action	0.002 (0.045)	NA	NA	NA
	Proposed Action	0.004 (0.073)	0.003 (0.062)	0.001 (0.027)	0.001 (0.011)
	Alternative 2	0.004 (0.071)	0.003 (0.061)	0.001 (0.026)	0.001 (0.010)
Fordel	No Action	0.001 (0.014)	NA	NA	NA
	Proposed Action	0.001 (0.028)	0.002 (0.031)	0.001 (0.014)	0.000 (-0.003)
	Alternative 2	0.001 (0.022)	0.001 (0.029)	0.000 (0.008)	0.000 (-0.007)

Notes: Average simulated inelastic compaction over proposed 20-year exchange period. Total inelastic compaction shown in parenthesis.
See Appendix E.

As mentioned above, the groundwater management strategies required under SGMA would also likely reduce the rate of subsidence in the Study Areas. Although a reduction in groundwater pumping may ultimately be required to achieve sustainable yield, it is also very likely that management strategies to reduce water use, such as more efficient irrigation systems, and an increase in the development of groundwater recharge facilitates would be prioritized over a proposed reduction in groundwater pumping to achieve sustainable yield by 2040 so that the viability of high-value long-term crops is maintained. These strategies are becoming more likely as federal and state grant money are being made available to address groundwater sustainability in the Central Valley.

Even so, it is important to note that the Proposed Action and Alternative 2, with specific design constraints that limit pumping and recharge components, provide examples of the programs that will likely be required to achieve SGMA's goal of sustainable groundwater yield by 2040. By contributing to the objectives of SGMA, the Proposed Action and Alternative 2 may halt groundwater declines when combined with others' efforts to implement the adopted GSPs. However, the GSPs are still in the early phases of study and preparation, and the effect of their specific management strategies on subsidence cannot yet be quantified with certainty, and are conservatively not included in the subsidence projected in Table 40.

Impact SUB-5 (Cumulative): Subsidence in the Upper Aquifer of the Mendota Pool Area
No Action Alternative Over the 20-year period, total compaction attributed to all pumping in the Primary Study Area would be 0.045 foot at the Yearout Ranch extensometer and 0.014 foot at the Fordel extensometer, which would be below the 0.1 foot subsidence threshold for the 20-year period. Projected subsidence under this alternative would occur at an average rate of 0.002 foot per year at the Yearout Ranch extensometer and 0.001 foot per year at the Fordel extensometer. Over the very long term (i.e., 50–100 years), this would result in very incremental subsidence. However, the lack of subsidence monitoring under this alternative could result in more adverse effects than projected in the model. As mentioned above, this finding is conservative because it does not consider any groundwater management strategies that would be required to meet the sustainable groundwater yield requirements of SGMA.

Proposed Action Over the 20-year period, total compaction attributed to all pumping actions in the Primary Study Area would be 0.073 foot at the Yearout Ranch extensometer and 0.028 foot at the Fordel extensometer, which would be below the 0.1 foot subsidence threshold. Projected

subsidence under the Proposed Action would occur at an average rate of 0.004 foot per year at the Yearout Ranch extensometer and 0.001 foot per year at the Fordel extensometer. Over the very long term, this would result in very incremental subsidence. Subsidence attributed to MPG exchange pumping is modeled at 0.062 at Yearout Ranch and 0.031 at Fordel. As mentioned above, this finding is conservative because it does not consider any groundwater management strategies that would be required to meet the sustainable groundwater yield requirements of SGMA.

Alternative 2 Over the 20-year period, total compaction attributed to all pumping actions in the Primary Study Area would be 0.071 foot at the Yearout Ranch extensometer and 0.022 foot at the Fordel extensometer, which would be below the 0.1 foot subsidence threshold. Projected subsidence under Alternative 2 would occur at an average rate of 0.004 foot per year at the Yearout Ranch extensometer and 0.001 foot per year at the Fordel extensometer. Over the very long term, this would result in very incremental subsidence. Subsidence attributed to MPG exchange pumping is modeled at 0.061 at Yearout Ranch and 0.029 at Fordel. As mentioned above, this finding is conservative because it does not consider any groundwater management strategies that would be required to meet the sustainable groundwater yield requirements of SGMA.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

3.6.5 References

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3.7 Land Use and Agricultural Resources

This section evaluates potential impacts on land use and agricultural resources associated with the proposed groundwater recharge component under the Proposed Action and Alternative 2, as well as potential impacts from land fallowing, groundwater pumping, or new construction under the alternatives, including the No Action Alternative. This section also reviews consistency with the Fresno County General Plan, Madera County General Plan, applicable zoning ordinances, MWA Refuge Water Management Plan, and Westlands Groundwater Management Plan.

The primary land use in the Primary and Secondary Study Areas is agriculture. Other land uses include residential, commercial, and industrial uses generally within the Cities of Mendota and Firebaugh, and in small rural communities within Westlands; however, water exchanges and associated potential changes in land use under the Proposed Action and alternatives would not occur in urban or residential areas and therefore, these areas are not discussed in detail under this analysis.

3.7.1 Environmental Setting/Affected Environment

Background

The primary land use throughout the Primary and Secondary Study Areas is agriculture, with this industry supporting many of the jobs and much of the economic output of the region. This area contains land classified as important farmlands by the California Department of Conservation as well as acreage enrolled in Williamson Act contracts, as described below. As such, the County of Fresno protects agricultural resources as an important land use through their General Plan and zoning ordinances. These measures are generally based on the quality of land in terms of potential production value.

Williamson Act

The Williamson Act protects important farmlands by incentivizing farmers to enter into agreements that commit their land to agricultural activities. The act enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space uses in return for reduced property tax assessments. Specifically, this enables landowners who voluntarily agree to participate in the program to receive assessed property taxes according to the income-producing value of their property in agricultural use, rather than on the property's assessed market value. Private land within locally designated agricultural preserve areas are eligible for enrollment under Williamson Act contracts (California Department of Conservation 2013).

Farmland Mapping and Monitoring Program

The California Department of Conservation uses the Natural Resources Conservation Service soil classifications to characterize agricultural lands. The Farmland Mapping and Monitoring Program (FMMP) assesses the location, quality and quantity of agricultural lands and monitors the conversion of these lands to nonagricultural uses. The FMMP classifies important farmland into four categories based on agricultural soil quality and current land use: prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance (see

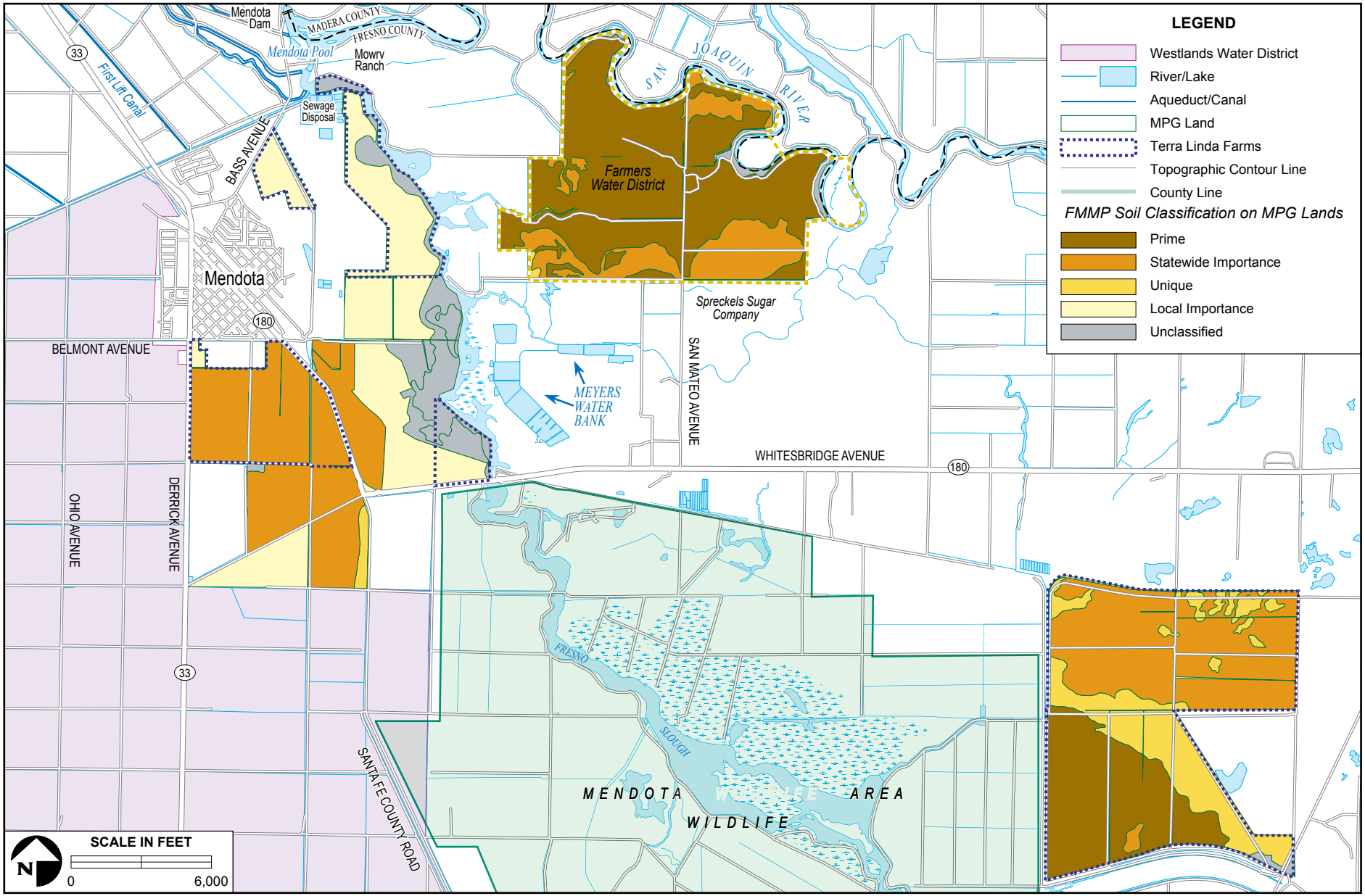
Table 41 and Figures 41 and 42). Important farmlands contain soils best suited for producing food and forage, particularly for producing high-yield crops.

Table 41: Natural Resources Conservation Service Land Use Classifications

Important Farmland	
Prime Farmland	Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields.
Farmland of Statewide Importance	Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture.
Unique Farmland	Farmland of lesser quality soils used for the production of the State's leading agricultural crops. This land is usually irrigated, but may include non-irrigated orchards or vineyards as found in some climatic zones in California.
Farmland of Local Importance	Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.
Other Land Uses	
Grazing Land	Land on which the existing vegetation is well-suited to the grazing of livestock.
Urban and Built Up Land	Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, institutional, public administrative purposes, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.
Other Land	Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies under 40 acres.
Water	Perennial water bodies with an extent of at least 40 acres.

Source: California Department of Conservation 2004.

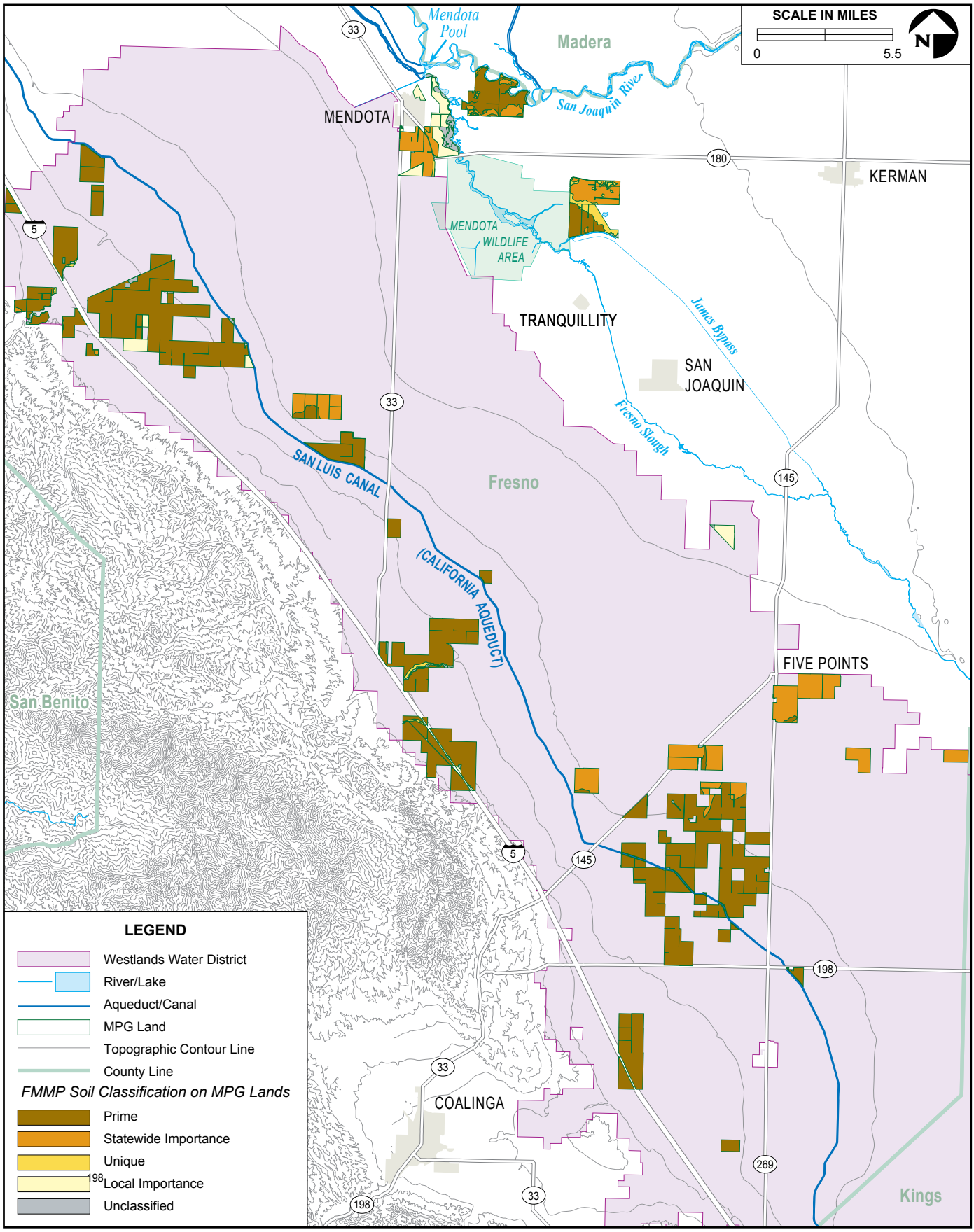
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FMMP Soil Classification of MPG Lands in the Mendota Pool Area

FIGURE 41



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FMMP Soil Classifications of MPG Lands

FIGURE 42

Findings from Previous EIS

The 2004 Final EIS concluded that the Exchange Agreements did not propose any change to, or conflict with, current land use designations (designated as the Westside Valley Area in the Fresno County General Plan) or zoning and would have no effect on land use. Consequently, no design constraints relevant to land use were included in the 2005 Exchange Agreements.

Study Areas

For the purposes of this section, the Primary Study Area includes MPG-owned farmland located within the Mendota Pool area in Fresno County. The Primary Study Area also includes the locations of proposed groundwater recharge facilities under the Proposed Action and alternatives in Fresno and Madera Counties, including the Terra Linda Farm's River Ranch, located west of the Fresno Slough in Fresno County and the NCR groundwater recharge ponds located in Madera County. The Secondary Study Area includes MPG farmlands in Westlands (Figure 4).

3.7.2 Regional Setting

The Valley is the largest agricultural region in the State, supporting the production of over 250 different crops with a total production value of $26 billion, which is over half of the State's total production value of $37.5 billion (CPSJV 2012). The Valley floor is primarily comprised of privately-owned agricultural land that is produced as irrigated cropland. Irrigated lands require at least 1.0 AFY of water per acre, with higher value crops such as fruits, nuts, and vegetables requiring more water (County of Fresno 2000). Correspondingly, agricultural lands make up the majority of water usage in the region.

Surface water used on agricultural lands in Fresno and Madera Counties are generally received by large irrigation districts delivered via the CVP or SWP. Available water supply from the Sierra Nevada meets roughly one third to one half of the agricultural water needs, with imported water contracted through the CVP or SWP and groundwater meeting the remainder of the water needs (DWR 2013). Reductions in water supplies due to drought, legal actions, and compliance requirements are of concern to farmers who rely on the long-term availability of water for agricultural production. See Section 3.2, *Groundwater Quality*, Section 3.3, *Surface Water Quality*, and Section 3.13, *CVP Operations*, for more information on water supply.

In addition to agricultural lands, the Valley sustains important wetland and riparian habitats which also depend on the use of surface water supplies. Riparian habitats in the region are located in areas along rivers, streams, canals and sloughs, while wetlands are mostly restricted to government-managed wildlife refuges. Much of the original wildlife habitats throughout the Valley have been converted to agricultural uses over the last 160 years, and only 5 percent of the original 4 million acres of wetlands remains (DWR 2013). For more information on the remaining habitat within proximity to the Mendota Pool, including the MWA, see Section 3.4, *Biological Resources*.

Land Use and Agricultural Resources in Fresno County

Fresno County produces $4.9 billion in field, seed, vegetable, and fruit and nut crops, representing over 13 percent of the State's agricultural products (County of Fresno 2013). In 2013, over 2 million acres of farmland were actively farmed in Fresno County: 1.3 million acres of field crops, such as barley, corn, cotton, and hay; 0.6 acres of fruit and nut crops; and 0.2 million acres of vegetable crops. Although the majority of farmland in the county is used to farm field crops (61 percent), these crops represent a small portion (12 percent) of the total value

of the county's agricultural production. Meanwhile, the remaining 39 percent of farmland is used to produce higher value crops such as fruits, nuts, vegetables, and seeds, which comprise the remaining 88 percent of the value of crops.

Land use planning in Fresno County is guided by the Fresno County General Plan and zoning ordinances. The Fresno County General Plan establishes long-term goals, objectives, and policies for physical development while zoning regulates land use and development standards to ensure that neighboring land uses are compatible with each other and to protect specific uses of land. Land uses in Fresno County are predominately agricultural. An agricultural zoning designation allows for the operation and production of crops, dairy farms, cattle feed lots, livestock, fish farms, the processing and sale of crops and livestock, rural residences and accessory structures, and some agricultural commercial centers (County of Fresno 2000). Fresno County is the top county for agricultural production in the United States, based on gross value of agricultural production (Fresno County Department of Agriculture 2012). As such, the General Plan aims to minimize the conversion of agricultural land to other uses (County of Fresno 2000).

Agricultural land in Fresno County consists mostly of important farmland (1,370,273 acres) used for crop production; the majority of this farmland is classified as prime. Grazing pastures account for 825,752 acres, while urban and nonagricultural land uses account for only 241,389 acres (California Department of Conservation 2014). The large quantity of prime and important farmland in Fresno County allows for high crop yields and production of high-value crops, most notably grapes, almonds, pistachios, cotton, and oranges (USDA 2012).

Land Uses and Agricultural Resources on MPG Farmlands

Zoning on most MPG owned or operated land is "AE-Agricultural," where land is reserved exclusively for agricultural uses, intended to protect agricultural operations and communities from encroachment by nonagricultural uses. Small portions of MPG lands in the Mendota Pool area, including part of Terra Linda River Ranch, are zoned "AL-Agricultural," a limited agricultural district intended to regulate some agriculturally intensive uses that may be incompatible with adjacent or nearby nonagricultural uses such as residential areas, schools, or civic centers (County of Fresno 2014). Further, an "AL-Agricultural" designation is intended to reserve lands and preserve compatibility for potential future urban uses (County of Fresno Ordinance Code Section 817).

MPG farmers own a total of approximately 49,858 acres of farmland. This includes 42,316 acres of farmland within Westlands and 7,542 acres within the Mendota Pool area. Although some of this farmland is currently fallow, land in the Secondary Study Area has historically been irrigated with CVP water. Of the 49,858 total acres of MPG farmland, 27,052 acres are currently farmed with permanent crops, 19,039 acres are farmed with annual crops, and 3,767 acres are currently fallow (see Table 42).

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Table 42: MPG Farmland Summary

Farmland Acreage	Total Adjacent Overlying Lands (including FWD)	Westlands	Total MPG Farmlands
Permanent Cropland	4,830	22,222	27,052
Annual Cropland	428	18,611	19,039
Fallow Land	2,284	1,483	3,767
Unknown	0	0	0
Total Farmland	7,542	42,316	49,858

The vast majority (98.6 percent) of MPG land, including fallowed lands, is categorized as important farmland by the FMMP (Figures 41 and 42). MPG lands not categorized as important farmland include areas of natural vegetation, small water canals and ponds, private roads, rural residences and agricultural accessory structures. Most of the important farmland is classified as prime (74.7 percent), followed by farmland of statewide importance, farmland of local importance, and unique farmland (see Table 43).

Table 43: Important Farmland Summary

Land Use Classification	Acreage	Percentage of Total MPG Farmland
Prime Farmland	37,243	74.7%
Farmland of Statewide Importance	9,067	18.2%
Unique Farmland	849	1.7%
Farmland of Local Importance	1,982	4.0%
Total Important Farmland	**49,141**	**98.6%**

Source: California Department of Conservation 2014.

The presence of important farmland, especially prime farmland, and production of associated high value crops allows MPG farmers to enroll in Williamson Act contracts. MPG farmers' participation in Williamson Act contracts is extensive; 548 parcels and 45,195 acres of farmland are currently enrolled, equating to 90.6 percent of MPG farmland (California Department of Conservation 2014).

Land Use and Agricultural Resources within New Colombia Ranch in Madera County

NCR is located within Madera County (Figure 6). Similar to Fresno County, Madera County is predominantly agricultural, with 304,248 acres of total cropland (USDA 2012). Within the Primary Study Area where NCR is located, the Madera County General Plan and zoning ordinances designate land use as "Agricultural-Exclusive," permitted for all types of agricultural uses, as well as rural residences and accessory structures. The Madera County General Plan outlines goals and policies aimed at preserving agricultural lands and conserving agricultural soil. The Madera County General Plan also encourages participation in Williamson Act contracts. Land within and adjacent to NCR are categorized as prime farmland and are currently enrolled under Williamson Act contracts (California Department of Conservation 2014).

3.7.3 Regulatory Setting

This section provides an overview of the regulatory agencies and specific land use regulations that are applicable to the Proposed Action and alternatives.

Federal Policies and Regulations

Farmland Protection Policy Act The Farmland Protection Policy Act (FPPA) was established in order to minimize the extent to which Federal programs contribute towards the conversion of farmland to nonagricultural uses. The act ensures that Federal programs are administered to be compatible with State and local regulations that protect farmland. Projects subject to FPPA includes those that may irreversibly convert croplands, fallowed lands, forests, and pastures to nonagricultural uses and are completed by a Federal agency. The FPPA excludes projects on land used for water storage.

State Policies and Regulations

California Department of Conservation, Division of Land Resource Protection The California Department of Conservation applies soil classifications developed by the Natural Resources Conservation Service to identify agricultural lands as defined under Public Resources Code Section 21060.1. The FMMP was established in 1982 to assess the location, quality, and quantity of agricultural lands and monitors the conversion of these lands to nonagricultural uses. Pursuant to the FMMP, these designations are included in the important farmland maps and applied when planning present and future uses for California's agricultural land resources. Important farmlands are considered prime, unique, farmland of statewide importance, and farmland of local importance.

California Land Conservation Act (Williamson Act) The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, is promulgated in California Government Code Section 51200-51297.4. The Williamson Act program is administered by the California Department of Conservation in conjunction with local governments, which administer the individual contract arrangements with landowners. Under the Williamson Act, the landowner commits their parcel or parcels to a 10-year "rolling" period during which no conversion out of agricultural use is permitted. Each year the contract automatically renews unless a notice of non-renewal or cancellation is filed. In return, the land is taxed at a rate based on the actual use of the land for agricultural purposes, as opposed to its unrestricted market value. Participation in the Williamson Act program is dependent on County adoption and implementation of the program and is voluntary for landowners.

California Government Code Section 51238 states that the erection, construction, alteration, or maintenance of water, electric, communication, or other facilities, is determined to be a compatible use within any agricultural preserve, unless otherwise decided by a local board or council. Also, Section 51238 states that the Board of Supervisors may impose conditions on lands or land uses to be placed within preserves to permit and encourage compatible uses in conformity with California Government Code Section 51238.1, which allows a board or council to deem compatible any use, without conditions or mitigation that would otherwise be considered incompatible. However, this may occur only if that land use meets the following conditions:

- The use will not significantly compromise the long-term productive agricultural capability of the parcel.

- The use will not significantly displace or impair current or reasonably foreseeable agricultural operations on the parcel.
- The use will not result in the significant removal of adjacent contracted land from agricultural or open space use.

Farmland Security Zone Act The Farmland Security Zone Act was passed by California legislature in 1999 to ensure that long-term farmland preservation is part of public policy. Under the provisions of this act, a landowner already under a Williamson Act contract can apply for Farmland Security Zone status by entering into a contract with the appropriate County. Farmland Security Zone classification automatically renews each year for an additional 20 years. In return, for a further 35-percent reduction in the taxable value of land and growing improvements (in addition to Williamson Act tax benefits), the owner of the property agrees not to develop the property into nonagricultural uses.

Irrigated Lands Regulatory Program (ILRP) Initiated by the SWQCB, the ILRP was established to prevent agricultural runoff from impairing surface waters. In 2012, following adoption of SGMA, groundwater regulations were added to the ILRP. In addition the ILRP requires lands converted from idle to irrigated agriculture to sign-up in the program.

Local Policies and Regulations

Fresno County General Plan The Fresno County General Plan, last updated in October 2000, provides a comprehensive long-term framework intended to protect agricultural and natural resources and guide development within the County. The General Plan identifies primary land use designations and three overlay designations (an overlay land use designation modifies the policies, standards, or procedures established for the underlying primary land use designation). Agriculture is essential to the visions and goals of the Fresno County General Plan, and that focus is reflected in its land use policies, which guide decisions to minimize the conversion of productive agriculture land, protect agricultural activities from incompatible land uses, and control expansion of nonagricultural development onto productive agricultural lands. The County of Fresno is currently updating its General Plan.[53] See Table 45 for goals and policies relevant to the Proposed Action and alternatives.

Madera County General Plan The Madera County General Plan provides a framework for development and physical growth in the County. The General Plan's Land Use, Public Facilities and Agricultural and Natural Resource Sections establish goals and policies that address agricultural resources and agricultural water supplies, including the preservation and expansion of agricultural land use within rural areas of the County. Such lands are designated "Agricultural-Exclusive" or "Agricultural" by the Land Use section of the General Plan and provide opportunities for a range of commercial agricultural operations. The policies outline the County's priority to preserve and, where feasible, expand and intensify agricultural land use activities. Agricultural operations are encouraged in areas containing both prime and non-prime farmlands. Relevant goals and policies are summarized in Table 45.

[53] The public review draft of the documents mentioned above were released for an advanced review opportunity on January 26, 2018 with the formal close of the comment period to coincide with the close of the Notice of Preparation (NOP) 45-day comment period on May 4, 2018.

3.7.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

Using data from the California Department of Conservation, Geographic Information System (GIS) mapping data was utilized to determine the extent of important farmland classification on MPG lands and proposed recharge facilities, and to determine which lands are enrolled under Williamson Act contracts. Analysis of applicable zoning ordinances, general plans, and other policies and regulations was conducted and findings of the analysis were assessed for compatibility with the Proposed Action and alternatives.

The Proposed Action and alternatives do not propose the designation of any new nonagricultural land uses or zoning, nor do they present conflicts with CVP water transfers from the Mendota Pool to MWA or its Refuge Water Management Plan. Therefore, there would be no conflict with any applicable habitat conservation plans or natural community conservation plans (CEQA threshold #4) under the Proposed Action or alternatives.

The baselines used for this analysis are the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action alternatives are compared to the existing setting for both NEPA and CEQA. The existing setting includes water exchanges under the Exchange Agreements and subsequent 3-Year Extension Exchange Agreements, while the No Action alternatives assume a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.1, *Environmental Review under NEPA and CEQA*.

An analysis of each alternatives potential consistency with applicable land use policies and regulations is provided in Table 44, Table 45, Table 46, and Table 47.

Thresholds of Significance

Impacts to land use and agricultural resources have been assessed to satisfy requirements under both NEPA and CEQA. Guidance under NEPA regulations 40 CFR 1508.27 requires analysis of environmental consequences to prime agricultural lands affected by a proposed Federal action; however, NEPA regulations do not provide specific thresholds related to agricultural resources or land use. Guidance for significance thresholds under CEQA are provided in Appendix G of the CEQA Guidelines, which like NEPA, requires analysis of impacts to agricultural lands. As such, significance criteria in Appendix G of the CEQA guidelines fulfill both NEPA and CEQA regulations. Some significance criteria within Appendix G of the CEQA guidelines are not applicable to the Proposed Action or alternatives. They are as follows:

1. Conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production;
2. Result in the loss of forest land or conversion of forest land to non-forest use; or
3. Physically divide an established community.

The Primary and Secondary Study Areas do not include forest or timberland, and none of the alternatives would involve development that would fragment an established community. Therefore, these criteria are not further discussed in this EIS/EIR.

The following criteria pertaining to land use and agricultural resources from Appendix G of the CEQA Guidelines are used to analyze potential impacts resulting from the Proposed Action and alternatives:

1. Convert prime farmland, unique farmland, or farmland of statewide importance, as shown on the maps prepared pursuant to the FMMP of the California Department of Conservation, to nonagricultural use;
2. Conflict with existing zoning for agricultural use, or a Williamson Act contract;
3. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the proposed action or alternatives (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect; or
4. Conflict with any applicable habitat conservation plan or natural community conservation plan.

Impacts and Mitigation Measures

Impact LU-1: Conversion of Important Farmland or Conflict with Williamson Act Contract

No Action Alternative Individual responses of MPG farmers in Westlands to the loss of water CVP water supply under the No Action Alternative is variable and while some farmers may have the ability to continue to irrigate farmlands using Westlands groundwater, others may dry farm, idle or fallow agricultural lands. As nearly all MPG farmlands are designated as important farmlands by FMMP, and 74.7 percent of MPG lands are prime, the anticipated fallowing, idling, or retiring of 10,000 acres under this alternative would likely occur on prime or important farmlands in the Secondary Study Area (i.e., Westlands). Dry land farming would provide a lower level of continued agricultural use of the land; however, given intermittent water availability and lower productivity on these lands, many farmers would likely choose to fallow or idle their land. With cessation of agricultural production, fallowed and idled lands are typically subjected to soil maintenance activities such as disking for weed control or cover crop planting, as recommended in the Natural Resources Conservation Service's Agricultural Air Quality Conservation Measures: Reference Guide for Cropping Systems and General Land Management (2012). These practices would allow fallowed and idled lands to retain agricultural value and the ability to be returned to commercial agricultural uses during wet years; therefore, the fallowing and idling of agricultural land is not considered a permanent conversion of prime or important farmland to nonagricultural uses.

However, given the irregular nature of water availability under this alternative, substantial amounts of farmland may be retired after several years. Such retired land may be subject to pressure for conversion to other uses; however, the majority of this land would likely remain as retired agricultural land due to the rural and remote areas in which these lands are located. Therefore, retirement of farmland would constitute a long-term change in the use of this land, but would not result in either a physical over-covering or loss of prime soils and important farmland or change to other land use designations. Given that this land is not expected to be converted to

uses other than agriculture, lands could be reactivated and returned to active agricultural use if or when a water supply becomes available.

As 90.6 percent of MPG lands are enrolled under Williamson Contracts, the likelihood that lands would be fallowed, idled or retired in Westlands that are under contract is high. Fallowing or idling of land would result in a temporary cessation of agricultural production that would be allowed under Williamson Act contracts; however, long-term retirement and cessation of agricultural production may result in a breach of contract and the County of Fresno could initiate a nine-year nonrenewal process. During the nonrenewal process, land would still be subject to the requirements of a Williamson Act contract until contract termination; including the requirement for production of an agricultural commodity. Thus, in the event that MPG farmland under a Williamson Act contract is forced to retire under this alternative, there would be a conflict with the Williamson Act, resulting in significant impacts to land use.

Proposed Action Under the Proposed Action, agricultural uses and operations on MPG farmlands would be sustained with only minor conversions to nonagricultural uses or conflicts with Williamson Act contracts. Well replacement may result in minimal losses to agricultural resources due to the space required for new wells, equating to less than one tenth of an acre out of the 49,858 acres of affected MPG lands. Given that the loss of farmland is minimal, well replacement would not likely compromise agricultural productions, displace agricultural operations, or result in the significant removal of agricultural lands. Well replacement events are also compatible with Williamson Act contracts. Therefore, well replacement events would not conflict with a Williamson Act contract and no impacts would occur in this regard.

Alternative 2 Under Alternative 2, the majority of agricultural uses on MPG farmlands would be sustained; however, the site of the proposed construction of the River Ranch Recharge Basin on Terra Linda Farms includes lands designated as agricultural. This land currently contains fallowed farmland and is surrounded by areas of cultivated agricultural land. The land on Terra Linda Farms where recharge basin construction is proposed is not currently under a Williamson Act contract, but does contain soils classified as farmland of local importance. Development of the River Ranch Recharge Basin would result in the construction of an agricultural supporting use on 85 acres of farmland of local importance. Further, Terra Linda Farms' land designation as "AL-Agricultural" signifies the County's commitment to preserving this land for future development, as stated in County of Fresno Ordinance Code Section 817. Therefore, the potential for conversion of agricultural to nonagricultural uses on this land has been anticipated by the County of Fresno.

As with the Proposed Action, some groundwater wells may need to be refurbished in their existing location, replaced in a new location, or moved to a new location in conformance with the SJRRP. Well replacement may result in minimal development on important farmlands and incremental losses of farmlands equating to less than one tenth of an acre. Given that the loss of farmland is minimal, well construction would not likely conflict with a Williamson Act contract and impacts would be less than significant.

Significance Determination before Mitigation

CEQA Significance Determination Impacts under the No Action Alternative are considered a *significant and unavoidable* impact. Under all other alternatives, impacts would be *less than significant.*

Impact LU-2: Consistency with Applicable Zoning, General Plans, Policies, and Regulations

No Action Alternative This alternative could be inconsistent with the General Plan's Agriculture and Land Use Goal LU-A, which aims to promote agricultural production and support agricultural activities (County of Fresno 2000). Cessation of the Exchange Agreements and the fallowing or idling of 10,000 acres of farmland would reduce agricultural production in Westlands. Other potential inconsistencies are related to Public Facilities and Service Goal PF-C and Policies PF-C.1, PF-C.9, and PF-C.11; these policies are directed towards providing adequate water supplies for agricultural consumption, encouraging Fresno County to work with local irrigation districts and water resource management programs to promote agricultural production in the County. The cessation of the Exchange Agreements in Westlands would result in an inadequate water supply for MPG farmers in Westlands and would inhibit continued agricultural production in this area.

The Fresno County General Plan also addresses groundwater quality and supply in Goal OS-A, which aims to protect and enhance groundwater resources in Fresno County. Specifically, this alternative would not be consistent with goals and policies listed in the Open Space and Conservation Implementation Programs, particularly Goal OS-A and Policies OS-A.3 and OS-A.13, which aims to protect and enhance groundwater resources. Cessation of the Exchange Agreements would remove limitations to MPG groundwater pumping, as well as the management and monitoring of groundwater pumping under the program. Further, this alternative does not include a groundwater recharge provision. While it is anticipated the quantity of groundwater pumping for Adjacent Overlying Lands would be less than quantities currently pumped under the Exchange Agreements and subsequent 3-Year Extension Exchange Agreements, the lack of monitoring and management of groundwater pumping–which would no longer be required in the absence of the agreements–may contribute to adverse effects to groundwater resources.

While this alternative would be potentially inconsistent with several General Plan goals and policies described above, this alternative would be consistent with applicable zoning ordinances and General Plan land use designations. Land use for all MPG farmlands would retain existing agricultural uses or uses allowed under the "AE-Agricultural" or "AL-Agricultural" designations. Impacts would therefore be less than significant.

Selection of this alternative would also be potentially inconsistent with goals outlined in Westlands' Groundwater Management Plan (Table 47), which includes goals and methods to: 1) minimize the impacts of groundwater pumping, including subsidence, overdraft and soil productivity; and 2) ensure efficient use of groundwater resources and minimize deep percolation (Westlands 1996). Under this alternative, MPG farmers would pump up to 25,000 AFY of water from the groundwater basin in Westlands. This would contribute to impacts related to subsidence and overdraft, and encourage the drilling of wells into the deep zone or lower aquifer. Further, as groundwater pumping would occur from a basin designated as high priority by the DWR, and would contribute towards subsidence impacts, this alternative would not be in line with the intent of SGMA. As implementation of this alternative could result in inconsistencies with several local land use policies and regulations, impacts would be significant.

Proposed Action All MPG farmlands and recharge facilities located in Fresno and Madera Counties are designated as agricultural by applicable zoning ordinances and general plans. The

Proposed Action would retain existing land uses and would be consistent with allowable uses under their designation. Well replacement, groundwater pumping, and existing recharge operations have historically been permitted within the region and would not conflict with existing agricultural uses; these uses are also permitted within agricultural preserves under California Government Code Section 51238.

The Proposed Action is consistent with goals and policies outlined in the Fresno County General Plan (County of Fresno 2000), Madera County General Plan (County of Madera 1995), and Westlands Groundwater Management Plan (Westlands 1996; see Table 44, Table 45, Table 46, and Table 47). These policies primarily relate to supporting and promoting agricultural uses and protecting groundwater resources in these areas. The Proposed Action would support existing farming operations by allowing for the continued availability of water through the Exchange Agreements, consistent with these policies. While the Proposed Action includes groundwater pumping, design constraints and well monitoring would help to maintain water quality and manage groundwater resources, consistent with Policy OS-A.3 of the Fresno County General Plan. Further, the groundwater recharge component of the Proposed Action is in line with the intentions of Policy OS-A.13, which encourages groundwater recharge.

Lastly, the MWA's Refuge Water Management Plan describes challenges related to operating elevation at the Mendota Pool and overall water quality entering the MWA (MWA 2011). Pumping related to the Proposed Action would not directly affect the operating elevation of the Mendota Pool (see Section 3.13, *CVP Operations*) and incorporation of the design constraints would ensure that water quality in the MWA area is maintained at acceptable levels (see Section 3.3, *Surface Water Quality*). As groundwater pumping would not directly affect fall flooding at the MWA or substantially degrade water quality transferred to the MWA, the Proposed Action would not conflict with the Refuge Water Management Plan. Therefore, no impacts would occur in this regard within implementation of this alternative.

Alternative 2 Construction of the River Ranch Recharge Basin on Terra Linda Farms would take place on land designated as "AL-Agricultural" and may necessitate planning review by Fresno County consistent with Policy LU-A.14, which requires discretionary permits and an assessment of the conversion of productive agricultural land. County review of the proposed recharge basin would assess compatibility with surrounding land uses.

All other MPG farmlands and the NCR recharge facilities located in Madera County are designated as agricultural under local zoning ordinances and general plans. These lands would retain their existing land uses. This alternative would also be largely consistent with goals and policies outlined in the Fresno County General Plan (2000), Madera County General Plan (1995), and Westlands Groundwater Management Plan (Westlands 1996; see Table 44, Table 45, Table 46, and Table 47). These policies primarily relate to supporting and promoting agricultural uses and protecting water resources in these areas. Alternative 2 would continue supporting existing farming operations by allowing for the continued availability of water through the Exchange Agreements, consistent with these policies. Alternative 2 would only be partially consistent with Fresno County General Plan Policy LU-A.14, which ensures that the review of discretionary permits includes an assessment of the conversion of productive agricultural land and that mitigation be required where appropriate. The construction of the recharge basin under Alternative 2 would result in the permanent conversion of 85 acres of farmland to non-agricultural uses. The County may require the implementation of mitigation measures during any

discretionary review of the recharge basin, however, additional mitigation is considered remote because the ultimate intent of the recharge basin is to ensure adequate groundwater supplies to support continued agricultural operations. Any mitigation required would be the responsibility of the MPG.

Lastly, groundwater pumping and exchange related to Alternative 2 would not directly affect the operating elevation of the Mendota Pool (see Section 3.13, *CVP Operations*) and use of the design constraints included in the Alternative 2 would ensure that water quality in the MWA area is maintained at acceptable levels (see Section 3.3, *Surface Water Quality*). As groundwater pumping would not directly affect fall flooding at the MWA or substantially degrade water quality transferred to the MWA, Alternative 2 would not conflict with the Refuge Water Management Plan. Therefore, implementation of this alternative would not result in any significant impacts in this regard.

Significance Determination before Mitigation
CEQA Significance Determination Under the No Action Alternative, impacts would be *significant and unavoidable*. Under the Proposed Action, *no impact* would occur with regards to land use. Impacts under Alternative 2 would be *less than significant*.

Cumulative Effects

Cumulative impacts to agricultural resources in the Project vicinity would include lands taken out of production along the San Joaquin River north of Mendota Pool due to seepage and inundation resulting from the SJRRP (SJRRP 2012), the temporary fallowing of 20,000 acres of farmland under the Exchange Contractor's 25-year extension of the Water Transfer Program (Reclamation 2008), and farmers' utilization of land fallowing to reduce water use during drought conditions or dry years.

The No Action Alternative may result in contributions to cumulative losses of agricultural resources due to potential conflicts with Williamson Act contracts. Land that would be fallowed or idled under the No Action Alternative would generally retain the ability to be brought back into production when water supply conditions allow. However, continued reductions in agricultural water supplies and economic pressures may result in the long-term retirement of agricultural lands. Well construction under the No Action Alternative and well replacement under the Proposed Action may result in minimal losses to agricultural resources, equating to less than one tenth of an acre out of the 49,858 acres of affected MPG land. This would not be considered substantial and therefore would not contribute significantly towards cumulative impacts to land use or agricultural operations in the region.

Selection of Alternative 2, specifically establishment of the River Recharge Basin, would cumulatively contribute to the conversion of 85 acres of farmland of local importance as identified by the FMMP to an agricultural support facility. While prime, unique, and farmland of statewide importance are protected under CEQA, farmland of local importance is not. The conversion of farmland of local importance to agricultural support uses would cumulatively result in a regional loss of cropland; however, this land would be used for an agricultural support facility and could be converted back for agricultural use. Therefore, this would not constitute a loss of agricultural resources.

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None of the alternatives proposed would indirectly result in establishment of land uses that would conflict with applicable zoning ordinances or General Plan land use designations. The No Action Alternative may result in activities that would potentially be incompatible with goals and policies related to agricultural land use, water resources, and groundwater management. Individually, these actions would not result in significant impacts to land use, but they may cumulatively contribute towards the mismanagement of regional resources.

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Table 44: Consistency with Wildlife Management Area Refuge Water Management Plan

WMA Refuge Water Management Plan	No Action Alternative	Proposed Action	Alternative 2
Goal: Protect existing habitat types with no net loss of acreage and enhance, where possible, their quality.	**Consistent**. No loss of MWA habitat would occur.	**Consistent**. No loss of MWA habitat would occur.	**Consistent**. No loss of MWA habitat would occur.
Goal: Maintain surface water quality to an acceptable standard. Avoid diversions of agricultural drainage and groundwater transfers from the Kings Sub-basin unless salinity, selenium, and manganese concerns have been addressed.	**Consistent**. There would be a net decrease of groundwater introduced to and transferred through the Mendota Pool, reducing potential for adverse changes in surface water quality.	**Consistent**. Surface water quality in the Mendota Pool would be similar to, or better than, existing conditions and groundwater recharge would assist in improving the quality of some of the groundwater that is pumped into the pool.	**Consistent**. Surface water quality in the Mendota Pool would be similar to, or better than, existing conditions and groundwater recharge would assist in improving the quality of some of the groundwater that is pumped into the pool.
Challenge: The lower operating elevation of the Mendota Pool has made the flooding of the MWA difficult and flooding rates have been reduced. This is not consistent with the mosquito abatement BMPs and reduces moist soil habitat.	**Consistent.** The operating elevation of the Mendota Pool would not be affected by this alternative.	**Consistent.** The operating elevation of the Mendota Pool would not be affected by this alternative.	**Consistent.** The operating elevation of the Mendota Pool would not be affected by this alternative.

Source: MWA 2011.

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Table 45: Consistency with Fresno County General Plan

Fresno County General Plan	No Action Alternative	Proposed Action	Alternative 2
Goal LU-A: To promote the long-term conservation of productive and potentially productive agricultural lands and to accommodate agricultural-support services and agriculturally related activities that support the viability of agriculture and further the County's economic development goals.	**Potentially Inconsistent.** This alternative would reduce the water supply to agricultural lands in Westlands by up to 25,000 AFY. This would result in decreases to agricultural production in Westlands. However, in lieu of the exchange of groundwater, groundwater would be pumped to irrigate Adjacent Overlying Lands, allowing up to 7,542 acres of MPG in the vicinity of the Mendota Pool to transition to permanent crops.	**Consistent**. The Proposed Action would allow for sustained agricultural production.	**Consistent.** Alternative 2 would allow for sustained agricultural production.
Policy LU-A.2: The County shall allow by right in areas designated Agriculture activities related to the production of food and fiber and support uses incidental and secondary to the on-site agricultural operation.	**Consistent**. Agricultural activities would take place on MPG lands.	**Consistent.** Agricultural activities would continue on MPG lands.	**Consistent.** Construction of the River Ranch Recharge Basin would convert these lands to nonagricultural uses (i.e., to the recharge basin). However Alternative 2 would continue supporting existing farming operations by allowing for the continued availability of water.
Policy LU-A.3: The County may allow by discretionary permit in areas designated Agriculture, special agricultural uses and agriculturally-related activities, including value-added processing facilities and certain non-agricultural uses. Approval of these and similar uses in area designated Agriculture shall be subject to the following criteria: a) The use should not be sited on productive agricultural lands if less productive land is available in the vicinity; b) The operational or physical characteristics of the use shall not have a detrimental impact on water resources or the use or management of surrounding properties within at least a one-quarter mile radius.	Not applicable	Not applicable	**Consistent.** Construction of the River Ranch Recharge Basin would take place on land designated as agriculture under the General Plan and would not have detrimental effect on water resources. Discretionary permits may be required.

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Table 45: Consistency with Fresno County General Plan (Continued)

Fresno County General Plan	No Action Alternative	Proposed Action	Alternative 2
Policy LU-A.14: The County shall ensure that the review of discretionary permits includes an assessment of the conversion of productive agricultural land and that mitigation be required where appropriate.	Not applicable	Not applicable	**Potentially Consistent.** Construction of the River Ranch Recharge Basin may require discretionary permits and assessment of the conversion of agricultural land.
Policy LU-A.17: The County shall accept California Land Conservation contracts on all designated agricultural land subject to location, acreage, and use limitations established by the County [provided that the County receives full subvention payment as partial replacement of local property tax revenue foregone as a result of participating in the Williamson Act program. All development and uses and activities that occur on land under contract shall comply with the requirements of the California Land Conservation Act and adopt County Rules.]	**Potentially Inconsistent.** Any lands fallowed for several years due to lack of water availability in Westlands may be subject to pressure for conversion to other uses and may initiate the nonrenewal process.	**Consistent.** Williamson Act contracts would be honored.	**Consistent.** Williamson Act contracts would be honored.
Goal PF-C: To ensure the availability of an adequate and safe water supply for domestic and agricultural consumption.	**Potentially Inconsistent**. Cessation of the Existing Exchange Agreements would reduce the water supply to agricultural lands by up to 25,000 AFY. This would result in inadequate water supply for MPG lands in Westlands.	**Consistent**. The Proposed Action would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.	**Consistent.** Alternative 2 would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.
Policy PF-C.1: The County shall actively engage in efforts and support the efforts of others to retain existing water supplies within Fresno County and to restore the water supplies that have diminished to the extent possible.	**Potentially Inconsistent**. Cessation of the Existing Exchange Agreements would reduce the water supply to MPG farmers by up to 25,000 AFY.	**Consistent**. The Proposed Action would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.	**Consistent**. Alternative 2 would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.
Policy PF-C.9: The County shall work with local irrigation districts to preserve local water rights and supply.	**Potentially Inconsistent**. Cessation of the Existing Exchange Agreements would reduce the water supply in Westlands by up to 25,000 AFY.	**Consistent.** The Proposed Action would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.	**Consistent.** Alternative 2 would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.

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Table 45: Consistency with Fresno County General Plan (Continued)

Fresno County General Plan	No Action Alternative	Proposed Action	Alternative 2
Policy PF-C.11: The County shall assume an on-going water supply to help sustain agriculture and accommodate future growth by allocation of resources as necessary to carry out the water resource management programs.	**Potentially Inconsistent**. Cessation of the Existing Exchange Agreements would reduce the water supply to agricultural lands by up to 25,000 AFY. This would result in inadequate water supply for MPG lands in Westlands.	**Consistent.** The Proposed Action would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.	**Consistent.** Alternative 2 would continue supplying water to MPG farms through the exchange of up to 25,000 AFY under the proposed 20-year Exchange Agreements.
Goal OS-A: To protect and enhance the water quality and quantity in Fresno County's streams, creaks, and groundwater basins.	**Potentially Inconsistent**. Cessation of the Existing Exchange Agreements would result in the discontinuation of the monitoring program, which assesses groundwater levels and quality and surface water quality. Additionally, increased groundwater extraction would occur in Westlands which could affect the groundwater basin.	**Consistent**. The Proposed Action would continue the exchange of water in the same quantities as under the Existing Exchange Agreements, up to 25,000 AFY. Further, the Proposed Action includes a recharge component which will enhance the groundwater basin as well as a continuation of the monitoring program and design constraints intended to ensure sufficient surface water and groundwater quality. The Proposed Action would also include coordination with area pumpers to improve water quality and access at MWA.	**Consistent**. Alternative 2 would continue the exchange of water in the same quantities as under the Existing Exchange Agreements, up to 25,000 AFY. Further, Alternative 2 includes the construction of a new recharge facility, which will enhance the groundwater basin as well as a continuation of the monitoring program and design constraints intended to ensure sufficient surface water and groundwater quality. This Alternative would also include coordination with area pumpers to improve water quality and access at MWA.
Policy OS-A.3: The County shall provide active leadership in its efforts to protect, enhance, monitor and manage groundwater resources within its boundaries.	**Potentially Inconsistent**. Cessation of the Existing Exchange Agreements would result in the discontinuation of the monitoring program, which assesses groundwater levels and quality and surface water quality.	**Consistent**. The Proposed Action includes the continuation of the groundwater monitoring program, which assesses groundwater levels and quality and surface water quality, as well as design constraints intended to ensure continued protection of these resources. The	**Consistent**. Alternative 2 includes the continuation of the groundwater monitoring program, which assesses groundwater levels and quality and surface water quality, as well as design constraints intended to ensure continued protection of these resources. Alternative 2 also includes an

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Table 45: Consistency with Fresno County General Plan (Continued)

Fresno County General Plan	No Action Alternative	Proposed Action	Alternative 2
		Proposed Action also includes a recharge component intended to enhance groundwater supplies as well as coordination with area pumpers to improve water quality and access at MWA.	85-acre recharge basin intended to enhance groundwater supplies as well as coordination with area pumpers to improve water quality and access at MWA.
Policy OS-A.13: The County shall encourage where economically, environmentally, and technically feasible, efforts aimed at directly or indirectly recharging the County's groundwater.	**Potentially Inconsistent**. This alternative does not contain a recharge component.	**Consistent**. The Proposed Action includes a groundwater recharge component.	**Consistent**. Alternative 2 includes the construction of a new groundwater recharge basin

Note: Changes to Goals and Policies under the Draft Revised Fresno County General Plan are tracked.

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Table 46: Consistency with Madera County General Plan

Madera County General Plan	No Action Alternative	Proposed Action	Alternative 2
Goal 3.C: To ensure the availability of an adequate and safe water supply and the maintenance of high quality water in water bodies and aquifers used as sources of domestic and agricultural water supply.	Not applicable	**Consistent**. The recharge component utilizing NCR ponds would replenish the groundwater basin using flood flows from the Kings River.	**Consistent**. The recharge component utilizing NCR ponds and the proposed River Ranch Recharge Basin would replenish the groundwater basin using flood flows from the San Joaquin River.
Policy 3.C.13: The County shall work with local irrigation districts to preserve local water rights. The County shall oppose public and private sales of water rights to users outside Madera County.	Not applicable	**Consistent**. Water in NCR ponds would be used for groundwater recharge purposes and not for public or private use outside of Madera County.	Not applicable

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Table 47: Consistency with Westlands Water District Groundwater Management Plan

Westlands Groundwater Management Plan	No Action Alternative	Proposed Action	Alternative 2
Goal: Minimize the impacts of groundwater pumping, including subsidence, overdraft and soil productivity	**Potentially Inconsistent**. Up to 25,000 AFY would be pumped in Westlands, subject to the pending regulations of SGMA, contributing to subsidence and overdraft impacts.	**Consistent**. No additional groundwater pumping in Westlands would occur.	**Consistent**. No additional groundwater pumping in Westlands would occur.
Goal: Ensure efficient use of groundwater resources and minimize deep percolation and its contribution to the shallow groundwater problem through effective water conservation	**Potentially Inconsistent**. Up to 25,000 AFY would be pumped in Westlands, subject to the pending regulations of SMGA.	**Consistent**. No additional groundwater pumping in Westlands would occur.	**Consistent**. No additional groundwater pumping in Westlands would occur.

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3.7.5 References

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3.8 Noise

This chapter evaluates potential noise and groundborne vibration impacts resulting from the Proposed Action and Alternatives, including exposure of sensitive receptors (e.g., residents) both short-term construction and long-term operational impacts. Data in this analysis was obtained from the Fresno County General Plan Health and Safety Element and the City of Mendota General Plan Noise Element, as well as information of noise levels from well drilling and pump operation from the Madera Irrigation District Water Supply Enhancement Project Final EIS (Reclamation 2011).[54]

3.8.1 Environmental Setting/Affected Environment

Background

Noise is typically defined as unwanted sound. High noise levels are known to have several adverse effects on people, including hearing loss, communication interference, sleep interference, physiological responses, and annoyance. The noise environment typically includes background noise generated from both near and distant noise sources as well as the sound from individual local sources. These can vary from an occasional aircraft or train passing by to continuous noise from sources such as traffic on a major road.

Sound is technically described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB). The dB scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up sound. The pitch of the sound is related to the frequency of the pressure vibration. Since the human ear is not equally sensitive to a given sound at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted decibel scale (dBA) provides this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Several rating scales have been developed to analyze the adverse effect of community noise on people. The equivalent energy noise level (Leq) is a measure of ambient noise, while the Community Noise Equivalent Level (CNEL) and Day-Night Average Noise Level (L_{dn}) are measures of community noise described as follows:

- Leq is the average acoustic energy content of noise for a stated period of time. Thus, the Leq of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.

- CNEL is a 24-hour average Leq with an additional 5 dBA added to noise during the hours of 7:00 PM to 10:00 PM and 10 dBA added to noise during the hours of 10:00 PM to

[54] It should be noted that Madera Irrigation District has withdrawn their proposal to implement the project; however, noise data prepared in the EIS is still relevant to the analysis contained within this EIS/EIR.

7:00 AM to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA Leq over a 24-hour period would result in a CNEL measurement of 66.7 dBA.

- L_{dn} is a 24-hour average Leq with an additional 10 dBA added between the hours of 10:00 PM and 7:00 AM to take into account the decrease in community background noise of 10 dBA during this period.

L_{dn} and CNEL are often used due to their utility in identifying noise related sleep disturbance effects, often a key community concern for increases in noise levels. Most California noise laws specify levels using the CNEL metric and most Federal laws use the Leq metric. Some laws also specify a minimum and maximum instantaneous noise level (Lmin and Lmax), which are the minimum and maximum noise level experienced during a given period of one second.

In terms of human response to noise, studies have indicated that a noise level increase of 3 dBA is barely perceptible to most people, a 5 dBA increase is readily noticeable, and a difference of 10 dBA would be perceived as a doubling of loudness. Everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud; Table 48).

Table 48: Representative Environmental Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	-110-	Rock band
Jet fly-over at 100 feet		
	-100-	
Gas lawnmower at 3 feet		
	-90-	
		Food blender at 3 feet
Diesel truck going 50 mph at 50 feet	-80-	Garbage disposal at 3 feet
Noisy urban area during daytime		
Gas lawnmower at 100 feet	-70-	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	-60-	
		Large business office
Quiet urban area during daytime	-50-	Dishwasher in next room
Quiet urban area during nighttime	-40-	Theater, large conference room
Quiet suburban area during nighttime		
	-30-	Library
Quiet rural area during nighttime		Bedroom at night, concert hall
	-20-	
		Broadcast/recording studio
	-10-	
Lowest threshold of human hearing	-0-	Lowest threshold of human hearing

Source: Caltrans. 2013. Technical Noise Supplement to the Traffic Noise Analysis Protocol.

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Noise levels from a particular source decline as distance to the receptor increases. Noise from stationary or point sources (including construction noise) is reduced by about 6 to 7.5 dBA for every doubling of distance or by intervening buildings or topography. The manner in which older homes in California were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units is generally 30 dBA or more (FTA 2006).

Groundborne Vibration

Vibration is sound radiated through the ground. The vibration of floors and walls may cause perceptible vibration, rattling of items such as windows or dishes on shelves, or a rumble noise. The ground motion caused by vibration is measured as particle velocity in inches per second; in the United States, this is referenced as vibration decibels (VdB; FTA 2006).

The background vibration velocity level in residential neighborhoods is usually around 50 VdB. The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Groundborne vibration of 100 VdB is the general threshold where minor damage can occur in fragile buildings (FTA 2006; Table 49).

Table 49: Human Response to Different Levels of Ground-borne Vibration

Vibration Velocity Level	Human Reaction
65 VdB	Approximate threshold of perception for many people.
75 VdB	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find that transportation-related vibration at this level is unacceptable.
85 VdB	Vibration acceptable only if there are an infrequent number of events per day.

Source: FTA 2006, Transit Noise and Vibration Impact Assessment, Final Report, Table 6-1.

Findings from Previous EIS

The 2004 Final EIS concluded that the Exchange Agreements would not have a significant impact on noise because pumping locations are far removed from sensitive receptors such as residences in the City of Mendota located approximately one mile west of the nearest MPG wells. Further, lands on the east side of the City of Mendota are generally industrial and do not support noise sensitive uses.

Study Areas

The Primary Study Area includes the area surrounding the MPG wells in FWD, and around the Mendota Pool and Fresno Slough used to pump water for the Exchange Agreements, recharge ponds at NCR, and proposed recharge canal at Terra Linda Farms. The Primary Study Area also include areas surrounding the proposed recharge basin at Terra Linda Farms, including the City of Mendota and the surrounding rural areas. The Secondary Study Area includes the areas of Westlands where MPG farmlands are located (Figure 4).

3.8.2 Regional Setting

Existing Conditions

Noise Generated by the Exchange Agreements

Noise associated with the Existing Exchange Agreements is generated primarily from the operation and maintenance of groundwater pumps in the Mendota Pool area and occasional associated vehicular traffic. These activities occur in rural agricultural regions away from population centers. Application of exchanged water in Westlands does not result in any measurable noise impacts.

The MPG groundwater pumps used as part of the existing program are located along the Mendota Pool, east of the City of Mendota, and in FWD. Under the Existing Exchange Agreements, operation and maintenance of approximately 76 existing wells produces noise in the Primary Study Area. Electric motors power 50 of these wells while diesel motors power 16 wells; 3 of the electric wells are powered by diesel generators. Lastly, 10 of the existing 76 MPG wells are unused. Based on recent area EIRs and EISs, noise levels generated by electric groundwater pumps generate sound levels of approximately 57–58 dBA at a distance of 25 feet, while diesel pumps generate sound levels of approximately 81–86 dBA at a distance of 50 feet (Reclamation 2011). Existing noise levels collected in and around the City of Mendota are presented in Table 50 and depicted in Figure 43. For well maintenance, the loudest equipment employed is a drill rig, with noise levels of roughly 84 dBA and 85 dBA, respectively (Federal Highway Administration [FHWA] 2011; Table 55). These noise levels are similar to those associated with operating a diesel groundwater pump.

Table 50: Measurements of Existing Noise Levels in and around the City of Mendota

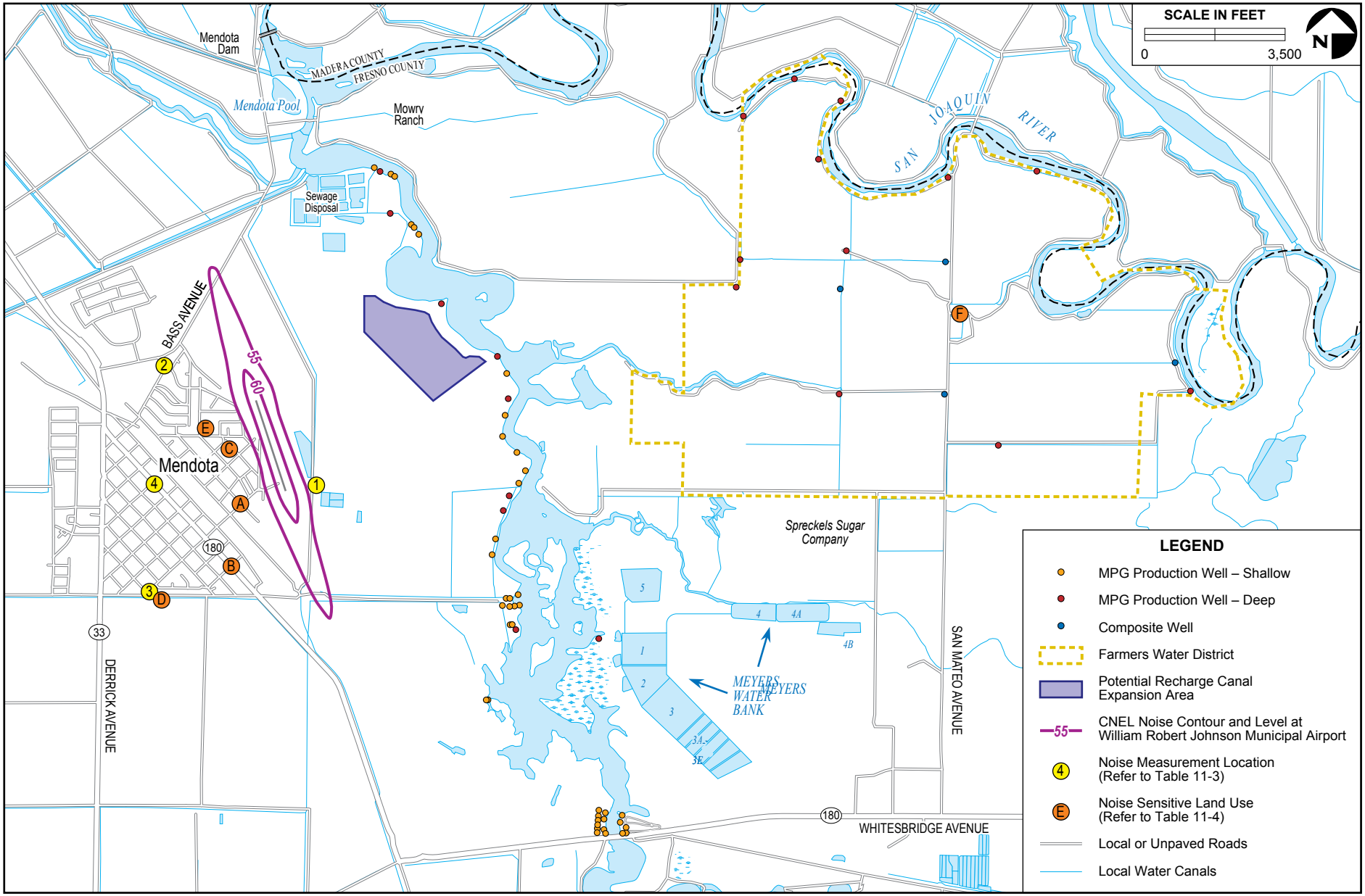
Site	Location	Leq	Lmax	Lmin
1	Belmont Avenue, between airport and biomass plant	57.4	62.7	54.9
2	At the intersection of 1st and 2nd Streets	59.6	78.0	36.1
3	At the intersection of Belmont Avenue and 9th Street	61.2	76.0	39.9
4	At the intersection of Highway 180 and 5th Street	65.2	78.7	49.2

Source: City of Mendota 2009.

Existing Noise Setting in the City of Mendota

Noise measurements, calculated factoring in all sources, were generated by the City of Mendota as part of the baseline analysis for the City's General Plan (see Figure 43). These measurements were all taken at locations west of the Mendota Municipal Airport, with the exception of Site 1, which is located on Belmont Avenue northeast of SR-180, between the airport to the west and the biomass plant to the east (see Table 50).

Much of the existing noise setting in the City of Mendota is related to operation of the Mendota Municipal Airport on the east side of the City (see associated noise contour lines in Figure 43).



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Noise Sensitive Land Uses and Existing Noise Measurements

FIGURE 43

Sensitive Receptors

Noise and vibration sensitive receptors typically include lodging, churches, meeting halls, schools, theatres, auditoriums, music halls, hospitals, nursing homes, office buildings, libraries, museums, playgrounds and neighborhood parks (City of Mendota 2009). The majority of noise- and vibration-sensitive land uses in the Primary Study Area are located on the west side of the City of Mendota, with the closest sensitive receptors (primarily residents) located 0.53 miles from the nearest MPG wells (see Table 51). Other sensitive receptors, such as Mendota Junior High School and Mendota Branch Library, are located more than one mile from the nearest MPG well.

Table 51: Noise-Sensitive Receptors in the Mendota Pool Area in the Vicinity of the Proposed Action

	Receptor	Address	Distance from an MPG Pump
A	Residences	Near Lolita and 9th St.	0.53 mile
B	Residences	Near Oller and 11th St.	0.58 mile
C	Apostolic Assembly of Faith/ Christian Life Academy	636 Juanita St	0.66 mile
D	Mendota High School	1282 Belmont Ave.	0.68 mile
E	Veteran's Park	Divisadero and Kate St.	0.76 mile
F	Residences in FWD	San Mateo Rd.	0.14 mile
G	Residences on Wonderful Orchards land (southern portion)	Eastside Drive	0.25 mile
H	Residences on Wonderful Orchards land (northern portion)	Firebaugh Blvd.	0.35 mile

The MPG's wells and recharge facilities are surrounded by agricultural land; with noise sensitive uses limited to two homes in FWD (County of Fresno 2013). Several homes located on the NCR are located approximately 0.35 mile east of the nearest recharge ponds and all sensitive receptors are more than 2.0 miles from water pumps used to draw recharge water from the San Joaquin River.

There are some noise-sensitive land uses in the Secondary Study Area located on portions of large farms. Small agricultural communities located in Westlands with clusters of residences and community supporting businesses also contain potentially sensitive receptors (Table 52).

Table 52: Agricultural Communities and Sensitive Uses in Westlands Water District

Use	Location / Address	Distance from an MPG Farm
Agricultural Communities with Residential Units	Three Rocks	0.2 mile
	Cantua Creek	1.0 mile
	Five Points	0.4 mile
Best Western Apricot Inn	46290 W Panoche Rd. Firebaugh, CA 93622	0.3 mile
Cantua Elementary School	Cantua Creek, CA (W. Clarkson Ave. & S. San Mateo Ave.)	1.0 mile
Westside Elementary School	19191 W Excelsior Ave. Five Points, CA 93624	1.0 mile
University of California: West Side Research and Extension Center	17353 W Oakland Ave. Five Points, CA 93624	0.5 mile

3.8.3 Regulatory Framework

Various Federal, State, and local standards have been developed to address the compatibility of land uses and noise levels. Applicable standards are summarized in the following section.

Federal Policies and Regulations

Federal Noise Control Act of 1972 (40 CFR Section 204) Public Law 92-574 regulates noise levels from operation of all construction equipment and facilities; establishes noise emission standards for construction equipment and other categories of equipment; and provides standards for the testing, inspection, and monitoring of such equipment. This Act delegates to states and municipalities primary responsibility for noise control.

Federal Transit Administration Noise and Vibration Criteria The Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment outlines criteria for allowable noise exposure increases. The FTA criteria note that an increase of 7 dBA in an area with an existing L_{eq} of 45 to 50 dBA may not be considered significant, but an increase of 1 dBA in an area with an L_{eq} of 65 to 74 dBA would be significant (FTA 2006). The FTA also developed methodology and significance criteria to evaluate vibration impacts from surface transportation modes (i.e., passenger cars, trucks, buses, and rail).

State Policies and Regulations

California Noise Control Act of 1973 The California Noise Control Act declares excessive noise as a serious hazard to the public health and welfare, and established the now defunct Office of Noise Control, which had the responsibility to set standards for noise exposure in cooperation with local governments or the State Legislature. The California Office of Noise Control land use compatibility guidelines provided the following:

- An exterior noise level of 60 to 65 dBA CNEL is considered "normally acceptable" for residences.
- A noise level of 70 dBA CNEL is considered to be "conditionally acceptable" (i.e., the upper limit of "normally acceptable" noise levels for sensitive uses such as schools, libraries, hospitals, nursing homes, churches, parks, offices, and commercial/professional businesses).
- A noise level of greater than 75 dBA CNEL is considered "clearly unacceptable" for residences.

Although the Office of Noise Control is no longer in operation, its guidelines still apply under the Act.

California Department of Health Services The State Office of Noise Control in the California Department of Health Services established guidelines to provide a community with a noise environment that it deems to be generally acceptable. Specifically, ranges of noise exposure levels have been developed for different land uses to serve as the primary tool a city uses to assess the compatibility between land uses and outdoor noise. To achieve a clearly compatible land use/noise zone, a noise level standard of 60 dBA L_{dn} is used for the exterior living areas of new single-family, duplex and mobile home residential land uses. A 45 to 65 dBA L_{dn} noise level standard is used for the interior and exterior of all new multi-family residential uses (State of California Governor's Office of Planning and Research 2017). Where a land use is denoted as

"normally acceptable" for the given L_{dn} noise environment, the highest noise level in that range should be considered the maximum desirable for conventional construction which does not incorporate any special acoustic treatment. The acceptability of noise environments classified as "conditionally acceptable" or "normally unacceptable" depends on the anticipated amount of time that will normally be spent outside the structure and the acoustic treatment to be incorporated in the structure's design.

Local Policies and Regulations

County of Fresno General Plan Health and Safety Element The County of Fresno General Plan Health and Safety Element includes policies intended to maintain compatibility between various land uses and environmental noise levels (County of Fresno 2000):

> **HS-G.7 Noise impacts to Sensitive Uses:** Where existing noise-sensitive uses may be exposed to increased noise levels due to roadway improvement projects, the County shall apply the following criteria to determine the significance of the impact:
>
> - Where existing noise levels are less than 60 dB L_{dn} at outdoor activity areas of noise-sensitive uses, a 5 dB L_{dn} increase in noise levels will be considered significant;
> - Where existing noise levels are between 60 and 65 dB L_{dn} at outdoor activity areas of noise-sensitive uses, a 3 dB L_{dn} increase in noise levels will be considered significant; and
> - Where existing noise levels are greater than 65 dB L_{dn} at outdoor activity areas of noise-sensitive uses, a 1.5 dB L_{dn} increase in noise levels will be considered significant.

Fresno County Noise Control Ordinance The Fresno County Noise Control Ordinance establishes exterior and interior noise standards for noise-sensitive land uses located within either the incorporated or unincorporated areas; noise sensitive land uses are defined as single or multifamily residences, schools, hospitals, churches, or public libraries. The noise standards outlined in the Fresno County Code of Ordinances, Chapter 8.40, are summarized in Table 53 (Fresno County Code of Ordinances, Chapter 8.40, August 2013).

Table 53: Exterior Noise Standards for Fresno County

Cumulative Number of minutes in any one-hour time period	Noise Level Standards (in dBA)	
	Daytime (7 AM to 10 PM)	Nighttime (10 PM to 7 AM)
30	50	45
15	55	50
5	60	55
1	65	60
0	70	65

Source: Fresno County Code of Ordinances, Chapter 8.40, August 2013.

The Fresno County Noise Control Ordinance establishes noise standard exemptions for construction noise. Construction noise is considered exempt from noise standards provided that construction activities are conducted from 6 AM to 9 PM Monday through Friday. Construction noise is exempt from the noise standards provided that construction activities are conducted from 7 AM to 5 PM on Saturday and Sunday.

City of Mendota General Plan Update Noise Element The Noise Element provides guidance about acceptable noise levels based on the proposed land use and sets forth noise standards for sensitive receptors (City of Mendota General Plan Update, Chapter 5.5-21. 2009; see Table 54). The following actions and goals apply to the Proposed Action or alternatives:

- Action N-1.2.2: Where existing or projected ambient noise levels are less than 60 dBA at the outdoor activity areas of residential uses, an increase of more than 5 dBA caused by a new transportation noise source will be considered significant. Where existing or projected ambient noise levels range between 60 and 65 dBA at the outdoor activity areas of residential uses, an increase of more than 3 dBA caused by to a new transportation noise source will be considered significant. Where existing or projected ambient noise levels are greater than 65 dBA at the outdoor activity areas of residential uses, an increase of more than 1.5 dBA caused by new transportation noise source will be considered significant.

- Action N-1.2.3: Where proposed non-residential land uses are likely to produce noise levels at existing or planned noise-sensitive uses that could exceed the City's noise standards (Table 54 below), an acoustical analysis shall be required as part of the environmental review process so that noise mitigation may be included in the project design. Development of procedures that monitor and ensure implementation of noise mitigation measures pursuant to an acoustical analysis shall also be required.

Table 54: Exterior Noise Levels Standards for Noise Sensitive Land Uses Affected by Non-Transportation Noise Sources

Noise Level Descriptor	Daytime (7 AM to 7 PM)	Evening (7 PM to 10 PM)	Nighttime (10 PM to 7 AM)
Hourly –Average (L_{eq}), dBA	55	50	45
Maximum (Lmax), dBA	70	60	55

Source: City of Mendota General Plan Update, Chapter 5.5-21. 2009.

3.8.4 Impact Analysis/Environmental Consequences

Thresholds of Significance

Significance criteria used for this analysis satisfy the requirements of both NEPA and CEQA. Significance thresholds under NEPA include conformance with the Health and Safety Element from the relevant General Plan(s), the Noise Control Ordinance from the Code of Ordinances for the County of Fresno, and the Noise Element of the City of Mendota General Plan Update. Significance thresholds under CEQA are defined by the State of California in Appendix G of the CEQA Guidelines. These thresholds also include conformance with County standards and regulations; thus, both NEPA and CEQA criteria are included in the thresholds as defined under CEQA. According to the CEQA guidelines, the Proposed Action or alternative's noise impacts would be considered significant if they would result in:

1. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
2. Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
3. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
4. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels without the project;
5. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, exposure of people residing or working in the project area to excessive noise levels; or
6. For a project located within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise.

The Fresno County Noise Control Ordinance and the Noise Element of the City of Mendota General Plan quantify significant noise (refer to Table 53 and Table 54). These metrics and thresholds were used in developing the following analysis.

The CEQA Guidelines do not define the levels at which groundborne vibration or groundborne noise is considered "excessive." For the purpose of this analysis, groundborne vibration impacts associated with human annoyance would be significant if the Proposed Action or alternatives exceeded 72 VdB, which is the vibration level that is considered by the FTA to be acceptable for frequent events (FTA 2006).

Methodology for Analysis

Potential noise and vibration impacts associated with the Proposed Action and Alternatives are related to operation and maintenance of wells and recharge facilities, well replacement, and construction of new recharge facilities. Projected noise generated by operation of diesel or electric powered groundwater pumps are based on the Madera Irrigation District EIS (Reclamation 2011). This analysis uses the upper noise limits for each type of well (e.g., 86 dBA at 50 feet for diesel pumps) to calculate noise experienced at sensitive receptors. Noise levels for construction activities were calculated based on standard noise produced by the machinery and equipment that would be used during construction activities at the site (see Table 55). Standard noise attenuation calculations were used to determine potential impacts of sensitive receptors in the vicinity of proposed construction activities using the following equation from the FTA Transit Noise and Vibration Impact Assessment, Final Report: $L_{eq} = L_{eq}$ at 50 feet – 20 Log(D/50), where L_{eq} = noise level of noise source, D = distance from the noise source to the receiver, L_{eq} at 50 feet = noise level of source at 50 feet (FTA 2006).

Table 55: Noise Ranges of Typical Construction Equipment

Construction Equipment	Noise Levels in dBA Leq at 50 Feet
Pickup Truck	55
Backhoe	80
Dozer	85
Grader	85
Scraper	85
Flat Bed Truck	84
Drill Rig Truck	84
Auger Drill Rig	85

Note: Machinery equipped with noise control devices or other noise-reducing design features does not generate the same level of noise emissions as that shown in this table.
Source: FHWA 2011.

Groundborne vibration impacts are experienced in close proximity to the source of the vibration, and attenuate rapidly with distance. Given that the nearest sensitive receptor for the Proposed Action and Alternatives is 0.14 miles (739 feet) from wells or recharge facilities, vibration impacts are expected to be imperceptible and therefore insignificant; therefore, this issue is not further discussed.

The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA. The existing setting includes water exchanges under the Exchange Agreements and subsequent 3-year Extension, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baseline used in this analysis or the methods used for evaluation of the significance of various environmental effects under NEPA and CEQA, see Section 3.1, *Environmental Review under NEPA and CEQA*.

Impacts and Mitigation Measures

Impact NOI-1: Noise Impacts associated with Groundwater Pumping and Farming Activities in the Mendota Pool Area

No Action Alternative Under this alternative, total groundwater pumping in the Mendota Pool area would be reduced with associated reductions in noise generation associated with pump operation. However, increased agricultural production due to reactivation of fallow land would result in additional noise related to farming operations. MPG lands in the Mendota Pool area are located in a rural area with limited sensitive receptors. As the noise associated with MPG farming activities and use of wells would not exceed noise standards, the No Action Alternative would not result in significant impacts in the Mendota Pool area. Additionally, the Mendota Municipal Airport serves as a buffer between noise-sensitive uses in the City of Mendota and the MPG pumping and farming activities around the Mendota Pool; therefore, noise impacts from MPG pumping would be negligible and not substantially adverse or significant.

Proposed Action Under the Proposed Action, operational noise levels associated with groundwater pumping activities from electric and diesel powered groundwater pumps are estimated to be 57-58 dBA at a distance of 25 feet. The sensitive receptors located nearest to these activities would be residences in the FWD, at a distance of approximately 0.14 mile (739 feet). At this distance, noise associated with operation of groundwater pumps would be below the 50 dBA noise threshold. Given that noise generated by operation of MPG groundwater

pumps is below 50 dBA at all sensitive receptors, the Proposed Action is consistent with the Fresno County Noise Ordinance for pumping performed during the day or at night.

In addition, well maintenance and replacement activities would also generate noise in the Mendota Pool area, but would result in levels below 45 dBA at sensitive receptors in the City of Mendota. This calculation is based on the maximum noise level for an auger drill rig of 85 dBA at 50 feet (FHWA 2011). These activities would occur during the day in order to satisfy applicable noise standards. Additionally, well maintenance and replacement activities would occur infrequently and be of short duration, with maintenance occurring annually for each well over the course of one to two days and replacements occurring once over the course of one week. Additionally, noise from traffic associated with these activities would be minimal due to the small size of the well maintenance and replacement crews.

Recharge Facility Operation and Maintenance Potential noise impacts may also occur as a result of operation of recharge facilities and maintenance activities at the Terra Linda Farms recharge canal or NCR recharge ponds. For MPG recharge events, Wonderful Orchards would generally use a singular water pump to move water into the canal system. This pump is over two miles away from any sensitive receptors, and therefore would not result in substantial noise impacts near sensitive receptors. The Terra Linda Farms recharge canal receives water by gravity flow and therefore does not require a noise-generating water pump.

Disking and tilling at the Terra Linda Farms recharge canal would result in similar noise levels as standard agricultural activities. This activity would only occur annually and would last for a short duration during daytime hours.

MPG's use of NCR Recharge Ponds may incrementally increase the need for maintenance activities at these facilities. As these ponds are already maintained by Wonderful Orchards, this activity would result in an incremental increase in the existing noise environment.

The highest noise level at any sensitive receptor would be 49 dBA at residences located in FWD. These residents would be generally tolerant of reasonable noise levels associated with adjacent farming activity as they are located on agricultural lands. Noise levels between 50 and 60 dBA are considered normally acceptable at residential uses and noise generated by ongoing operation of the Proposed Action would be below this level at the residences in FWD. Therefore, noise levels associated with operation of the Proposed Action are within a reasonable range, and the Proposed Action would not result in a substantially adverse effect or potentially significant impact.

Alternative 2 Noise impacts associated with operation, maintenance and replacement of MPG groundwater wells and operation and maintenance of the NCR recharge facilities under this alternative would be similar to those associated with the Proposed Action. As under the Proposed Action, noise levels from these activities would comply with the Fresno County Noise Ordinance and the City of Mendota Noise Element.

Operation of the River Ranch Recharge Basin Operation of the River Ranch Recharge Basin would require use of a water pump to draw water from the Terra Linda Farms recharge canal into the recharge basin during recharge events.[55] This pump would be located adjacent to the recharge canal, at least one mile away from sensitive receptors. This activity would result in similar noise levels to standard agricultural activities expected on these lands. Given the large distance between these noise source and sensitive receptors, and the buffer provided by the Mendota Municipal Airport and surrounding land, noise impacts associated with operation of the River Ranch Recharge Basin would be minimal and would comply with applicable noise ordinances.

Operation of the River Ranch Recharge Basin is not expected to result in a substantial increase in traffic and associated noise above existing conditions. Operation and maintenance of the River Ranch Recharge Basin would result in occasional additional truck trips to ensure proper functioning of the facility during recharge events. This activity is expected to result in approximately two trips per day by mid-sized trucks during recharge events and occasional trips (e.g., less than once per week) when the facility is dormant. This would be a minimal increase in traffic. Therefore, Alternative 2 would not result in a substantially adverse effect or significant impact.

Significance Determination before Mitigation
CEQA Significance Determination Impacts under all Alternatives would be *less than significant.*

Impact NOI-2: Noise Impacts Associated with Alternative Land Uses and Operations in Westlands Water District
No Action Alternative Estimated noise levels in Westlands are shown in Table 56; these estimates were developed based on the assumption that wells are powered by electric motors as required by permitting conditions and Rule 4702 of the San Joaquin Valley Air Pollution Control District (SJVAPCD). Most of the MPG farms in Westlands extend more than one mile across, and it is unlikely that an MPG farmer would choose to locate a groundwater pump near residences or other sensitive uses; therefore, these estimates are conservative.

[55] The groundwater pump used to convey water from the Terra Linda Canal to the River Ranch Recharge Basin was assumed to be diesel-powered to provide a conservative analysis.

Table 56: Estimated Sound Level Experienced at Sensitive Receptors from Operating Groundwater Wells

Receptor	Location	Distance	Noise Level
Agricultural Communities with Residential Units	Three Rocks	0.2 miles	25.5 dBA
	Cantua Creek	1.0 miles	11.5 dBA
	Five Points	0.4 miles	19.5 dBA
Best Western Apricot Inn	Firebaugh	0.3 miles	22.0 dBA
Cantua Elementary School	Cantua Creek	1.0 miles	11.5 dBA
Westside Elementary School	Five Points	1.0 miles	11.5 dBA
University of California: West Side Research and Extension Center	Five Points	0.5 miles	17.5 dBA

Note: Noise levels at sensitive uses were determined with the following equation from the FTA Transit Noise and Vibration Impact Assessment, Final Report: $L_{eq} = L_{eq}$ at 50 feet – 20 Log(D/50), where L_{eq} = noise level of noise source, D = distance from the noise source to the receiver, L_{eq} at 50 feet = noise level of source at 50 feet. Noise levels have been rounded up to the nearest whole number.

Operation of wells under this alternative would not result in noise levels above 25.5 dBA at any of the sensitive receptors in Westlands (Table 56); therefore, these levels would be significantly below Fresno County Noise Control Ordinance standards and the normally acceptable noise levels for residences, schools, and hotels. Therefore, the No Action Alternative would not result in a substantially adverse effect or significant impact.

Proposed Action Implementation of this alternative would have no effect on the operation of existing land uses located within Westlands with regards to noise. Therefore, no impacts would occur with implementation of this alternative.

Alternative 2 Impacts would be as described under the Proposed Action. No impact noise related impacts to land use operations within Westlands would occur under this alternative.

Significance Determination before Mitigation
CEQA Significance Determination The No Action Alternative would result in a *less than significant* impact. Implementation of either the Proposed Action or Alternative 2 would result in *no impact*.

Impact NOI-3: Noise Impacts Related to Construction and Maintenance Events for the River Ranch Recharge Basin
No Action Alternative Construction of additional recharge facilities would not occur under this alternative. Therefore, no impacts would occur within implementation of the No Action Alternative in this regard.

Proposed Action Impacts would be as described under the No Action Alternative. No impacts would occur with implementation of the Proposed Action in this regard.

Alternative 2 Under this alternative, construction of the 85-acre River Ranch Recharge Basin would generate noise from the use of heavy equipment, including one large bulldozer with a ripper, two scrapers, two excavators, one compactor, and one water wagon, and would occur over approximately two weeks. Similarly, maintenance events would include ripping the bottom of the recharge basin once every two to ten years and disking and tilling the surface of the basin annually. This activity would require the use of a bulldozer with a ripper for ripping the basin

and standard agricultural equipment for disking and tilling the basin. These events would last approximately one week and would occur during daytime hours.

The closest sensitive receptors to the proposed recharge basin are over one mile to the west. Estimated sound levels were calculated for sensitive receptors based on the maximum sound level produced by construction equipment and standard noise attenuation over distances, with the maximum noise level experienced at a sensitive receptor estimated as 44.3 dBA (see Table 57).

Table 57: Estimated Sound Level Experienced at Sensitive Receptors from Construction of the River Ranch Recharge Basin

Receptor	Distance (miles)	Noise Level (dBA)
Residences on Inez St.	1.15	44.3
Apostolic Assembly of Faith/ Christian Life Academy	1.26	43.5
Veteran's Park on Divisadero St. and Kate St.	1.36	42.9

Note: Noise levels at sensitive uses were determined with the following equation from the FTA Transit Noise and Vibration Impact Assessment, Final Report: $L_{eq} = L_{eq}$ at 50 ft. – 20 Log(D/50), where L_{eq} = noise level of noise source, D = distance from the noise source to the receiver, L_{eq} at 50 ft = noise level of source at 50 feet.

Construction and maintenance of the River Ranch Recharge Basin would not result in noise levels above 45 dBA at any sensitive receptors. These noise levels are below acceptable noise levels according to the Fresno County Land Use Compatibility for Community Noise Environments. Additionally, construction noise would be buffered by the Mendota Municipal Airport and would not substantially affect sensitive noise receptors.

Construction of the River Ranch Recharge Basin would require heavy construction equipment to be transported to and from the site. Construction equipment would be stored onsite during the construction period, and would, therefore, only require one trip to and from the site. Occasional trips by a refueling truck would also be required at a maximum of once per day. Therefore, noise from increased truck traffic during construction under Alternative 2 would be minimal and would not result in a substantially adverse effect or significant impact.

Significance Determination before Mitigation
CEQA Significance Determination Impacts under Alternative 2 would be *less than significant*. *No impact* would occur under either the No Action Alternative or the Proposed Action.

Cumulative Effects

Many projected noise levels for the Proposed Action and Alternatives would be barely distinguishable from the ambient setting at sensitive receptors. Operational farming activities, groundwater pumping, and operation of the recharge facilities under the Proposed Action and Alternative 2 all occur in locations at least 0.14 mile (793 feet) away from sensitive receptors and would cause negligible increases in perceptible noise levels at the nearest sensitive receptor. Operational noise generated from other cumulative projects within one mile of activities of the Proposed Action and Alternatives would be similar in source, nature, frequency, and intensity as noise generated under the Proposed Action and Alternatives. Like the Proposed Action and Alternatives, these activities would consist of groundwater pumping and exchange, farming activities, operation and expansion of groundwater recharge facilities, maintenance of facilities,

and construction activities associated with extension of SR-180. These activities would consist of continuation of ongoing operations negligible changes in the existing noise levels with some daytime increases in noise levels from short-term operation of construction equipment. These noise generating activities in combination of these noise generating activities with those of the Proposed Action and Alternatives are not considered to generate a significant perceptible increase in noise levels within the area. Therefore, implementation of the Proposed Action and Alternatives would not considerably contribute to cumulative adverse noise levels experienced by sensitive receptors. Construction events are also temporary and relatively small in scale, and noise related to construction would also be temporary.

Under the No Action Alternative, increased farming activities, groundwater pumping, and traffic in the Mendota Pool area may incrementally increase ambient noise levels. In Westlands, ambient noise levels under No Action Alternative may slightly increase from the increased operation and maintenance of groundwater wells. However, this noise would not result in significant cumulative impacts.

3.8.5 References

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3.9 Traffic

This section describes existing traffic and circulation conditions in the vicinity of the Proposed Action and Alternatives. Information for this section was gathered from the City of Mendota General Plan (City of Mendota 2009), Caltrans SR-180 Westside Expressway Route Adoption Study (Caltrans 2011), and Transportation Research Board Highway Capacity Manual 2010 (Transportation Research Board 2010). Environmental consequences are analyzed within the context of the affected environment and relevant regulations and policies.

3.9.1 Environmental Setting/Affected Environment

Background

The Primary and Secondary Study Areas are generally characterized by rural agricultural land accessed by local farm roads within the regional road network of arterial roads, including several State Routes. Below are the terms used to describe types of roadways as defined by the FHWA:

- Freeways: A divided highway facility with full control of access and two or more lanes of traffic in each direction. Freeways are operated by Caltrans and designed for high-speed and high-volume vehicle traffic (65 miles per hour [mph]) or faster).
- State Routes: High-speed roadways that connect activity centers with local and county transportation networks. State Routes are under the jurisdiction of Caltrans.
- Arterials: Arterial roads accommodate relatively high traffic volumes and provide circulation between activity centers and other arterials. Arterials have maximum design capacities of about 20,000 vehicles per day.
- Collector Streets: Collector streets are divided two-lane streets between neighborhoods. Collector streets have relatively low to moderate speed limits (35 to 40 mph), and may have restricted access to neighboring land uses. Collector streets typically have a maximum design capacity of about 10,000 vehicles per day.
- Local Streets: Local streets are undivided two-lane streets designed for trips within neighborhoods, and connect to collector streets and arterial roads. Local streets provide low-speed access to neighborhood land uses, usually carry less than 2,000 vehicles per day, and are managed by local jurisdictions (FHWA 2012).

Level of Service

Roadway operating conditions are measured in terms of Level of Service (LOS) based on roadway characteristics and traffic volumes, with LOS A representing free-flow conditions and LOS F representing severe congestion (Table 58). Traffic volumes are monitored annually by Caltrans and recorded as Average Annual Daily Traffic.

Table 58: Level of Service (LOS) Criteria for Signalized Intersections

LOS	Interpretation	Percentage of Heavily Congested Travel
A	Excellent; Traffic is free-flowing. Very low vehicle delays.	0 - 20
B	Good; An occasional approach phase is fully utilized and many drivers begin to feel somewhat restricted within groups of vehicles.	21 - 40
C	Fair; Occasionally drivers may have to wait and back-ups may develop.	41 - 60
D	Poor; Delays may be substantial during portions of the rush hours, but enough lower volume periods occur to permit clearing of developing lines, preventing excessive back-ups.	61 – 80
F	Very Poor; Back-ups from nearby locations or on cross streets may restrict or prevent movement of vehicles out of the intersection approaches, and result in tremendous delays with continuously increasing queue lengths.	81 - 100

Source: Transportation Research Board 2010.

Findings from Previous EIS

The 2004 Final EIS concluded that the 2005 Mendota Pool 10-Year Exchange Agreements would have no effect on local or regional transportation or circulation as the Exchange Agreements did not propose any change to or result in any conflict with current use of the transportation network.

Study Areas

The Primary Study Area for this section includes the road network in the immediate vicinity of Mendota Pool, including the unpaved roads that provide access to the irrigation canals and groundwater wells near Mendota Pool and within FWD, including access roads for the Terra Linda Farms property. The Primary Study Area also encompasses the road network in the City of Mendota and the surrounding vicinity, including SR-180 and SR-33 as well as arterial, collector, and local streets (City of Mendota 2009).

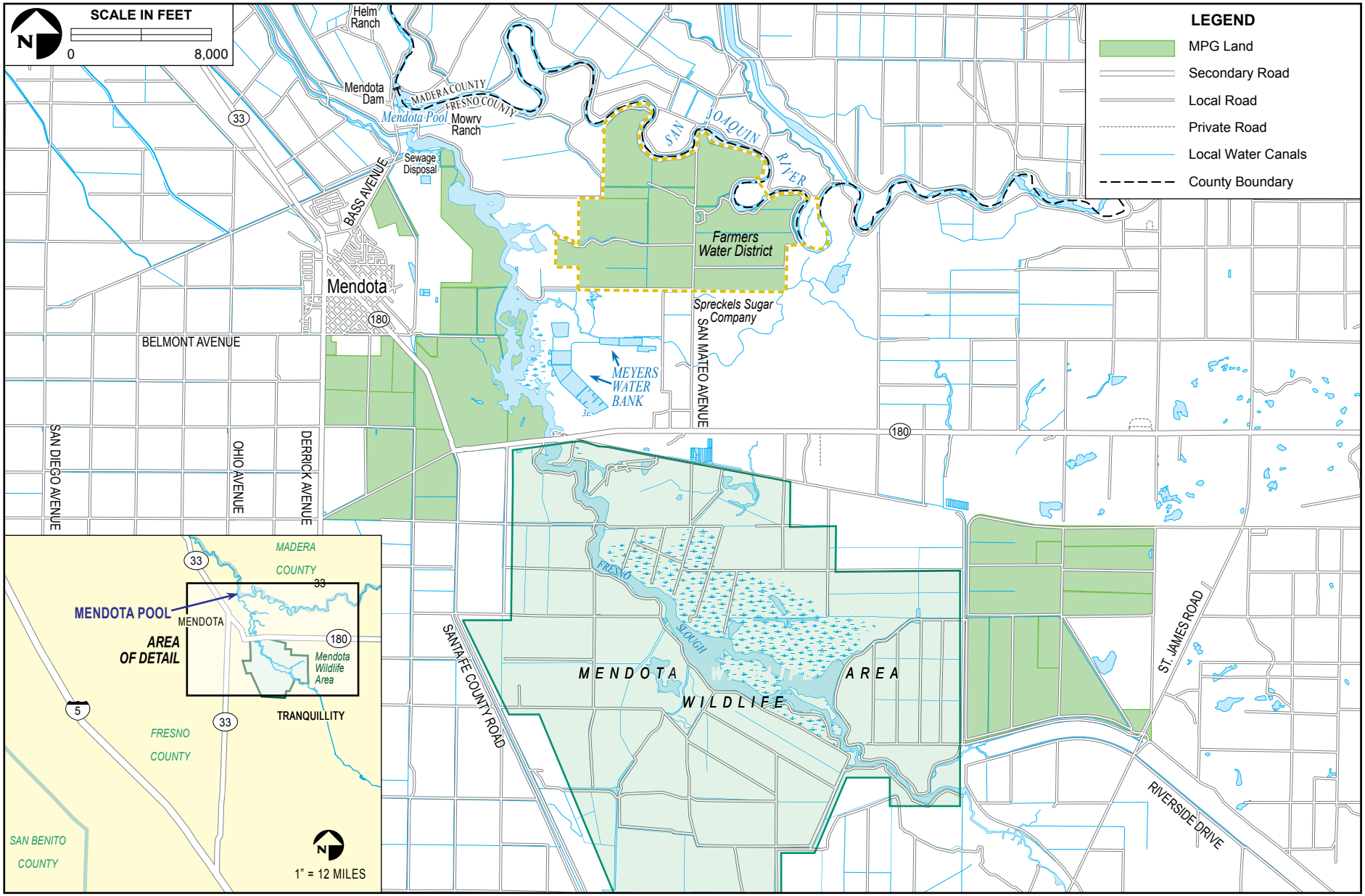
The Secondary Study Area includes the road network in Westlands where the MPG lands are located (Figure 4). This includes unpaved farm access roads, arterial and regional access roads, as well as I-5, SR-33, SR-145, SR-269, and SR-198. Other arterials, collectors, and local streets in communities within Westlands are also considered within the Secondary Study Area.

3.9.2 Regional Setting

Existing Conditions within the Primary Study Area

Major roadways that serve or traverse the Primary and Secondary Study Areas include I-5, SR-180, and SR-33. I-5 provides north-south travel through the west side of the southern San Joaquin Valley, while SR-180 offers east-west travel through Fresno County and access to the east to SR-99. In the immediate vicinity of the Mendota Pool and the MPG land in Westlands, a network of rural county roads provides access to nearby communities and agricultural lands (Figure 44).

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Road Types in the Vicinity of Mendota Pool Group Adjacent Overlying Lands

FIGURE 44

State Route 180 SR-180 is a 180-mile long east-west highway passing through San Benito, Fresno, and Tulare Counties, serving rural agricultural land in the Primary Study Area and the Cities of Firebaugh, Mendota, San Joaquin, and Kerman. Within the Primary Study Area, Average Annual Daily Traffic on SR-180 ranges from approximately 6,800 to 10,600 vehicles per day and the LOS ranges from A to D, with areas near Mendota experiencing peak hour congestion (Caltrans 2011; City of Mendota 2009). SR-180 is currently the subject of a proposed four-lane expressway between I-5 and the City of Fresno, which would allow for additional capacity as well as improved accessibility and safety (Caltrans 2011).

State Route 33 SR-33 runs from north to south for approximately 290 miles through the Central Valley, connecting the Cities of Ventura in the south to Tracy in the north. Within the Primary Study Area, SR-33 borders the MPG lands and connects Mendota to the nearby Cities of Firebaugh and Dos Palos to the north. SR-33 also links Mendota and I-5. SR-33 generally contains one lane in each direction with occasional expansion lanes. Portions of SR-33 that run through the City of Mendota, approximately 1.5 miles west of the Mendota Pool, were operating at LOS C and D in 2007 (Caltrans 2007). These portions face significant congestion at intersections, carrying between 4,700 and 4,850 cars during peak hours, with cars often queuing through more than one traffic light cycle (City of Mendota 2009).

Collector and Local Streets Within the Primary Study Area, the majority of the roads that run through Adjacent Overlying Lands are unnamed and unpaved. They form a grid structure that provides access to agricultural lands and groundwater wells and are mostly used by agricultural vehicles. Notable roads include Bass Avenue, a paved two-lane road that connects Mendota Pool to the City of Mendota, and Panoche Road, which connects SR-180 to SR-33. An unnamed and unpaved dirt road runs parallel to the Terra Linda Farms Recharge Canal. This road provides access to most of the MPG groundwater wells west of the Fresno Slough. Groundwater wells in FWD can be accessed via San Mateo Avenue and other unnamed dirt roads in FWD.

Other Transportation Modes Public transit opportunities within the City of Mendota are limited; however, the City of Mendota coordinates with Fresno County Rural Transit Agency to provide schedules, with multiple round trip intercity services available Monday through Friday 7:00 AM to 5:30 PM (City of Mendota 2009).

Pedestrian movement within the Primary Study Area is limited due to the long distances between points of interest and the lack of pedestrian infrastructure on local farm roads. Additionally, there are no Class I bike paths in the City of Mendota; however, the Fresno County of Governments (FCOG) has designated a regional bikeway route for intra-city circulation along SR-180 to its intersection with SR-33, proceeding north on SR-33 to Firebaugh (City of Mendota 2009).

Existing Conditions within the Secondary Study Area

Interstate 5 I-5 follows the western edge of the Secondary Study Area from the terminus of SR-165 to the City of Avenal. It is the freeway located closest to Mendota, located 15 miles west of the City (City of Mendota 2009). Caltrans is currently proposing to construct an extension of SR-180 as a four-lane freeway that would connect Mendota directly to I-5 and close a transportation gap between SR-180, SR-33, and I-5 (Caltrans 2011, 2013).

Other Arterial Roadways A number of arterials, including SR-145, SR-269, and SR-198 provide regional access to the Secondary Study Area. Local streets and collectors, which

generally conform to a grid pattern, branch off these State Routes and provide direct access to farmlands. Intersections within small communities and along rural farm roads are stop-sign controlled. While the SLC presents a minor barrier to access to some the MPG farmlands, it can be crossed in a variety of locations, including SR-33, SR-145, SR-269, SR-198, and a number of rural arterial roads (e.g., W. Excelsior Avenue, W. Jeffery Avenue, W. Oakland Avenue, etc.; see Figure 45).

3.9.3 Regulatory Framework

Transportation-related issues are largely regulated at the State and local level. This section provides an overview of the regulatory agencies and specific regulations that are applicable to the Proposed Action and alternatives.

Federal Policies and Regulations

Federal Highway Administration (FHWA) The FHWA passes the responsibilities of maintaining and regulating the national highway system to State and local governments through coordination with transportation programs and financial assistance.

State Policies and Regulations

The California Department of Transportation Caltrans manages the operation of State Highways, including the freeways and State Routes passing through the Central Valley.

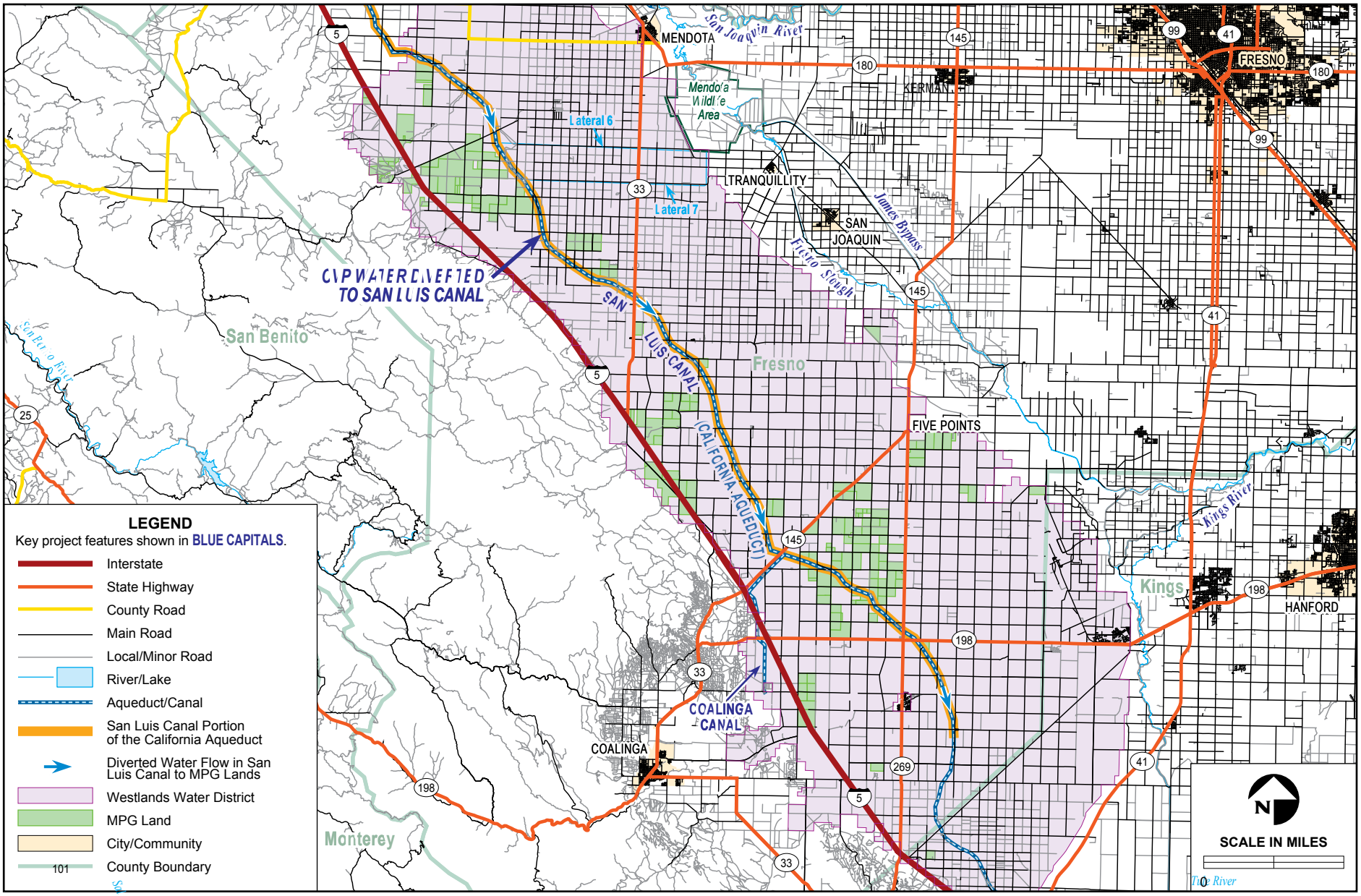
Statewide Transportation Improvement Program The California Transportation Commission administers transportation programming for the State. Transportation programming is the public decision-making process that sets priorities and funds projects envisioned in long-range transportation plans. It commits expected revenues over a multi-year period to transportation projects. The State Transportation Improvement Program is a multi-year Capital Improvement Program of transportation projects on and off the State Highway System, funded with revenues from the State Highway Account and other funding sources.

Agricultural Industries Transportation Services Caltrans commissioned the Agricultural Industries Transportation Services (AITS) Needs Assessment and Pilot Program in 2001 to meet the transportation needs of the State's agricultural worker population and to improve transportation safety and affordability for agricultural workers. The program provides a transportation service for farm workers using certified vanpool vehicles and operators. While the pilot program initially faced numerous obstacles, the AITS program continues to benefit agricultural workers in the counties of Fresno, Madera, and Kings.

Local Policies and Regulations

Fresno Council of Governments Regional Transportation Plan (2014) The FCOG has the responsibility for all regional transportation planning and programming activities within unincorporated Fresno County. The Regional Transportation Plan (RTP) identifies short-term improvements and long-term strategies for the highway and County's transportation network. Under the RTP, FCOG coordinates with transportation programs that serve commuters and agricultural workers, including AITS. The RTP also recognizes the importance of providing efficient distribution routes to active elements of the regional agricultural industry.

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Road Types in the Vicinity of the Westlands Water District

FIGURE 45

Fresno County Transportation and Circulation Element The following objectives and policies from the Transportation and Circulation Element of the General Plan for Fresno County are relevant to the Proposed Action and alternatives (County of Fresno 2000).

Policy TR-A.2 Level of Service The County shall plan and design its roadway system in a manner that strives to meet LOS D on urban roadways within the spheres of influence of the Cities of Fresno and Clovis and LOS C on all other roadways in the county.

TR-A.8 Development Impact Fees The County shall assess fees on new development sufficient to cover the fair share portion of that development's impact on the local and regional transportation system.

3.9.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

This analysis qualitatively considers reasonably foreseeable changes to traffic conditions resulting from the Proposed Action and alternatives.

The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assume a cessation of this program and associated exchanges. For further discussion of the baseline used in this analysis or the methods used for evaluation of the significance of various environmental effects under NEPA and CEQA, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Thresholds of Significance

The significance criteria used for this analysis satisfy the requirements of both NEPA and CEQA. Thresholds of significance are based on Appendix G of the State CEQA Guidelines. These thresholds encompass the factors taken into account under NEPA to determine the significance of an impact in terms of context and intensity. The Proposed Action and alternatives would result in a significant impact related to traffic if they would do any of the following:

1. Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections);
2. Exceed, either individually or cumulatively, a LOS standard established by the county congestion management agency for designated roads or highways;
3. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
4. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
5. Result in inadequate emergency access;
6. Result in inadequate parking capacity; or

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7. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks).

Significance criteria associated with changes in air traffic patterns would not be applicable as implementation of the Proposed Action or alternatives would not have any substantial impacts to surrounding airports (e.g., Mendota Municipal Airport). The Proposed Action and alternatives do not propose any physical changes to roadways or parking facilities; further, it does not conflict with any plans, policies, or programs supporting alternative transportation. Therefore, impacts related to emergency access, parking capacity, or alternative transportation are not analyzed further.

Impacts and Mitigation Measures

Impact TR-1: Traffic in the Primary Study Area
No Action Alternative An estimated additional 25 full-time workers and 57 seasonal workers would be needed in the Mendota Pool area to support increased agricultural production on Adjacent Overlying Lands (see Section 3.12, *Environmental Justice and Socioeconomics*). The 25 full-time workers would generate up to 50 new daily commuter trips, with seasonal workers potentially adding up to an additional 114 daily commute trips. However, these numbers would likely be reduced due to carpooling, use of farm labor buses, and the AITS program, particularly during peak seasons. This would result in minor increases in farm worker commuter traffic and haul truck trips from increased distribution of agricultural goods and waste. Incremental increases in traffic under this alternative would likely be dispersed across the rural road system, with the most affected roads being Belmont Avenue which links fallow land west of the Pool to the City of Mendota and SR-180 connecting lands east of the Pool to Mendota and the City of Fresno (Figure 44).

The City of Mendota's General Plan identifies that all segments of Belmont Avenue operated at LOS B or C during the AM and PM peak hours in 2007; however, several segments could deteriorate to LOS D, E, or F by 2025 with full build-out of the General Plan. Truck hauling and farmworker commuter trips generally take place outside of traditional peak traffic hours. Therefore, while segments of SR-180 experience limited peak-hour congestion, most increases in traffic generated under this alternative are expected to be outside of the peak hour, with peak-hour traffic increasing only incrementally.

With regard to potential safety impacts on these roadways, major roads in the vicinity of MPG farms such as Belmont Avenue and SR-180 each have a long line of sight and contain left turn pockets and graded dirt shoulders that allow vehicles to pull over, thereby allowing vehicles to pull over and reduce the risk of collisions. San Mateo Avenue is a local rural road with very low traffic volumes and a long line of sight. The intersection of San Mateo Avenue with SR-180 is controlled with a stop sign on San Mateo Avenue only, and has an eastbound left turn lane on SR-180. Visibility at this intersection is at least 1,500 feet both to the east and west, providing ample warning to drivers of approaching vehicles. Both these roadways have wide graded shoulders in most places. Any increase in traffic from renewed farming activities on these roads would likely occur outside of peak hours and would not affect the existing relatively free-flow traffic conditions of these roadways. Further, trips would be widely dispersed across the area road network, limiting these increases on any one roadway.

Annual maintenance activities at MPG groundwater wells would continue to occur, similar to existing conditions. These wells can be accessed via existing roads and would not require changes to traffic circulation or substantially contribute to congestion.

Proposed Action Traffic associated with operation of the Proposed Action would include agricultural worker commuter trips, truck haul trips related to agricultural deliveries and waste, and occasional truck trips associated with maintenance of the MPG wells and the Terra Linda Farms Recharge Canal and construction of replacement wells. These activities also take place under existing conditions and would result in little to no increase in vehicle trips compared to existing conditions. There would also be little to no increase in traffic associated with maintenance activities at the NCR Recharge Ponds since these are existing ponds that are already maintained. Further, monitoring activities would not substantially increase vehicle trips, as the Proposed Action would carry forward the monitoring activities currently conducted under the existing exchange program and agreements.

Alternative 2 As under the Proposed Action, this alternative would produce traffic levels similar to existing conditions related to agricultural worker commuter trips, haul trips, and infrequent well maintenance trips.

Construction and operation of the River Ranch Recharge Basin at Terra Linda Farms would result in additional short-term traffic during construction, but would otherwise have minimal effects. Traffic impacts would generally result from the initial delivery and final removal of construction equipment from the site and from delivery of fuel for this equipment and passenger vehicle trips from construction workers. Due to the short duration of this activity (approximately two weeks) and the incremental addition to local and regional traffic volumes, construction of the recharge basin would not cause a substantial increase in traffic or change the existing LOS for designated roadways or highways.

Occasional truck trips associated with annual maintenance of the River Ranch Recharge Basin would be required; however, basin maintenance events would occur infrequently and would add very few trips to the existing traffic. Therefore, this activity would have little impact on traffic conditions or the local or regional transportation network.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact TR-2: Traffic in the Secondary Study Area
No Action Alternative Traffic associated with farming activity in Westlands would decrease due to reduced farm worker commutes from the loss of an estimated 120 full-time workers and 276 seasonal workers (see Section 3.12, *Environmental Justice and Socioeconomics*). The number of truck haul trips distributing agricultural goods, transporting operational services, and moving waste products would also be reduced. The reduction of traffic trips would occur throughout the regional roadway network in Westlands and would not necessarily result in a deterioration of LOS on roadways or intersections.

Due to the infrequent nature and small scale of potential well operation and maintenance anticipated under this alternative, these activities would only produce an incremental amount of

traffic trips and would have little impact on regional traffic patterns and congestion. This would not result in a substantial change to the circulation network.

Proposed Action The Proposed Action would support continued farming operations on existing farmland in Westlands, including related traffic such as passenger vehicle trips associated with farm worker commutes and truck trips associated with hauling farm production and/or waste during the planting and harvest seasons. This would constitute a continuation of existing traffic patterns and would not result in any change to the circulation network or traffic volume.

Alternative 2 This alternative would have the same impacts as the Proposed Action.

Significance Determination before Mitigation
CEQA Significance Determination Impacts would be *less than significant* under all Alternatives.

Cumulative Effects

Traffic related to temporary construction activities included in any of the alternatives would not contribute to cumulative effects as construction traffic would be short-term and temporary in nature. The Proposed Action and Alternative 2 would not contribute significantly to cumulative effects in either the Mendota Pool area or Westlands as levels of traffic resulting from these actions are expected to be similar to existing conditions.

The No Action Alternative would incrementally increase traffic impacts within the Primary Study Area as increased agricultural production on 2,284 acres of currently fallow lands would produce additional commuter and haul trips. These trips would likely occur on SR-180 and SR-33, which connect MPG lands to regional activity centers and arterial roadways. These roadways currently experience congestion in portions near Mendota and within Fresno County and exceed FCOG LOS requirements on some roads during peak hours, especially near the City of Mendota. However, incremental traffic trip increases resulting from the No Action Alternative would likely take place outside of peak hour congestion, and programs such as AITS would help to diffuse the amount of trips generated by agricultural workers. Further, proposals to expand SR-180 (Caltrans Highway Route Adaption for SR-180) and actions listed under the 2014 RTP would improve circulation within the Primary and Secondary Study Areas. As such, these incremental increases in traffic under the Proposed Action and alternatives would not have a cumulatively considerable effect on local and regional traffic.

3.9.5 References

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3.10 Air Quality

This section evaluates potential air quality impacts of the Proposed Action and alternatives in the San Joaquin Valley. This evaluation includes a discussion of both potential short-term construction impacts and long-term operational impacts. Information was derived from the EPA, California Air Resources Board (CARB), and SJVAPCD. Anticipated impacts related to GHG emissions are summarized in Section 3.11, *Climate Change and Greenhouse Gases*, and are not discussed in this section.

3.10.1 Environmental Setting/Affected Environment

Background

The Mendota Pool is located in the San Joaquin Valley Air Basin (Air Basin), a natural basin formed by the predominantly flat San Joaquin Valley, which is bound on the west by the Coast Ranges, on the east by the Sierra Nevada Mountains, on the south by the Tehachapi Mountains, and on the north by the Sacramento Valley Air Basin. The Air Basin is the second largest in California; it is approximately 300 miles long and covers nearly 25,000 square miles, including the following counties: Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare, and roughly half of Kern (SJVAPCD 2013). Major urban centers located within the Air Basin include the Cities of Bakersfield, Fresno, Modesto, and Stockton.

The EPA has established criteria to protect public health and welfare for several common air pollutants (also known as "criteria air pollutants"): ground-level ozone; particulate matter; carbon monoxide (CO); nitrogen dioxide (NO_2); sulfur dioxide (SO_2), and lead. The air pollutants monitored in the Air Basin and their potential health impacts include:

- **Ground-Level Ozone (Ozone):** Ozone is a pungent, colorless, toxic gas produced by a photochemical reaction (triggered by sunlight) between nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Conditions that produce high concentrations of ozone are direct sunshine, stagnation, high temperatures, and strong temperature inversions. Ozone concentrations are generally highest during the summer months when these conditions are favorable. Direct health effects include respiratory and eye irritation and possible changes in lung functions. Groups most sensitive to ozone include children, elderly, persons with respiratory disorders, and persons who exercise strenuously outdoors.

- **Respirable Particulate Matter (PM_{10}) and Fine Particulate Matter ($PM_{2.5}$):** PM_{10} and $PM_{2.5}$ consist of suspended dust particles less than 10 or 2.5 microns, respectively. PM_{10} is generally fugitive dust kicked up from mobile sources or wind. $PM_{2.5}$ is emitted from combustion processes or is formed as a secondary pollutant through chemical reactions. Most particulate matter is produced by fuel combustion, motor vehicle travel, and construction activities. Children, elderly, and persons with pre-existing respiratory or cardiovascular disease are more susceptible to the effects of high PM_{10} and $PM_{2.5}$ levels. Potential health effects include skin, eye and throat irritation, respiratory infections, and asthma attacks. Daily fluctuations in $PM_{2.5}$ concentration levels have been tied to hospital

admissions, school and kindergarten absences, a decrease in respiratory lung volumes in normal children, and increased medication use. Recent studies show lung function in children is reduced with long-term exposure to particulate matter.

- **Carbon Monoxide (CO):** CO is a colorless, odorless gas produced by the incomplete combustion of fuels. CO concentrations tend to be the highest near congested transportation corridors and intersections, especially during winter mornings with little to no wind, when surface-based inversions trap the pollutant at ground levels. Elevated concentrations of CO weaken the heart's contractions and lower the amount of oxygen carried by the blood. Inhalation of moderate levels of CO can cause nausea, dizziness, and headache, while inhalation of high levels can be fatal. CO reduces the amount of oxygen in the blood, causing heart difficulties in people with chronic diseases, reduced lung capacity and impaired mental abilities. Individuals most at risk include fetuses, patients with heart disease, and patients with chronic hypoxemia (oxygen deficiency).

- **Nitrogen Dioxide (NO_2):** NO_2 is byproduct of fuel combustion. The principal form of nitrogen oxide produced by combustion is nitric oxide, which reacts quickly to form NO_2, creating the mixture of nitric oxide and NO_2 commonly called NO_x. NO_2 results in reduced visibility. NO_2 also contributes to the formation of ozone and $PM_{2.5}$. Major sources of NO_x include power plants, large industrial facilities, and motor vehicles. NO_x irritates the nose and throat and increases susceptibility to respiratory infections, especially in asthmatics.

- **Sulfur Dioxide (SO_2):** SO_2 is a colorless, extremely irritating gas or liquid that is produced as a result of burning high sulfur-content oils and coal, and from chemical processes occurring at chemical plants and refineries. Major sources of SO_2 include power plants and large industrial facilities. SO_2 emissions aggravate lung diseases, especially bronchitis, and constricts breathing passages, especially in asthmatics and during moderate to heavy exercise. SO_2 can causes wheezing, shortness of breath, and coughing. High levels of particulate matter appear to worsen the effect of SO_2, and long-term exposures to both pollutants leads to higher rates of respiratory illness.

- **Lead:** Lead occurs in the atmosphere as particulate matter. The primary sources of airborne lead include the manufacturing and recycling of batteries, paint, ink, ceramics, ammunition, and secondary lead smelters. From 1980 to 2014, lead emissions in the United States dropped by 99 percent (EPA 2014). Fetuses, infants, and children are sensitive to the adverse effects of lead exposure. Exposure to low levels of lead can adversely affect the development and function of the central nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotient. In adults, increased levels of lead are associated with increased blood pressure. Lead poisoning can cause anemia, lethargy, seizures, and death.

- **Toxic Air Contaminants (TACs):** TACs are a diverse group of air pollutants including both organic and inorganic chemical substances emitted from sources including gasoline stations, motor vehicles, dry cleaners, industrial operations, painting operations, and research facilities. TACs differ from the above criteria pollutants in that ambient air quality standards have not been established for TACs. TACs are capable of causing chronic and acute health effects. These effects include increased risk of cancer. The

majority of the estimated health risks from TACs can be attributed to a relatively few compounds, the most important being particulate matter from diesel-fueled engines.

- **Odors:** Odors are not regulated under the Federal or State Clean Air Acts; however, they are considered under CEQA. Odors can potentially affect human health in several ways. Odorant compounds can irritate the eye, nose, and throat, which can reduce respiratory volume. VOCs that cause odors can stimulate sensory nerves to cause neurochemical changes that might influence health, for instance, by compromising the immune system. Unpleasant odors can also trigger memories or attitudes, causing cognitive and emotional effects such as stress.

Findings from Previous EIS

The 2004 Final EIS concluded that the 10-Year Exchange Agreements would have no impact on air quality; this finding was based on the assumption that farming operations would be consistent with past operations. Assuming the MPG well pumps use electric motors, groundwater pumping would not directly generate emissions within the Mendota Pool area, but would generate emissions indirectly at source power generation stations. However, the MPG currently uses both diesel and electric groundwater pumps under the Existing Exchange Agreements, making local area emissions slightly higher than initially estimated in the 2004 Final EIS.

Study Areas

The Primary Study Area for the air quality analysis includes the area surrounding the Mendota Pool (refer to Figure 5), where construction and operation of the Proposed Action or alternatives would potentially generate emissions due to operation of the MPG wells and construction, maintenance, and operation of potential recharge facilities at Terra Linda Farms or the recharge canals in FWD. While the boundaries of the Primary Study Area were delineated to study the potential effects of groundwater levels, groundwater quality, and surface water quality, it happens to extend for over three miles from the location of potential emission sources, and therefore, adequately takes into account emissions that may be carried away from the source by wind, or be generated from by related vehicles or farming equipment.

The Secondary Study Area includes the areas of Westlands that are within Fresno County, with consideration given to emissions produced on the MPG lands that may be carried away from the source by wind, or be generated by directly related vehicles or equipment (refer to Figure 4).

3.10.2 Regional Setting

Topography and Climate

The Air Basin often experiences high levels of air pollution that are exacerbated by regional climate and topography. The mountain ranges on three sides of the Air Basin trap air within the San Joaquin Valley, creating a zone of high air pollution potential. Within the Air Basin, temperature inversions, long hot summers, and stagnant foggy winters are conducive to the formation and retention of air pollutants. Fugitive dust (particulate matter) and ground-level ozone are of particular concern in the area as well. The production of these pollutants is exacerbated by the concentration of agricultural activities in the region. The combined effects of these characteristics cause the Valley to be unusually susceptible to air pollution problems (SJVAPCD 2012).

The Air Basin frequently experiences weather conditions that retain air pollutants close to the ground. Low mixing heights, long hot summers, stagnant fog, and light winds allow air pollutants to accumulate within the Air Basin. Persistent temperature inversions formed by warmer air in the upper layer and cooler air in the lower layer limit the vertical dispersion of air contaminants, holding them relatively near the ground. These inversions break when the sun heats the lower layer, allowing the two layers to mix and the previously trapped air to leave the Air Basin. The Air Basin also experiences periods of stagnant wind conditions, which limit the movement and dispersal of air pollutants. The combination of stagnant wind conditions and low temperature inversions is conductive to producing a high concentration of air pollutants. Conversely, on days of no inversion or high wind speeds, ambient air pollutant concentrations are the lowest.

Air Quality within the Air Basin

The EPA and CARB classify the air quality of each air basin based on ambient concentrations of criteria pollutants. The classification is determined by comparing monitoring data with Federal and State air quality standards. According to EPA and CARB air quality standards, current air quality conditions across the Air Basin are poor. Two air pollutants of significant concern are ozone and particulate matter. The entire Air Basin does not attain Federal or State air quality standards for ozone (8-hour concentrations) and $PM_{2.5}$ (see Table 59).

Table 59: State and Federal Attainment Status in 2015

Pollutant	State	Federal
Ozone (1-hour)	**Nonattainment**	(Not Applicable)
Ozone (8-hour)	**Nonattainment**	**Nonattainment**
PM_{10}	**Nonattainment**	Attainment
$PM_{2.5}$	**Nonattainment**	**Nonattainment**
CO	Attainment	Attainment
NO_x	Attainment	Attainment
SO_x	Attainment	Unclassified
Lead	Attainment	Attainment

Source: CARB 2015a.

Air Quality within the Primary and Secondary Study Areas

The SJVAPCD operates a network of 36 air quality monitoring sites that measure and record concentrations of air pollutants throughout the Air Basin. Air pollutant data from monitoring stations within the Primary and Secondary Study Areas, located approximately 10 miles south and 30 miles west of the Mendota Pool area, document air quality conditions in the region.

Similar to Air Basin air quality conditions, air monitoring data recorded at these stations show that ozone and particulate matter levels exceed Federal and State standards in the Primary and Secondary Study Areas (see Table 60). The Federal and State standards for CO, NO_2, and SO_2 have not been exceeded during monitoring years 2013-2015.

Table 60: Ambient Air Quality Measurements and Days over Thresholds

Pollutant	Standard	Station	Number of Days Threshold Was Exceeded & Maximum Levels During Violations[1,2,3,4]		
			2013	2014	2015
Ozone	State 1-Hour > 0.09 ppm	TRA	0 days	0 days	0 days
	State 8-Hour > 0.07 ppm		18 days	11 days	11 days
	Federal 8-Hour > 0.075 ppm		3 days	3 days	5 days
	Max. CA 1-Hour Conc.		0.09 ppm	0.09 ppm	0.09 ppm
	Max. CA 8-Hour Conc.		0.079 ppm	0.078 ppm	0.081 ppm
	Max. Fed. 8-Hour Conc.		0.078 ppm	0.077 ppm	0.081 ppm
Respirable Particulate Matter (PM_{10})	State 24-Hour > 50 µg/m^3	FRE	122	109	*
	Federal 24-Hour > 150 µg/m^3		0 days	0 days	*
	Max. CA 24-Hour Conc.		142.2 ppm	107.3 ppm	78.7 ppm
	Max Fed. 24-Hour Conc.		138.1 ppm	102.9 ppm	74.3 ppm
	State Annual Average		45.6 ppm	41.8 ppm	*
Fine Particulate Matter ($PM_{2.5}$)	Federal 24-Hour > 35 µg/m^3	TRA FC	7 days	3 days	*
	Max. Fed. 24-Hour Conc.		60.1 µg/m^3	46.0 µg/m^3	*
	Federal Annual Average		8.3 µg/m^3	*	*
	Federal Annual Average < 15 µg/m^3		No	*	*
	Federal 24-Hour > 35 µg/m^3	FC FRE	41 days	35 days	20 days
	Max. Fed. 24-Hour Conc.		99.6 µg/m^3	94.6 µg/m^3	75.2 µg/m^3
	State Annual Average		17.1 µg/m^3	16.4 µg/m^3	14.5 µg/m^3
	State Annual Average < 12 µg/m3		Yes	Yes	Yes
Nitrogen Dioxide (NO_2)	Max. CA 1-Hour Conc.	FRE	60.3 ppb	59.5 ppb	49.7 ppb
	State 24-Hour > 0.04 ppm		0 days	0 days	0 days

[1.] ppm = parts per million; µg/m^3 = micrograms per cubic meter; ppb = parts per billion.
[2.] "*" denotes there was insufficient data available to determine the value.
[3.] Measurements were obtained from the Tranquility-32650 West Adams Avenue air monitoring station (TRA) for ozone, and $PM_{2.5}$ and from Fresno-Garland Street air monitoring station (FRE) for PM_{10}, CO, NO_2, and SO_2. $PM_{2.5}$ measurements were also obtained for Fresno County (FC) for better coverage.
[4.] State and Federal measurements vary based on method of analysis, testing locations, and other factors.
Sources: CARB 2016; CARB 2015b.

Sources of Air Pollution

The Valley collects and holds emissions produced by the activities of its three million residents and from vehicles that travel on major thoroughfares such as SR-99 and I-5. Major contributors of air pollutants in the Valley include agricultural operations, industrial processes, manufacturing activities, operation of motor vehicles, and construction and demolition activities. Industrial operations within the Primary Study Area include the Covanta Mendota biomass energy plant located between the town of Mendota and the MPG groundwater pumps along Fresno Slough. This plant generates power by burning biomass, including agricultural waste from the surrounding area. Air pollutants are also generated naturally when winds pull fine dust particles (PM) off the ground surface into the air.

Area-wide emission sources in both the Primary and Secondary Study Areas, which include farming operations, road dust, and windblown dust, generate the majority of airborne particulates (i.e., PM_{10} and $PM_{2.5}$; see Table 61; CARB 2013). Soil surfaces can be sources of PM emissions during windy conditions or during machinery operation on soils (USDA 2012). The degree to which PM becomes airborne is dependent on the amount and type of surface cover, soil moisture, compaction, and topography.

Table 61: 2015 Estimated Annual Average Regional Emissions in the Air Basin

Emission Source	Emissions in Tons Per Day					
	VOC	PM_{10}	$PM_{2.5}$	CO	NO_x	SO_x
Stationary	673.3	14.2	8.8	25.3	30.4	7.0
Area-wide	1068.8	249.3	53.8	185.1	13.2	1.3
Mobile	73.4	14.5	9.9	586.0	228.6	1.3
Total Emissions	**1815.5**	**278.0**	**72.5**	**796.4**	**272.2**	**9.6**

Source: CARB 2016.

Emissions of NO_x, a precursor to ozone, are primarily generated by mobile sources (i.e., motor vehicles, farm equipment, etc.). Emissions of VOCs, which also contribute to ozone, come from a variety of stationary, area-wide, and mobile sources mainly attributable to farming operations and activities that use diesel combustion engines (SJVAPCD 2012).

NO_x is the primary contributor to the formation of ground-level ozone and $PM_{2.5}$ due to local climate combined with the chemical composition of area air pollutants (SJVAPCD 2012). NO_x emissions are mainly produced by mobile sources, primarily heavy-duty diesel trucks. VOCs are also a contributor to increased ozone levels. Much of these emissions are due to various farming operations and related activities. In addition to pollutants generated in the Valley, regional wind patterns transport emissions from the San Francisco Bay Area and the Sacramento region to the Air Basin. These emissions contribute approximately 11 percent of air pollution in the Primary and Secondary Study Areas (SJVAPCD 2012).

Sensitive Receptors

Sensitive receptors are populations susceptible to the effects of air pollution. Sensitive receptors include children less than 14 years of age, the elderly over 65 years of age, athletes, and people with cardiovascular and chronic respiratory diseases (CARB 2013). While ambient air quality standards were established to protect public health and are generally regarded as conservative for healthy adults, there is greater concern to protect adults who are ill or have long-term respiratory problems, and young children whose lungs are not fully developed. The SJVAPCD identifies the following as sensitive locations/facilities: long-term health care facilities, rehabilitation centers, convalescent centers, retirement homes, residences, schools, playgrounds and parks with active recreational uses, childcare centers, and athletic facilities (see Table 62).

Table 62: Sensitive Receptors in the Primary Study Area

	Use	Address	Distance to Nearest Emission Source
A	Residences on Lolita St. and 9th St., and near Airport Blvd.	Near Lolita and 9th St.	0.53 miles
B	Residences on Oller St. and Puchute St.	Near Oller and 11th St.	0.58 miles
C	Mendota High School	1282 Belmont Ave.	0.68 miles
D	Veterans' Park	Divisadero and Kate St.	0.76 miles
E	Residences on Wonderful Orchards land (south)	Eastside Drive	0.25 miles
F	Residences on Wonderful Orchards land (north)	Firebaugh Blvd.	0.35 miles
G	Residences in FWD	San Mateo Rd.	0.15 miles

Most stationary emission sources related to the Existing Exchange Agreements are groundwater pumps and agricultural operations that produce fugitive dust. Sensitive receptors within one mile of a stationary emission source in the Primary Study Area include residences, one school, and one park (see Table 62). The majority of sensitive uses are located on the west side of the City of

Mendota, with the closest sensitive receptors located 0.15 miles away from a stationary emission source. There are some sensitive receptors such as schools and medical facilities in the City of Mendota, located more than one mile away; however, due to their distance and urban surroundings, emissions from these sources would have little effect on these sensitive receptors. The eastern portion of the City of Mendota consists of industrial uses and the Mendota Municipal Airport, which are not considered sensitive uses.

The Primary Study Area also includes the land surrounding the NCR Recharge Ponds and the potential FWD recharge canals. FWD contains a few residences located on agricultural lands; however, these residences are inhabited by farm owners or caretakers who are engaged in the agricultural operations that surround these properties. Other than the small number of residences, land uses in the FWD, including the agricultural lands and a few industrial buildings, are not considered sensitive uses.

The Secondary Study Area includes Westlands; this area is highly agricultural with very few sensitive receptors. While the majority of land use activities in Westlands are not considered sensitive, there are some residences located on portions of large farms. Small agricultural communities located in Westlands with clusters of residences and community supporting businesses also contain some sensitive receptors (see Table 63).

Table 63: Agricultural Communities and Sensitive Uses in Westlands Water District

Use	Location / Address	Distance from an MPG farm
Agricultural Communities with Residential Units	Three Rocks	0.13 miles
	Cantua Creek	1.0 miles
	Five Points	0.4 miles
Best Western Apricot Inn	46290 W Panoche Rd. Firebaugh, CA 93622	0.3 miles
Cantua Elementary School	Cantua Creek, CA (W. Clarkson Ave. & S. San Mateo Ave.)	1.0 miles
Westside Elementary School	19191 W Excelsior Ave. Five Points, CA 93624	1.0 miles
University of California: West Side Research and Extension Center	17353 W Oakland Ave. Five Points, CA 93624	0.5 miles

3.10.3 Regulatory Framework

Air quality within the Air Basin is addressed by various Federal, State, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, regulation, planning, policy-making, education, and a variety of programs. The relevant laws, regulations, and agencies responsible for regulating and improving air quality within the Air Basin are discussed below.

Federal Policies and Regulations

United States Environmental Protection Agency The EPA is responsible for setting and enforcing the primary and secondary National Ambient Air Quality Standards (NAAQS) for atmospheric pollutants, which include O_3, CO, NO_x, SO_x, PM_{10}, and Pb, under the Federal Clean Air Act. This agency regulates emission sources that are under the exclusive authority of the Federal government, such as aircraft, ships, and certain locomotives. The NAAQS represent maximum acceptable concentrations of criteria pollutants to ensure that the air is considered

healthy to breathe. When an area exceeds these standards, it is designated as "nonattainment" by the EPA for NAAQS. The applicable NAAQS are presented in Table 64, below.

Table 64: Federal, State, and Local Air Quality Thresholds

Air Pollutant	Averaging Time	EPA Ambient Standard	CARB Ambient Standard	SJVAPCD Construction & Operational Thresholds[1]
Ozone	1 Hour	--	0.09 ppm	--
	8 Hour	0.075 ppm	0.07 ppm	--
Respirable Particulate Matter (PM_{10})	24 Hour	150 µg/m^3	50 µg/m^3	--
	Annual	--	20 µg/m^3	15 tons/year
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	35 µg/m^3	--	--
	Annual	15 µg/m^3	12 µg/m^3	15 tons/year
Carbon Monoxide (CO)	1 Hour	35.0 ppm	20.0 ppm	--
	8 Hour	9.0 ppm	9.0 ppm	--
	Annual	--	--	100 tons/year
Nitrogen Dioxide (NO_2)	1 Hour	0.100 ppm	0.18 ppm	--
	Annual	0.053 ppm	0.03 ppm	10 tons/year
Sulfur Dioxide (SO_2)	1 Hour	0.075 ppm	0.25 ppm	--
	24 Hour	--	0.04 ppm	--
	Annual	--	--	27 tons/year
Lead	30-Day Average	--	1.5 µg/m^3	--
	Rolling 3-Month Average	0.15 µg/m^3	--	--

[1] SJVAPCD thresholds of significance for criteria pollutants are the same quantities for both construction and operational emissions.
Sources: CARB 2015b; SJVAPCD 2011.

As part of its enforcement responsibilities, the EPA requires each state with areas in nonattainment of NAAQS to prepare and submit a State Implementation Plan (SIP) that demonstrates the means to attain and maintain compliance with the NAAQS. The SIP must integrate Federal, State, and local plan components and regulations to identify specific measures to reduce pollution, using a combination of performance standards and market-based programs within the timeframe identified in the SIP. Under the Clean Air Act, the SIP and its action items to achieve attainment of the NAAQS must be approved by the EPA in accordance with the General Conformity Rule. In order to meet this Clean Air Act requirement, a federal agency must demonstrate that every action that it undertakes, approves, permits or supports will conform to the appropriate SIP. In an area with an approved SIP, such as the SJVAPCD, conformity is demonstrated in one of four ways: (i) Showing that the emission increases caused by an action are included in the SIP, (ii) demonstrating that the state agrees to include the emission increases in the SIP, (iii) off-setting the action's emissions in the same or nearby area, or (iv) identifying mitigation to reduce the emission increase or alternatively demonstrating through air quality modeling that the federal action is consistent with the specific measures of the approved SIP.

State Policies and Regulations

California Air Resources Board CARB, an entity within the California Environmental Protection Agency, is responsible for the coordination and administration of both Federal and State air pollution control programs within California. In this capacity, CARB conducts research, sets California Ambient Air Quality Standards (CAAQS), compiles emission inventories, develops suggested control measures, provides oversight of local programs, and prepares the

SIP. The California Clean Air Act requires all areas of the State to achieve and maintain the CAAQS by the earliest practicable date. As shown in Table 64, the CAAQS include more stringent standards than the NAAQS for many criteria pollutants. CARB also establishes emissions standards for motor vehicles sold in California, consumer products (such as hair spray, aerosol paints, and barbecue lighter fluid), and various types of commercial equipment, and sets fuel specifications to further reduce vehicular emissions.

Local Policies and Regulations

San Joaquin Valley Air Pollution Control District The SJVAPCD is the agency principally responsible for comprehensive air pollution control in the Air Basin; as such, they are responsible for preparing attainment plans for each nonattainment criteria pollutant for which the district does not meet the standard. The SJVAPCD has developed plans and established strategies to attain State and Federal ozone and PM standards. To meet the requirements of the SIP, the SJVAPCD adopted the following plans: 2017 $PM_{2.5}$ Plans, 2016 Plan for the 8-hour Ozone Standard; 2013 Revoked 1-hour Ozone Plan; 2007 Ozone Plan, and the 2007 PM_{10} Maintenance Plan.

These plans include regulatory and incentive-based measures to reduce emissions of ozone and PM precursors throughout the San Joaquin Valley. The current rules and regulations are published on the SJVAPCD's website (http://www.valleyair.org/rules/1ruleslist.htm), and include regulations regarding generation of dust during construction activities (Rule 8021) and permitting requirements for new and modified stationary sources of air emissions (Rule 2201). Additionally, Rules 4550 (Conservation Management Practices) and 3190 (Conservation Management Practices Plan Fee), adopted in 2004, require farmers with over 100 acres of contiguous lands to prepare and implement Conservation Management Practices relating to agricultural air quality in an effort to reduce fugitive dust emissions and reach attainment status on PM_{10}. Fugitive dust due to construction or earth moving activities are addressed in Rule 8021 and 8081, which require control measures to limit dust emissions. Lastly, Rule 4702 (Internal Combustion Engines) requires diesel engines to meet compliance standards.

3.10.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

This analysis focuses on the air quality impacts from air pollutant emissions associated with the construction and operation of the Proposed Action and alternatives.

The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA. The existing setting includes water exchanges under the 2004 Final EIS, Settlement Agreement No. 2, and 3-Year Extension Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Thresholds of Significance

Air quality impacts related to the Proposed Action and alternatives are analyzed under both NEPA and CEQA. Significance thresholds under NEPA include conformance with EPA NAAQS and regulations. Guidance for significance thresholds under CEQA are provided in

Appendix G of the CEQA Guidelines. The CEQA guidelines also include requirements to analyze conformance with Federal, State, and local standards and regulations. As such, both NEPA and CEQA criteria are included in the guidelines as defined under CEQA. Therefore, based on the State CEQA Guidelines, implementation of the Proposed Action or alternatives may have a significant impact on air quality if it would do any of the following:

1. Conflict with or obstruct implementation of the applicable air quality plan;
2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
3. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
4. Expose sensitive receptors to substantial pollutant concentrations; or
5. Create objectionable odors affecting a substantial number of people.

The EPA, CARB, and SJVAPCD provide quantitative significance thresholds for criteria pollutants (see Table 64). EPA and CARB standards represent maximum concentration levels of criteria pollutants that are considered safe for public health, while SJVAPCD thresholds represent the maximum emissions of criteria pollutants that may be annually generated by a new or modified stationary source. SJVAPCD also requires that new or modified stationary emission sources do not cause or make worse a violation of Federal and State air quality standards. Air quality impacts of the Proposed Action and alternatives are analyzed based on their potential to exceed adopted emissions thresholds identified in Table 64. The adopted SJVAPCD project-specific emissions thresholds are established to ensure that the combination of all projects within the SJVAPCD do not result in cumulative increases in ambient pollutant concentrations and exceedance of NAAQS. Given air pollutant emissions are cumulative in nature, if an individual project does not exceed the established emissions thresholds, that project would also not result in a cumulatively considerable impact.

Impacts and Mitigation Measures

Impact AQ-1: Fugitive Dust Emissions

No Action Alternative In the Primary Study Area, the reduction in fallow lands would reduce PM_{10} emissions within the Mendota Pool area. However, some fugitive dust would be produced from new farming operations on these lands. Overall, this would result in a slight net decrease of PM_{10} emission within the Primary Study Area.

In the Secondary Study Area, fallowing of an estimated 10,000 acres of irrigated farmland would result in an increase in fugitive dust emissions in Westlands. However, converted fallowed lands would also result in a reduction of energy intensive activities on soils, which would decrease the amount of fugitive dust produced from these activities. Although this would somewhat offset the amount of PM_{10} produced on these lands, this alternative would result in a net increase of PM_{10} emissions in Westlands.

Farms over 100 acres in size are subject to SJVAPCD Rule 4550 and must implement Conservation Management Practices that reduce PM_{10} emissions. Under these practices, land subject to fallowing or idling is normally disked for weed control or planted with a cover crop or cover vegetation. These soil practices serve to minimize fugitive dust. Implementation of Conservation Management Practices would ensure that land fallowing would not conflict with an existing air quality plan, would not likely result in a cumulatively significant net increase in PM, would not likely violate or exacerbate a nonattainment situation specific to an existing air quality standard, and would not be expected to expose sensitive receptors to substantial PM emissions.

Proposed Action Fugitive dust emissions from agricultural activities and levels of exposure to sensitive receptors in both the Primary and Secondary Study Area would remain at levels similar to existing conditions, and similar to conditions anticipated under the No Action Alternative, as there would not be a change in existing agricultural land uses or associated activities under the extension of the Exchange Agreements.

In the Primary Study Area, some fugitive dust may be generated during recharge facility maintenance and well replacement. The annual turning of soils at the Terra Linda Farms Recharge Canal would result in some PM_{10} emissions. However, like other similar recharge facility maintenance activities within the area, these emissions would be short-term in nature and would not exceed the SJVAPCD 15 tons/year PM_{10} threshold. NCR Recharge Ponds are already maintained by Wonderful Orchards for their own uses and may require some additional maintenance, which could have an incremental contribution to local PM_{10} emissions.

As under the Existing Exchange Agreements, occasional well replacements would occur as part of normal agricultural activity, with drilling resulting in a small amount of dust due to ground disturbance. Effects would be short-term and temporary in nature, with construction activities lasting approximately one week per well. Compliance with Rule 4550 of the SJVAPCD and implementation of Conservation Management Practices would further reduce PM_{10} emissions, so that resulting fugitive dust emissions would not conflict with an existing air quality plan (e.g., the SIP), thus complying with the General Conformity Rule, and would not likely result in a cumulatively considerable net increase in PM (for which the region is currently in state nonattainment status), would not likely violate or contribute substantially to an existing air quality standard, or expose sensitive receptors to substantial pollutant concentrations.

Alternative 2 Alternative 2 would include emissions from the construction and operation of the 85-acre River Ranch Recharge Basin (see Table 65 and Table 66). The River Ranch Recharge Basin would be maintained through annual disking and tilling, and occasional (once every 2 to 10 years) deep ripping using a large bulldozer with a ripping attachment over an 80-acre area. Maintenance events would occur over one week and would require a small construction crew.

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Table 65: Estimated Emissions from Construction of the River Ranch Recharge Basin

	Maximum Emissions (tons/year)				
	ROG	**NO_x**	**CO**	**PM_{10} (Exhaust and Dust)**	**$PM_{2.5}$ (Exhaust and Dust)**
Construction	0.0415	0.5072	0.3296	0.298	0.287
SJVAPCD Threshold	10	10	100	15	15
Threshold Exceeded?	**No**	**No**	**No**	**No**	**No**

Notes: All calculations were made using the CalEEMod computer model (see Appendix G).
Calculations include worker trips, construction vehicle emissions and fugitive dust.

Table 66: Estimated Operational Emissions related to River Ranch Recharge Basin

	Estimated Emissions (tons/year)					
	VOC	**NO_x**	**CO**	**SO_2**	**PM_{10} (Exhaust and Dust)**	**$PM_{2.5}$**
Vehicles	0.038	0.2707	0.1987	0	0	0
Landscaping	0	0	0.00001	0	0	0
Pumps	0.038	0.2707	0.1987	0.00034	0.0204	0.0204
Maximum tons/year	**0.076**	**0.5414**	**0.39741**	**0.00034**	**0.0204**	**0.0204**
SJVAPCD Threshold	10	10	100	27	15	15
Threshold Exceeded?	**No**	**No**	**No**	**No**	**No**	**No**

See Appendix G for CalEEMod computer model output.

Construction of the River Ranch Recharge Basin at Terra Linda Farms would result in short-term PM_{10} emissions (0.298 tons/year) in the Primary Study Area (see Table 65). Use of a water truck during earthmoving activities, as well as compliance with District Rule 8021 and the implementation of a Dust Control Plan (required for soil displacement of more than 2,500 cubic yards), would reduce effects of fugitive dust during basin construction. Due to the emissions estimated for PM_{10}, the requirement for compliance with adopted SJVAPCD air quality management plans that would apply to this activity (discussed under the Local Policies and Regulations heading and Table 64 above), and the short duration of this activity, these emissions would not exceed any air quality thresholds of significance.

Similar to the Proposed Action, fugitive dust during drilling for well replacement would include a small amount of dust due to ground-disturbing activities. However, as these construction emissions would be limited to a shorter construction period (with construction activities lasting approximately one week per well) and require less ground disturbance than anticipated for the construction of the River Ranch Recharge Basin, emissions are not expected to exceed those modeled for construction of the River Ranch Recharge Basin and would not exceed SJVAPCD significance thresholds. Compliance with Rule 4550 of the SJVAPCD and implementation of Conservation Management Practices would further reduce PM_{10} emissions, so that so that resulting fugitive dust emissions would not conflict with an existing air quality plan (e.g., the SIP), thus complying with the General Conformity Rule, and fugitive dust emissions would not result in a cumulatively considerable net increase in PM (for which the region is currently in nonattainment status with regard to State criteria), would not violate or contribute substantially to an existing air quality standard, and would not expose sensitive receptors to substantial pollutant concentrations.

Fugitive dust emissions resulting from agricultural activities and levels of exposure to sensitive receptors in both the Primary and Secondary Study Areas would remain at levels similar to existing conditions as there would not be a change in existing agricultural soil management practices or associated activities under the this alternative. Operation of the River Ranch Recharge Basin would result in incremental increases in PM_{10} emissions from operation of pumps, but otherwise would not significantly contribute to fugitive dust emissions (see Table 66).

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact AQ-2: Combustion Emissions
No Action Alternative Under this alternative, total groundwater pumping would be slightly reduced to approximately 33,395 AFY. This reduction would slightly decrease combustion emissions resulting from MPG groundwater pumping. The MPG would continue pumping groundwater using existing active wells as well as from any new replacement wells. Due to permitting conditions and compliance with Rule 4702 of the SVJAPCD, replacement wells would likely contain electric pumps.

Agricultural operations on irrigated farmlands produce combustion emissions through the use of fuel-powered equipment and vehicles during activities such as planting, harvesting, weeding, and maintenance. While fallowed land requires some maintenance activities that utilize fuel-powered equipment, operations on irrigated farmlands tend to be more energy intensive and produce more combustion emissions than fallowed land maintenance. The net increase of fallowed lands in Westlands under this alternative would result in a net decrease in combustion emissions produced from agricultural operations on these lands within the Air Basin.

Increased groundwater extraction from wells within Westlands (up to 25,000 AFY) would create additional sources of combustion emissions. These wells may use diesel or electric pumps, although pumps used in new groundwater wells are generally electric due to permitting conditions and compliance with Rule 4702 of the SJVAPCD.

Proposed Action The Proposed Action may result in combustion emissions from the following activities:

Agricultural operations Agricultural operations in the Primary and Secondary Study Areas are expected to remain at existing levels with no major changes to combustion-related emissions levels.

Operation of groundwater pumps The MPG would continue pumping groundwater from up to 75 wells, including the existing 66 active wells and any replacement wells that are constructed. Replacement wells would likely contain electric pumps in order to comply with permitting conditions and Rule 4702 promulgated by the SJVAPCD. Diesel motors in diesel-powered wells would result in combustion emissions considered toxic and carcinogenic by the State of California; however, emission levels from an individual pump would not exceed SJVAPCD point source thresholds. Electric motors used to power operational wells and any replacement wells would result in off-site emissions associated with power generation by the utility company.

Construction of replacement wells Under the Proposed Action, replacement wells may be required based on results of the monitoring program. Establishment of these wells would result in short-term construction emissions. Combustion emissions from well replacement construction would include exhaust emissions from operation and delivery of one drilling rig and commute trips from the construction crew of two to three people. Drilling replacement wells would occur infrequently.

Maintenance of groundwater wells The existing groundwater wells would continue to require routine maintenance under the Proposed Action, as is currently performed under the existing program.

Maintenance of recharge ponds and canal Maintenance activities for the recharge facilities would result in air emissions associated with the use of heavy fuel-powered construction equipment. Maintenance activities would be conducted annually and emissions would result from operation and delivery of construction equipment, as well as commute trips associated with a small construction crew. These emissions would be short-term. This activity would be similar to existing maintenance activities associated with maintaining fallow land at Terra Linda Farms and recharge basins at NCR.

Given that emissions from ongoing operation, routine maintenance, and possible groundwater well replacements under the Proposed Action would be either short-term, temporary events, or similar to existing conditions, combustion emissions would not result in a cumulatively considerable net increase or exceed SJVAPCD air quality thresholds. Therefore, the Proposed Action would not conflict with an existing air quality plan (e.g., the SIP), would be in compliance with the General Conformity Rule, and would not contribute substantially to an existing violation of an air quality standard, or expose sensitive receptors to substantial pollutant concentrations.

Alternative 2 Combustion emissions related to agricultural operations, groundwater pumps, well replacement, and well maintenance would be similar those described under the Proposed Action.

Construction of the River Ranch Recharge Basin at Terra Linda Farms would result in short-term combustion emissions in the Primary Study Area (see Table 65). As seen in Table 65, the emission of criteria pollutants associated with basin construction would not exceed SJVAPCD air quality thresholds.

Combustion emissions related to operation of the River Ranch Recharge Basin include pumping water into the basin during flood events, and vehicle trips and operation of equipment during maintenance events and landscaping; estimated emissions from these activities are listed in Table 66 and are below the stated thresholds for operational emissions. Given that emissions resulting from basin construction, maintenance, and operation would be below SJVAPCD thresholds, combustion emissions would not conflict with an existing air quality plan (e.g., the SIP), thus complying with the General Conformity Rule, and would not result in a cumulatively considerable net increase, violate or contribute substantially to an existing air quality standard, or expose sensitive receptors to substantial pollutant concentrations.

Significance Determination before Mitigation

CEQA Significance Determination *Less than significant* for all Alternatives.

Impact AQ-3: Objectionable Odors

No Action Alternative Agricultural activities on irrigated farmlands traditionally employ fertilizers, pesticides, and diesel-powered farm equipment that can produce objectionable odors. The No Action Alternative would bring approximately 2,284 acres of Adjacent Overlying Lands back into production within the Primary Study Area. This has the potential to increase odors related to farming activities within the Primary Study Area, especially on currently fallow Terra Linda farmlands near the City of Mendota. However, industrial lands to the east of Mendota and Mendota Municipal Airport, which are not considered sensitive land uses, provide a buffer between sensitive receptors within the City of Mendota and agricultural lands (refer to Table 62).

Residences in FWD, Wonderful Orchards lands, and within the Secondary Study Area are mainly farm owners or caretakers who engage in the agricultural operations that surround these properties, and are not considered sensitive to odors produced by agricultural operations. Therefore, this alternative would not create objectionable odors that would affect population areas that include sensitive receptors.

Proposed Action Irrigated farmlands traditionally employ fertilizers, pesticides, and diesel-powered farm equipment that can produce objectionable odors. Under the Proposed Action irrigated farmlands and associated odor producing activities would be similar to existing conditions, and no new substantial populations would be exposed to objectionable odors.

Alternative 2 Impacts would be the same as the Proposed Action.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Effects

The Air Basin is currently in Federal and State nonattainment for ozone, PM_{10} and $PM_{2.5}$. Fugitive dust, combustion emissions, and objectionable odors all contribute to deteriorating air quality. Air quality impacts from singular construction events under any of the alternatives would not be individually significant. Cumulatively, the No Action Alternative may contribute to incremental increases in fugitive dust, combustion emissions, and odors due to a shift in farming activities on the MPG lands; however, compliance with SJVAPCD regulations would reduce impacts by requiring Conservation Management Practices as listed in Rule 4550.

While the Proposed Action or Alternative 2 may contribute to fugitive dust and combustion emissions during construction and maintenance activities, impacts would be temporary. Ongoing air quality impacts resulting from agricultural operations and groundwater pumping under the action alternatives would be similar to existing conditions and, therefore, would not result in new cumulatively considerable effects.

3.10.5 References

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3.11 Climate Change and Greenhouse Gases

This section analyzes potential impacts of GHG emissions that would result from implementation of the Proposed Action and Alternatives, including estimating GHG emissions that would result from construction and operation of the Proposed Action. Data regarding climate change observations and trends were taken from the Climate Change Handbook for Regional Water Planning, a joint publication by the EPA and the DWR (EPA and DWR 2011).

3.11.1 Environmental Setting/Affected Environment

Background

Climate Change Climate change refers to significant change in the measures of climate lasting for an extended period of time. Climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. These changes are caused by a number of natural factors—oceanic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions—as well as human-induced alterations. The primary anthropogenic driver of climate change is the release of GHGs into the atmosphere (American Meteorology Society 2010).

Climate change could result in adverse effects including sea level rise, flooding, increased weather variability, intensified storm events, reduced reliability of water supplies, reduced quality of water supplies, and increased stress on ecosystems that would reduce biodiversity. Additionally, climate change may impact human health due to heat waves and extreme weather events, reduced air quality, and increased climate-sensitive diseases, including food-borne, water-borne, and animal-borne diseases. Factors such as increases in average temperatures, changes in rainfall and water supply and related changes in pest populations may adversely impact agricultural production, including the suitability of crops to a particular region and crop yields.

Adverse effects from climate change would be distributed across the globe. Sensitive communities, such as low-lying nations that are more susceptible to impacts from sea level rise, may be more heavily impacted than communities in other regions; however, climate change would not have clearly definable impacts to a specific region or community. In other words, the effects of climate change would have global consequences, many of which are not site-specific (EPA 2018).

Greenhouse Gases GHGs consist of a variety of gases that have the potential to trap heat, mainly water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone, and chlorofluorocarbons (CFCs). Water vapor and ozone and their relationship to climate change are not clearly understood and defined, and these GHGs are not currently regulated. Methodologies and regulations approved by the Intergovernmental Panel on Climate Change (IPCC), EPA, and CARB focus on CO_2, CH_4, N_2O, and CFCs. CFCs have been banned and have no natural source, so these GHGs are not included in this analysis. The following provides a brief description of each of the remaining GHGs and their sources:

- **Carbon Dioxide (CO_2)** – The natural production and absorption of CO_2 occurs through the burning of fossil fuels (e.g., oil, natural gas, and coal), solid waste, trees and wood products, and as a result of other chemical reactions, such as those required to manufacture cement. Globally, the largest source of CO_2 emissions is the combustion of fossil fuels such as coal, oil, and gas in power plants, automobiles, and industrial facilities. CO_2 is removed from the atmosphere (or sequestered) when it is absorbed by plants as part of the biological carbon cycle. When in balance, total CO_2 emissions and removals from the entire carbon cycle are roughly equal. Since the Industrial Revolution in the 1700s, human activities have increased CO_2 concentrations in the atmosphere by 35 percent as of 2005 (IPCC 2007).

- **Methane (CH_4)** – Methane is emitted from a variety of both human-related (anthropogenic) and natural sources. Anthropogenic sources include the production and transport of coal, natural gas, and oil, from livestock and other agricultural practices, and from the decay of organic waste in municipal solid waste landfills. It is estimated that 60 percent of global CH_4 emissions are related to human activities. Natural sources of CH_4 include wetlands, gas hydrates, permafrost, termites, oceans, freshwater bodies, non-wetland soils, and wildfires (IPCC 2007).

- **Nitrous oxide (N_2O)** – Concentrations of nitrous oxide also began to rise at the beginning of the Industrial Revolution, reaching 314 parts per billion (ppb) by 1998. Microbial processes in soil and water, including those reactions that occur in agricultural fertilizer containing nitrogen, produce N_2O. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to the atmospheric load of N_2O (EPA 2018).

Because the impacts each of the GHGs has on climate change varies, the common metric of Carbon Dioxide Equivalents (CO_2e) is used to report a combined impact from all of the GHGs. This metric scales the global warming potential of each GHG to that of CO_2. GHG emissions are typically expressed in metric tons (MT CO_2e), millions of metric tons (MMT CO_2e), or gigatons (Gt CO_2e).[56]

Findings from Previous EIS

The 2004 EIS for the 2005 Mendota Pool 10-Year Exchange Agreements did not include an analysis or findings regarding climate change and GHG emissions.

Study Areas

Impacts from GHG emissions are generally global and climate change impacts related to GHG emissions do not necessarily occur in the same area as an action is located. Therefore, this analysis is cumulative in nature and the Study Area is not restricted to an area surrounding the Proposed Action area; while the Study Area would be the entire planet, of particular concern for the Proposed Action and Alternatives would be California and especially the San Joaquin Valley.

[56] A gigaton of CO_2e is equal to one billion metric tons of CO_2e.

3.11.2 Regional Setting

Climate Change

Impacts in California California is already experiencing impacts related to climate change, including a seven-inch rise in the sea level along the California coast over the last century; a decrease in the average snowpack in the Sierra Nevada region; an increase in the frequency, length, and severity of wildfires; and a shift in precipitation rates, with increased precipitation in the north and decreased precipitation in the south. According to DWR climate model projections, California can expect temperature increases from 1.6 to 3.4 degrees Fahrenheit, depending on which climate projection scenario modeled, with most temperature increases occurring in the warmer inland areas and in summer; changes in the distribution of precipitation and the timing of runoff; and an increase in the frequency and severity of extreme weather events, such as wildfires, floods, droughts, and heat waves (DWR 2018a).

Climate change increases the uncertainty regarding California's water supplies by changing the location, quantity, and timing of precipitation, including both rainfall and snow, while also increasing demand for water due to increased average temperatures and more frequent and extended dry periods. Increased temperatures are causing more precipitation to fall as rain rather than snow and causing snow to melt earlier in the year, resulting in reduced water storage as snowpack. DWR has observed a 19 percent reduction in the annual surface water runoff from snowpack in the San Joaquin River Basin between April and July, and anticipates a potential total reduction of 25 to 40 percent in the state's snowpack water storage by 2050. As the location and quantity of precipitation shifts, changes in where and how water is stored and transported may be required; this would impact operation of water transportation infrastructure, including the CVP, and may require storage of early runoff through the use of dams or underground water banks. In addition to changes in the supply of water, demand for water may increase as droughts become more frequent and severe, evapotranspiration rates increase, and the growing season is extended. As agricultural resources and crop cultivation are highly dependent on water supplies, precipitation, and stable climate conditions, the agriculture industry would be particularly sensitive to climate change. Therefore, trends in irrigated agricultural lands are projected to decrease and crop patterns are likely to shift (EPA and DWR 2011).

Impacts in the San Joaquin River Hydrologic Region According to the 2013 Update of the California Water Plan, as in the rest of the State, the San Joaquin River Hydrologic Region is already experiencing the effects of climate change; the effects of which have, and will likely continue to have, an impact on water and other resources in the future. Changes in timing, amount, and type of precipitation and runoff, as well as increasing temperatures, more extreme floods, and prolonged droughts, will affect the availability of water, resulting in effects to agriculture in the region (DWR 2013).

Greenhouse Gas Emissions

Global GHG Emissions The burning of fossil fuels, such as coal and oil, especially for the generation of electricity and powering of motor vehicles, has led to substantial increases in CO_2 emissions (and thus substantial increases in atmospheric concentrations). In 2011, atmospheric CO_2 concentrations were found to have increased by over 31 percent above the pre-industrial concentrations that were present prior to 1750 (IPCC et al. 2013).

As of 2014, global GHG emissions were estimated at 49 Gt CO_2e per year, with CO_2 making up 76 percent of the total anthropogenic GHG emissions. This is an overall increase in GHG emissions of 71 percent from the 28.7 Gt CO_2e of emissions in 1970 (IPCC et al. 2014). Annual anthropogenic GHG emissions have increased by 10 Gt CO_2e between 2000 and 2010, with this increase coming directly from energy supply (47 percent), industry (30 percent), transport (11 percent), and buildings (3 percent) sectors. About half of cumulative anthropogenic CO_2 emissions between 1750 and 2010 have occurred in the last 40 years. In 1970, cumulative CO_2 emissions from fossil fuel combustion, cement production, and flaring since 1750 were 420 Gt CO_2e, since 1970 to 2010, that cumulative total tripled to 1300 Gt CO_2e (IPCC et al. 2014).

United States GHG Emissions In 2014, the United States emitted 6,870.5 MMT CO_2e. Total United States emissions have increased by 7.4 percent from 1990 to 2014, and emissions increased from 2013 to 2014 by 1.0 percent (70.5 MMT CO_2e). The increase from 2013 to 2014 was due to relatively cool winter conditions, which led to an increase in fuels for the residential and commercial sectors for heating. Additionally, transportation emissions increased as a result of a small increase in vehicle miles traveled and fuel use across on-road transportation modes. Industrial sector emissions also slightly increased due to an increase in industrial production across multiple sectors. Since 1990, United States GHG emissions have increased at an average annual rate of 0.3 percent. Overall, net emissions in 2014 were 8.6 percent below 2005 levels.

Overall, from 1990 to 2014, total emissions of CO_2 increased by 440.9 MMT CO_2e (8.6 percent), while total emissions of CH_4 decreased by 43.0 MMT CO_2e (5.6 percent), and N_2O decreased by 2.7 MMT CO_2e (0.7 percent). Fossil fuel combustion accounted for 93.7 percent of CO_2 emissions and 80.9 percent of total United States GHG emissions in 2014. CH_4 emissions, which have decreased by 5.6 percent since 1990, resulted primarily from decomposition of wastes in landfills, enteric fermentation associated with domestic livestock, and natural gas systems. Agricultural soil management, manure management, mobile source fuel combustion and stationary fuel combustion were the major sources of N_2O emissions.

Since the Industrial Revolution (i.e., about 1750), global atmospheric concentrations of CO_2 have risen approximately 43 percent, principally due to the combustion of fossil fuels. Within the United States, fossil fuel combustion accounted for 93.7 percent of CO_2 emissions in 2014. Globally, approximately 32,190 MMT of CO_2 were added to the atmosphere through the combustion of fossil fuels in 2013, of which the United States accounted for approximately 16 percent. Of the five major sectors generating emissions through direct fossil fuel combustion – electricity generation, transportation, industrial, residential, and commercial – electricity generation accounts for approximately 39 percent and transportation accounts for 33.4 percent of these emissions. In 2014, approximately 82 percent of the energy consumed in the United States was produced through combustion of fossil fuels, while the remaining 18 percent came from other energy sources such as hydropower, biomass, nuclear, wind, and solar energy. Overall, total United States GHG emissions by sector were 83.6 percent for the energy sector, including fossil fuel and transportation combustion, 5.5 percent for industrial processes, 8.3 percent for agriculture, 0.4 percent for land use and forestry, and 2.5 percent for waste, including landfills and wastewater treatment (EPA 2016).

State of California GHG Emissions In 2014, California generated approximately 441.5 MMT CO_2e, a decrease of 2.8 MMT MT CO_2e compared to 2013. This represents an overall decrease of 9.4 percent since peak levels in 2004. Gross per capita emissions were 11.4 MT CO_2e per

person in 2014, constituting an 18 percent decrease from the 2001 peak of 13.9 MT CO_2e per person. Overall trends in the state's GHG emission inventory demonstrate that the carbon intensity of California's economy (the amount of carbon pollution per million dollars of gross domestic product) is declining, representing a 28 percent decline since the 2001 peak, while the state's gross domestic product has grown 28 percent during this period.

Transportation is the source of approximately 36 percent of the state's GHG emissions, followed by electricity generation (both in-state and out-of-state) at 20 percent, and industrial sources at 21 percent. Residential and commercial sources account for 9 percent, agriculture accounts for 8 percent, High Global Warming Potential Gases (high-GWP) comprise 4 percent, and recycling and waste accounts for 2 percent (CARB 2016).

County of Fresno GHG Emissions FCOG has performed an analysis of GHG emissions from vehicle trips by cars and light trucks within and to and from Fresno County. According to this analysis, cars and light trucks contribute 8,297 tons per day of GHG emissions (FCOG 2010). Additionally, the County of Fresno performed an analysis of baseline GHG emissions related to County operations in 2010, finding that County operations contributed 117,997 tons of GHGs in 2010 (324 tons per day), including 21,508 tons of GHGs (59 tons per day) related to their vehicle fleet. The County does not currently have a comprehensive inventory of their total GHG emissions (Economic Development Corporation 2012).

3.11.3 Regulatory Framework

Global climate change is addressed through the efforts of various Federal, State, regional, and local government agencies as well as national and international scientific and governmental conventions and programs. These agencies work jointly to understand and regulate the effects of GHG emissions and resulting climate change through legislation, regulations, planning, policymaking, education, and a variety of programs. The significant agencies, conventions, and programs focused on global climate change are discussed below.

Federal Policies and Regulations

United States Environmental Protection Agency The EPA is responsible for implementing Federal policy to address global climate change. The Federal government administers a wide array of public-private partnerships to reduce GHG emissions produced in the United States. These programs focus on energy efficiency, renewable energy, methane and other non-CO_2 gases, agricultural practices, and implementation of technologies to achieve GHG reductions. On May 13, 2010, the EPA issued a Final Rule that took effect on January 2, 2011, setting a threshold of 75,000 MT CO_2e/year for GHG emissions from major industrial facilities. The EPA has not yet established a threshold for other development.

State Policies and Regulations

California Air Resources Board CARB, a part of the California Environmental Protection Agency (CalEPA), is responsible for the coordination and administration of both Federal and State air pollution control programs within California. In this capacity, CARB conducts research, sets State ambient air quality standards, compiles emission inventories, develops suggested control measures, and provides oversight of local programs. CARB has primary responsibility for the development of California's SIP, on which it works closely with the Federal government and the local air districts. CARB also adopted a statewide GHG emissions limit for 2020 (427

MMT of CO_2e), an emissions inventory, and requirements to measure, track, and report GHG emissions by major industries.

California Department of Water Resources DWR is responsible for managing and protecting California's water supply by working with other agencies and the public to develop strategic goals, and short-term and long-term actions to conserve, manage, develop, and sustain California's watersheds, water resources, and management systems. Every five years, DWR updates the *California Water Plan*, which evaluates different combinations of regional and statewide resource management strategies to reduce water demand, increase water supply, reduce flood risk, improve water quality, and enhance environmental and resource stewardship. The *California Water Plan* includes consideration of climate change impacts in water management. DWR also collaborates with CalEPA to publish the *Climate Change Handbook for Regional Water Planning*, which provides guidance on how to incorporate climate change planning when proposing a project.

Executive Order B-30-15 California Governor Brown announced on April 29, 2015 through Executive Order B-30-15 a new statewide policy goal to reduce GHG emissions 40 percent below their 1990 levels by 2030. This order acts as an intermediate goal to achieving 80 percent reductions by 2050 as outlined in Executive Order S-3-05 below.

Executive Order S-3-05 California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following GHG emission reduction targets:

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

AB 32, the California Global Warming Solutions Act of 2006 The California Global Warming Solutions Act of 2006 (AB 32) recognizes California as a major contributor to United States GHG emissions. AB 32 acknowledges that such emissions cause significant adverse impacts to human health and the environment, and therefore must be identified and mitigated where appropriate. AB 32 establishes a State goal of reducing GHG emissions to 1990 levels by 2020 – a reduction of approximately 30 percent from projected State emission levels and 15 percent from current State levels, with even more substantial reductions required in the future.[57]

CARB has adopted the Climate Change Scoping Plan, which outlines the State's strategy to achieve the 2020 GHG limit set by AB 32. This Scoping Plan proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify energy sources, save energy, create new jobs, and enhance public health.

Senate Bill (SB) 97 SB 97, adopted in 2007, amends CEQA to establish that GHG emissions and their effects are appropriate subjects for CEQA analysis, and directs the California Governor's Office of Planning and Research to develop draft CEQA Guidelines for evaluating and mitigating GHG emissions and global climate change effects. In March 2010, the California

[57] ARB has determined the statewide levels of GHG emissions in 1990 to be 427 MMT CO_2e.

Office of Administrative Law codified into law CEQA amendments that provide regulatory guidance with respect to the analysis and mitigation of the potential effects of GHG emissions, as found in CEQA Guidelines Section 15183.5. The California Resources Agency adopted the Guidelines in January 2009.

Local Policies and Regulations

San Joaquin Valley Air Pollution Control District The SJVAPCD, the agency principally responsible for comprehensive air pollution control in the Air Basin, adopted the Climate Change Action Plan in 2008, which called for guidance to assist SJVAPCD staff, valley businesses, land use agencies, and other permitting agencies in addressing GHG emissions as part of the CEQA process. In response, the SJVAPCD adopted a district policy and guidance in December 2009 to provide direction assessing and reducing the impacts of project specific GHG emissions on global climate change from stationary sources. The policy is detailed in *District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency* (District Policy) and guidance regarding this policy is provided in *Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA*.

The District Policy establishes the process to evaluate the significance of action-specific GHG emission impacts on global climate change and to establish Best Performance Standards (BPSs) to reduce action-specific GHG emissions. Use of BPSs is a method of streamlining the CEQA process of determining significance and is not a required emission reduction measure. Actions implementing BPSs are determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29-percent reduction in GHG emissions, from business-as-usual, is required to determine that an action would have a less than cumulatively significant impact. The SJVAPCD is developing BPSs for Full-Time Agricultural Operations Spark-Ignited Internal Combustion Engines Serving Irrigation Pumps, but has not yet posted draft or approved BPSs for these sources. The SJVAPCD has not officially adopted a significance threshold for generation of GHGs from water exchanges to assess the level at which an action's incremental contribution is considered cumulatively considerable.

The District Policy applies to projects for which the SJVAPCD has discretionary approval authority over the Project and serves as the lead agency for CEQA purposes. However, land use agencies can refer to it as guidance for projects that include stationary sources of emissions. The guidance does not limit a lead agency's authority in establishing its own process and guidance for determining significance of action-related impacts on global climate change.

Fresno Council of Governments FCOG is a voluntary council of local governments including the following agencies: County of Fresno, City of Clovis, City of Mendota, City of Coalinga, City of Orange Cove, City of Firebaugh, City or Parlier, City of Fowler, City of Reedley, City of Fresno, City of San Joaquin, City of Huron, City of Sanger, City of Kerman, City of Selma, and City of Kingsburg. It is a county-wide planning agency and serves as a forum for regional issues related to transportation, long-term housing, land use needs, economic and community development, and the environment. Although FCOG is not a GHG management agency, it is responsible for developing transportation, land use, and energy conservation measures that affect GHG emissions. FCOG prepared the Sustainable Communities Strategy, which integrates land use and transportation planning in order to attain GHG emission reduction targets by 2020 and 2035; this plan was approved by CARB in January 2015.

3.11.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

GHG emissions associated with the Proposed Action and Alternatives are primarily related to operation of groundwater pumps and Basin construction under Alternative 2. Using the California Emission Estimator Model (CalEEMod), GHG emissions resulting from groundwater pumping were calculated based on the energy needed to operate these pumps, and specific to recharge basin construction that would occur under Alternative 2; activities that would not produce a substantial amount of GHGs were assessed qualitatively. Emissions from pump operations were calculated based on the amount of power necessary to raise an AF of water by one foot, efficiency of diesel and electric wells, and the average groundwater depth. Refer to Appendix G for model output and detailed calculations of GHG emissions related to recharge basin construction and to Appendix I for calculations of GHG emissions from groundwater pumping. The effects of GHG emissions are cumulative in nature, and are, therefore, analyzed in the context of CEQA and NEPA requirements for cumulative impact analysis.

The baselines used for this analysis are the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA to provide full disclosure of the potential impacts. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Limitations of GHG Analysis

The global nature of GHG generation and impacts, especially between existing and cumulative future conditions, complicate precise GHG emission analysis. Changes in GHG emissions can be difficult to attribute to a particular planning program or action because the action may cause a shift in the locale for some types of existing GHG emissions, rather than causing "new" GHG emissions. For instance, this action may indirectly generate CO_2 emissions from use of electricity for the operation of wells in the Mendota Pool area, while preventing CO_2 emissions associated with energy used for pumping wells in Westlands instead. As a result, GHG emissions are qualitatively discussed in terms of a net increase, reduction, or no change that would exist if the Proposed Action or alternatives were implemented. The analysis of GHG emissions is particularly conservative in that it assumes all of the GHG emissions are new additions to the atmosphere.

Management practices for agricultural soils accounts for over half of GHGs emitted in the agriculture industry (EPA 2018). Agricultural soils on both irrigated and fallowed lands emit N_2O and CH_4 from anaerobic decomposition of organic matter such as animal waste and plant litter. GHG emissions generated by either irrigated or fallowed lands depend on a variety of factors that are difficult to quantify within Fresno County, including carbon sequestration, individual soil management techniques, and type and amount of fertilizers used. Further, the lack of sufficient studies on GHG emissions from fallowed land practices makes it difficult to determine whether fallowed lands would produce a net increase or decrease in GHGs compared to irrigated farmlands. While agricultural land uses and soil management practices may alter as a result of the Proposed Action and Alternatives, it is undetermined whether these changes would

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ultimately result in substantial changes to GHG emissions. Therefore, GHG emissions due to agricultural farming and fallowing practices are not further discussed in this analysis.

Thresholds of Significance

The significance criteria used for this analysis satisfy the requirements of both NEPA and CEQA. CEQA includes qualitative significance thresholds. These guidelines are used in evaluating the cumulative significance of GHG emissions from the Proposed Action or alternatives. According to Appendix G of the CEQA Guidelines, impacts related to GHG emissions from the proposed Project would be significant if the Project would:

1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; and/or
2. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

Regarding the first threshold, the CEQA thresholds do not provide specific quantitative thresholds that define a significant impact. Under CEQA, State, regional, and local agencies have the authority to define their own significance thresholds; however, Reclamation, DWR, and the SJVAPCD do not currently define quantitative significance thresholds for GHG emissions. An emissions threshold of 10,000 MT CO_2e/year for GHGs generated by the Proposed Action or Alternatives has been selected for this analysis. This threshold is consistent with thresholds established by other jurisdictions including the Bay Area Air Quality Management District (BAAQMD), the Sacramento Metropolitan AQMD, Santa Barbara County, and the San Luis Obispo Air Pollution Control District.

Impacts and Mitigation Measures

CVP water would be conveyed from the DMC to the Mendota Pool under the No Action Alternative and to the SLC under the Proposed Action and Alternative 2. The amount of energy that would be required to convey flows through either canal would be similar to the amount of energy used for CVP operations between all of the alternatives, including the Proposed Action, and would be the same as under existing conditions. Therefore, this impact is not considered further.

Land fallowing would provide little benefit or opportunity for long-term carbon sequestration. This is because as fallowed land would be transitioned back to traditional irrigated agricultural practices, any carbon sequestered during the fallow period would be released back into the atmosphere as the land is tilled or harrowed to support seeding of the land for irrigation and cultivation. Some benefit for carbon sequestration would occur with the planting of cover crop and other no-till practices during fallowing periods compared to conventional fallowing (e.g., lands not planted with cover crop, left as bare soil). However, carbon sequestration potential would not differ substantially between vegetation retained or cover crop planted on fallowed land and new crops planted on irrigated land.

The 2013 Update of the California Water Plan contains projections for changes to water supply and temperature associated with climate change for 12 different future climate scenarios over the next 100 years. For the City of Fresno, which is approximately 30 miles east of the Mendota Pool and experiences a similar climate, the average precipitation under these scenarios over the

period from 2011 to 2099 ranged from 8 to 11 inches a year while the historic average is 10 inches per year. The study also provided temperature projections for the Sacramento Valley Floor, which is located 100 miles north of the Mendota Pool and has similar climate. This area was projected to experience temperature increases of 3 to 10 degrees Fahrenheit between 2006 and 2100, with most of the rise occurring between 1950 and 2100 (DWR 2013).

Recently, the United States Global Research Program (USGRP) concluded in its Climate Science Special Report (2017) that "Many lines of evidence demonstrate that it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century." The USGRP also concludes that "Global climate is projected to continue to change over this century and beyond. The magnitude of climate change beyond the next few decades will depend primarily on the amount of greenhouse (heat trapping) gases emitted globally and on the remaining uncertainty in the sensitivity of the Earth's climate to those emissions (very high confidence)."

Reclamation developed a global climate model in 2016 for the Sacramento and San Joaquin Basins (Reclamation 2016). The model predicts increased temperatures, increased precipitation, increased runoff, and reduced snowpack at higher latitudes during the 21st century.

Impact CC-1: Generation of Greenhouse Gases

No Action Alternative GHG generation under this alternative would be generated by groundwater pumping for Overlying Adjacent Lands, occasional vehicle trips for well maintenance events, construction activities for periodic well replacement, use of farming equipment, vehicle trips from farm worker commuters, and truck haul trips delivering agricultural products.

Groundwater pumping would generate direct GHG emissions due to diesel fuel combustion and indirect emissions due to use of electricity; however, these emissions would be slightly reduced from existing conditions within the Mendota Pool Area. Of the active MPG wells, 16 are diesel-powered, 3 have electric pumps but are powered by diesel generators, and 47 have electric pumps. Any replacement wells would be powered by electric motors to comply with permitting conditions and Rule 4702 issued by the SJVAPCD. As the termination of the Exchange Agreements would reduce exchange pumping, this net reduction in pumping would result in a reduction of roughly 329 MT of CO_2e/year (see Appendix I).

Activities required to maintain existing and replacement MPG wells would be similar to existing conditions since these wells would continue to be used to pump groundwater for use on Adjacent Overlying Lands. Although it is projected that wells will occasionally need to be replaced over the next 20 years, with resultant emissions from drilling operations, this would result in short-term GHG emissions in line with those under existing conditions.

The net decrease in lands used for agricultural production in Westlands and groundwater pumping in the Mendota Pool area under the No Action Alternative would incrementally decrease traffic volumes, with corresponding reductions in related GHG emissions. These reductions would be relatively small since worker commute trips would generally be replaced by commute trips to other job sites.

Farming of an additional 2,284 acres in the Mendota Pool area under this alternative would also produce GHGs from burning fuel that is consumed by farm equipment required for crop

planting, maintenance, and harvesting. The fallowing or idling of lands in Westlands would generate some GHG emissions from maintenance activities that would occur on these lands. These activities may include disking for weeds or the planting of cover crops. However, the GHGs produced from these activities would likely be less than GHG emissions currently generated by farming equipment used for ongoing crop production, planting, maintenance and harvesting activities.

Agricultural crops absorb CO_2 during growth, which contributes to carbon sequestration. While there would be a reduction in agricultural crop growth due to land fallowing/idling and retirement, carbon sequestration potential would not differ substantially between crops planted on irrigated lands or cover crops (i.e., ruderal or non-crop vegetation) planted on fallowed or idle lands.

Given the overall net reductions in commuter trips, groundwater pumping, and energy intensive agricultural activities, GHG emissions from this alternative would be reduced compared to existing conditions.

Extraction of up to an additional 25,000 AFY from wells in Westlands would also generate GHGs. Wells in Westlands are expected to draw from the lower aquifer, with well perforations starting approximately 400 feet bgs; pumping from these wells would require more power than pumping from existing MPG wells in the Mendota Pool area due to drawing water up from greater depths. Additionally, the total amount of water that would be pumped under this alternative is greater than under existing conditions, which would generate additional GHGs.

Pumping 25,000 AFY of water from a depth of 400 feet using electric pumps would generate approximately 4,037 MT CO_2e/year (see Appendix I). Meanwhile, the net reduction in pumping in the Mendota Pool area would reduce GHGs emitted by electrical and diesel pumps by approximately 329 MT of CO_2e/year. Therefore, the total increase in GHG emissions would be 3,708 MT of CO_2e/year, which is below the 10,000 MT of CO_2e/year threshold.

Overall, increased operation of wells in Westlands would result in increases of GHG emissions compared to existing conditions.

Proposed Action Potential GHG emissions associated with the Proposed Action are related to the operation and maintenance of groundwater pumps, occasional replacement of groundwater wells, maintenance of the Terra Linda Farms Recharge Canal and NCR Recharge Ponds, and traffic associated with these activities. These emissions would be similar to current conditions under the Existing Exchange Agreements, with the addition of emissions related to maintenance of the recharge facilities.

GHG Emissions from Groundwater Wells The Existing Exchange Agreements include operation, maintenance, and occasional replacement of up to 75 wells. Of the 66 active wells, 47 are powered by electric motors and 16 by diesel motors (3 of the electric well pumps are powered by diesel generators). Potential replacement wells would be powered by electric motors in order to comply with permit conditions, and Rule 4702 issued by the SJVAPCD. Use of diesel-powered pumps would result in direct GHG emissions, while electric motors would create indirect emissions associated with offsite power generation. The MPG wells included in the Proposed Action would continue to operate as they are currently configured; however, in the case that a diesel well is replaced, it would be replaced by a well that is powered by an electric

motor. Therefore, emissions related to continued use of these wells would be in line with existing conditions, and reduced in the event of well replacements.

Using the existing configuration of wells (29 percent diesel and 71 percent electric) and an average groundwater depth of 30 feet, pumping results in the use of approximately 25,123 gallons of diesel fuel and 814 megawatt hour (MWh) of energy each year. This use results in generation of 481 MT of CO_2e/year (see Appendix I).

GHG Emissions from Recharge Facilities The Proposed Action includes the use of recharge facilities at Terra Linda Farms and NCR; these facilities would require routine maintenance, which would result in GHG emissions associated with the use of heavy construction equipment and agricultural equipment. Annual maintenance activities at the Terra Linda Farms Recharge Canal would require the use of a large bulldozer and commute trips from a small construction crew. These activities would be temporary and short term, and would not contribute substantially to regional GHG emissions.

Maintenance activities at the NCR Recharge Ponds would produce GHG emissions; however, these ponds are already maintained by Wonderful Orchards for their own uses. Use of these ponds under the Proposed Action may result in some additional maintenance, which could have a de minimus, incremental contribution to existing GHG emissions.

Alternative 2 Construction of the River Ranch Recharge Basin would generate GHG emissions during construction activities over a two-week period from the use of diesel powered construction equipment. CalEEMod was used to estimate GHG emissions generated from basin construction (Table 67). These emissions would be far below the 10,000 MT CO_2e/year threshold.

Table 67: Estimated GHG Emissions for Construction

Year	Annual Emissions CO_2e
2018	41.9 MT
Amortized after 30 years	1.4 MT
Threshold	10,000 MT

Note: Although there is no quantitative threshold established by the SJVAPCD, the published Climate Change Action Plan references the thresholds adopted by the BAAQMD and the South Coast Air Quality Management District, which are commonly recognized and used in the evaluation of significance for GHG emissions. For this reason, the threshold used to evaluate significance for the proposed Project is 10,000 MT CO_2e/Year.
Source: See Appendix G for CalEEMod computer program output and for GHG emission factor assumptions.

Potential GHG emissions associated with Alternative 2 are related to operation and maintenance of groundwater pumps, occasional replacement of wells, and traffic associated with these activities. GHG emissions from well replacement and maintenance would be similar to those described under the Proposed Action. These emissions would be generally in line with those experienced under existing conditions.

Annual maintenance events at the River Ranch Recharge Basin would also generate some GHG emissions. Maintenance events would involve the use of one large bulldozer with a ripper over a one-week period and associated vehicle trips. Emissions would be temporary, and would not contribute substantially to GHG emissions.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact CC-2: Climate Change Impacts on MPG Water Supplies
The science of climate change is evolving quickly, and the predicted effects on California's water supplies continue to evolve. Climate change is projected to increase the uncertainty regarding California's water supplies by changing the location, quantity, and timing of precipitation, including both rainfall and snow, while also increasing demand for water due to increased average temperatures and more frequent and extended dry periods. Increased temperatures are projected to cause more precipitation to fall as rain rather than snow and causing snow to melt earlier in the year, resulting in reduced water storage as snowpack (DWR 2018a).

While it is important to consider potential effects of climate change when modeling potential long-term changes to water supplies, after consideration of climate-change-related effects on water supplies during the 20-year horizon of the Proposed Action and Alternative 2, it was determined that historical precipitation and runoff data would continue to be the most reliable inputs to inform impacts from the 20-year exchange program. This approach and relevant conclusions are summarized below and discussed in more detail in the 2015 Hydrogeologic Technical Analysis included in Appendix E. This analysis accounts for the four primary water inputs to the Mendota Pool and Fresno Slough (i.e., the DMC, groundwater pump-ins and agricultural runoff, the San Joaquin River, and the Kings River).

Kings River Flows Based upon review of available data and models and due to its geographic location, Kings River flows are susceptible to any reduced snow pack caused by climate change. The Kings River's headwaters originate as snowpack and precipitation in the western Sierra Nevada Mountains which, is impounded in Pine Flat Lake before flowing into the San Joaquin Valley. Along the Kings River, snowmelt and larger flood flows exceed the storage capacity of reservoirs along the river upstream of the Mendota Pool (e.g., Pine Flat Lake, Tulare Lake) more frequently than on the San Joaquin River. As a result, floodwater flows from the Kings River more frequently serve as inputs to the Fresno Slough and Mendota Pool than those of the San Joaquin River, the flow of which into the Mendota Pool may further be constrained through construction of bifurcation structures and levees under the SJRRP Mendota Pool Bypass and Reach 2B Improvements Project (see Section 3.0, *Scope of Analysis*, Pending Project No. 1).

For this reason and because these floodwater waters are largely not contractually obligated to other uses, the MPG proposes to use Kings River flood flows as the primary source of water for recharge for their proposed groundwater recharge program. Based on historic flow data, the predicted availability of flood flows from the Kings River were assumed to be available in up to eight years during the 20-year exchange period (Appendix E, page 51). The rates of inflow to the Fresno Slough were assumed to be 100–750 AFY for years when flood flows are available (Appendix E, page 51). However, if climate change reduces the amount of Sierra Nevada precipitation to the extent that the lakes and conveyance infrastructure along the Kings River can impound 100 percent the winter/spring flood flows more frequently, it may reduce the frequency and potentially the amount of groundwater recharge assumed in the Hydrogeologic Technical Analysis (Appendix E) and this EIR/ EIS for both the Proposed Project and Alternative 2.

For this reason, the Hydrogeologic Technical Analysis evaluated the potential for climate change to result in changes to the occurrence and magnitude of flows in the Kings River. Based on the available literature, the influence of climate change focusing on the hydrology of the Kings River watershed (and in turn availability of flood flows) could not be determined. So, the analysis instead focused on a 2011 study of the impacts of climate change on stream flow in drainages in the southern Sierra Nevada to infer what may also occur in the Kings River (Appendix E, page 55).

Climate change influences on flood flow frequencies were evaluated for existing conditions (1951–1999), near-term conditions (2001–2049), and long-term conditions (2050–2099). The study utilized three different climate change models to evaluate the changes in 3-day flood occurrences in the Southern Sierra Nevada for both the near-term and long-term conditions. In two out of the three models for the near-term conditions, there was little change (a reduction of less than one [0.3] flood event) in flood occurrences for near-term conditions (2001–2049). The third model predicted the annual average frequency of flood events may be increased by 2.7 to 5.1 events (i.e., increasing availability of water for recharge). When evaluating the change from existing conditions to long-term conditions, two out of the three models showed little change in average annual frequency of flooding by 2049, while the third model showed a change from 2.7 to 4.0 flood events. Since both comparisons of changes in flood occurrences between existing conditions to either near-term and long-term conditions yielded little change in anticipated flood occurrences in the Southern Sierra Nevada, it was concluded that the assumptions of frequency and availability of water from Kings River flood flows to the MPG recharge facilities would not be adversely affected by climate change over the 20-year exchange period (Appendix E, page 55).

CVP Operations and DMC Flows As exchanged water would be delivered to MPG farmlands in Westlands through the SLC, the effect of climate change on CVP operations must be considered. The DMC is also the largest input to the Mendota Pool, so any affect that climate change would have on DMC inflows to the Pool could invalidate the results of the surface water model results in the Hydrogeologic Technical Analysis.

Both the SLC and DMC begin at the Delta Clifton Court Forebay which moderates the effect of the pumps on the fluctuation of flow and stage in adjacent Delta channels. Principal factors affecting Delta hydrodynamics are (1) river inflow and outflow from the Sacramento River and San Joaquin River systems, and (2) export pumping from the south Delta, primarily through the Banks and Jones pumping plants. Inflow to the Delta comes from the Sacramento, San Joaquin, Mokelumne, and Cosumnes rivers, and many smaller eastside tributaries.

CVP and SWP operations from the pumping plants are constrained by a number of flow and quality regulations throughout the Sacramento River basin that have occurred since the Coordinated Operation Agreement (COA) was signed. These other operational agreements have been developed to define how the CVP and SWP will share these responsibilities. Many of these agreements restrict maximum allowable export from the Delta at any time and can be impacted by changes in Delta inflow. Typically, the CVP and SWP attempt to maximize their export pumping from the Delta within these operational constraints.

The potential key effects of climate change on flows in the DMC originating in the Delta is particularly related to the Delta Clifton Court Forebay. Furthermore, sea level rise could affect

San Francisco Bay with saline water penetrating further inland, and conditions in the Delta constraining CVP/SWP operations in the Delta, and also lead to changes in upstream operations in the San Joaquin Basin (DWR 2018c). As mentioned above, DWR has already observed a reduction in the annual surface water runoff from snowpack in the San Joaquin River Basin between April and July. Seasonal pattern shifts due to earlier snow melting causes most of the extra water to be released as Delta outflow due to limitations on reservoir volume. Effects of climate change on shifting surface water runoff are projected to be more pronounced by the end of the Century (DWR 2018b).

Flows in the Delta are affected by rainfall and stream water input from the Sacramento River. California has the largest year-to-year precipitation variability across the conterminous United States, largely because much of the state's annual precipitation comes from a relatively small number of big storms in the winter. Historical decadal variability in rainfall is observed in all of California's hydrological regions, and there is no consistent increase or decrease in precipitation throughout each decade during 1951-2010 (DWR 2018a). Climate projections published by DWR in 2018, discussed in further detail below, indicate that although precipitation in the Central Valley is projected to increase slightly, projected changes are generally within the range of historical variability. This indicates that changes in precipitation will not be a driving force of changes in Delta flows and subsequent groundwater infiltration within the 20-year time period of the Proposed Action.

In August 2018, the DWR published a study titled *Mean and Extreme Climate Change Impacts on the State Water Project,* to project the impact of shifting hydrology due to climate change on the CVP and SWP (DWR 2018b). This study models projections for a mid-century scenario of 2045-2074, centered around 2060. However, the same climate science and region apply, and therefore these projections can be utilized to infer similar effects of climate change on an earlier timeframe. The study found that the change in annual volume of Sacramento River inflows projected in mid-century scenario is not statistically significant compared to annual stream flows measured for the current climate, and the difference between future and current conditions are minimal (DWR 2018b). In other words, the annual volume of water flowing through the Sacramento River is projected to remain similar to annual flows in the current climate, and therefore is not projected to have an impact on pumping operations of the CVP, and subsequently, the DMC. The mid-century scenario shows that a shift in the monthly stream flow may occur and that the peak of inflow is likely to occur one month earlier in (February rather than March) which will require adaptation of some dam and reservoir systems, but would not ultimately affect the annual quantity of inflows (DWR 2018b). Strategic management of the reservoir and adaptation to shifting hydrology would be able to equalize peaks and manage variation of streamflow so that the effects would not adversely affect CVP operations over the next 20 years.

San Joaquin River Flows The groundwater model in the Hydrogeologic Technical Analysis assumes seepage from all surface water features including streams and canals including the San Joaquin River are estimated to range from 49,000 AFY to 133,000 AFY over the entire Primary Study Area. Under cumulative conditions, subsequent to completion of the SJRRP – Mendota Pool Bypass and Reach 2B Improvements Project, the surface water mixing models assumed that 2,500 cfs of contractually obligated flows would be delivered to the Mendota Pool. If climate change results in an inability of the SJRRP to maintain flows along the river through the Primary Study area, it could result in different impacts than concluded by the models.

The primary driver of effects on San Joaquin Basin operations is hydrology upstream of Friant Dam and the ability of Millerton Lake to adequately store and manage change to the level and timing of snowpack in the Sierra Nevada Mountains. When snowmelt exceeds contracted releases from Friant Dam and the required flood storage capacity of the reservoir, it is released down the San Joaquin River as snowmelt and flood releases. This maintains adequate capacity in the reservoir for future periods of high inflows.

To assess the effect of climate change on the SJRRP, Reclamation completed a technical report for the San Joaquin River Restoration Program Draft EIS/EIR titled *Sensitivity of Future Central Valley Project and State Water Project Operations to Potential Climate Change Attachment* (Reclamation 2018). Consistent with other data sources, this technical document finds that the Western United States and Reclamation Mid-Pacific Region have experienced a decline in spring snowpack, reduced snowfall-to-winter precipitation ratios, and earlier snowmelt runoff. The technical report evaluated five climate change scenarios for the 2011-2040 period.

The technical report found that due to the higher required releases of the SJRRP, snowmelt and flood releases may be reduced or even eliminated. The general trends in these impacts are seen for the current climate and in all of the climate change scenarios. Friant Dam's main release increases to accommodate the additional restoration requirement, while flood and snowmelt releases decrease. The technical report found that flows that reach Mendota Pool (driven by flood releases) decrease for all scenarios, but the reductions are more pronounced in the wetter climate change scenarios and less pronounced in the drier climate change scenarios. In other words, the Restoration Flows reduce the storage of surplus water during all scenarios, but none of the five climate change scenarios analyzed reduced the ability of the SJRRP to maintain Restoration Flows through Reach 2B, which exceed historical average annual conditions. It is important to note that this technical report considered additional water emanating from the San Joaquin is treated as abandoned water in the Delta, whereas, the SJRRP is in the process of developing a long-term plan for recapture and recirculation, reuse, exchange, or transfer of Restoration Flows (see Section 3.0, *Scope of Analysis,* Pending Project No. 21), which may reduce the amount of surplus water required to be released from Friant Dam to maintain Restoration Flows. As a result, climate change is not expected to substantially effect inflows to the Mendota Pool from the San Joaquin River or reduce seepage from the San Joaquin River into the groundwater basin during the life of the 20-year exchange program.

Groundwater Inflows Groundwater inflows represent a relatively minor portion of the inflows to the Mendota Pool. Although there has been a recent increase in the construction and use of recharge basins to aid in groundwater recharge, precipitation continues to be the largest factor in recharging groundwater basins, infiltrating either directly from the surface or from the beds of stream and canals where stormwater collects. In August 2018, DWR published the *Projected Changes in Precipitation, Temperature, and Drought across California's Hydrologic Regions* to develop comprehensive climate change scenarios at a scale suitable for illuminating regional vulnerabilities and localized adaptation strategies in California (DWR, 2018a). This study considered the potential change in precipitation for two future periods, mid-century (2020–2059) and late-century (2060–2099). The mid-century period covers the entirety of the 20-year exchange period, and are the only results considered in this discussion. Projections are evaluated under two climate forecasting scenarios named Representative Concentration (RCP) 4.5 and RCP 8.5. The RCP 4.5 scenario assumes low future GHG concentrations, while RCP 8.5 assumes high future GHG concentrations.

The study observes that future rain events in the wet season (winter-spring, annually) would likely become more extreme and/or more frequent, which is consistent with the findings of previous studies. Projections are compared to a historical baseline period of 1951-1990, which was found to be less impacted by climate change in comparison to the 1990s and 2000s. The 40-year historical baseline shows high natural variability in annual precipitation evident on every hydrologic regional scale in California. By the end of the mid-century (2020-2059), annual precipitation in the San Joaquin River Hydrologic Region is projected to increase by 3.6 to 6.4 percent in comparison to the historical baseline, based on each climate scenario. However, the projected increase is generally within the range of historical variability, implying that the natural variability may continue to be the dominant signal in future precipitation (DWR 2018a). Therefore, the projected increase in precipitation from 2020-2059 cannot be attributed to the effects of climate change alone. Increase in variability may become a factor in future precipitation patterns, likely attributed to a combination of projected fewer wet days and longer dry periods, punctuated by heavier precipitation on wet days. However, the annual amount of precipitation is projected to rely on natural variability and remain statistically similar in volume. Thus, it is reasonable (and potentially conservative) to utilize historical rainfall data when modeling the projected groundwater infiltration for the 20-year exchange program, which would end nearly 20 years before the end of the mid-century modeling period. Further, drought conditions in the San Joaquin River Hydrologic Region for the 40-year period of 2020-2059 are projected to be less frequent and severe compared to the historical baseline conditions. Expected increases in precipitation during this period are likely to offset the effect of increased temperatures (DWR 2018a).

No Action Alternative Under the No Project Alternative, the MPG would discontinue their association, and up to 25,000 AFY of groundwater exchanged for CVP water would no longer be available to farmers with lands in Westlands. Groundwater pumping by the disbanded farmers in the Primary Study Area is estimated to be reduced to 33,395 AFY (compared to 38,316 AFY permitted under the Proposed Action). However, as detailed in the above discussion, the effects of climate change within the San Joaquin River Hydrologic Region are not projected to have a direct substantial effect on the availability of water resources, nor are they projected to substantially defer in terms of annual precipitation and surface/groundwater inflows compared to historic conditions. As a result, the anticipated effects of climate change would not result in significant impacts to the No Action Alternative during the 20-year exchange period, and modeled conditions of the Hydrogeologic Technical Analysis remain accurate for assessment of potential impacts.

Though not anticipated, despite the potential threat to the available of surface and groundwater supplies within the Central Valley through the mid-century, the effects of climate change on the availability of supplies would be further limited through implementation of SGMA. SGMA and sustainable basin management would begin as early as 2020 and continue until sustainability of the groundwater basin is achieved in 2040. During this time period, the basin and its resources would be adaptively managed through the pending GSPs, which would account for any unanticipated changes in basin conditions, including those induced by climate change, allowing for immediate responses to changes and a highly responsive approach to addressing climate change. Thus, SGMA and implementation of GSPs would further reduce the effects that climate change may have on surface and groundwater supplies and operations within the Study Areas

Proposed Action Under the Proposed Action, MPG would utilize up to 26,316 AFY of groundwater supplies for exchange and 23,169 AFY of Kings River flood flows for recharge at the existing four NCR Recharge Ponds over the 20-year life of the exchange program. As detailed in the above discussion, the effects of climate change within the San Joaquin River Hydrologic Region are not projected to have a direct substantial effect on the availability of water resources, nor are they projected to substantially defer in terms of annual precipitation and surface/groundwater inflows compared to historic conditions. Although climate projections have anticipated that demand for water may increase as droughts become more frequent and severe, evapotranspiration rates increase, and the growing season is extended, these effects would not apply to the Proposed Action, pumping would be limited to 26,316 AFY and additional pumping of groundwater for exchange with Reclamation would not be permitted. If demand for irrigation water increases as a result of climate change, such increases in demand would not be accommodated under the Proposed Action due to limits on exchange pumping.

Therefore, the anticipated effects of climate change would not result in significant impacts to the Proposed Action during the 20-year exchange period, and modeled conditions of the Hydrogeologic Technical Analysis remain accurate for assessment of potential impacts. Further, as described above under the No Action Alternative, the effects of climate change would be further reduced or nullified through implementation of SGMA, resulting in a reduced potential for effects of climate change on the Proposed Action.

Alternative 2 Alternative 2 involves the construction of the River Ranch Recharge Basin. This analysis assumes that flood flows from the Kings River would be the source of water for River Ranch Recharge Basin and that flows would be available for the same eight years (over the 20-year period) that they're available to the Terra Linda Farms Recharge Canal to be activated under the Proposed Action. Under this alternative, the MPG would maximize recharge with the goal of achieving over 43,000 AF of recharge over the 20-year exchange period by constructing the River Ranch Recharge Basin, activating the Terra Linda Farm Recharge Canal, and contributing to the existing four NCR Recharge Ponds, dependent upon the availability of water supplies and capacity of recharge facilities. All other components of the 20-Year MPG Program would be the same as under the Proposed Action.

As detailed above, similar to the Proposed Action, the anticipated effects of climate change would not result in significant impacts to Alternative 2 during the 20-year exchange period, and modeled conditions of the Hydrogeologic Technical Analysis remain accurate for assessment of potential impacts. Further, as described above under the No Action Alternative, the effects of climate change would be further reduced or nullified through implementation of SGMA, resulting in a reduced potential for effects of climate change on Alternative 2.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Impacts

Analysis of GHG emissions and climate change impacts discussed above are cumulative in nature. The Proposed Action and Alternatives would result in an incremental increase in GHG emissions during construction activities, direct and indirect emissions from groundwater pumping, and traffic associated with construction and maintenance activities. Emissions of

GHGs would occur in the vicinity of the Proposed Action and Alternatives, but would be distributed globally.

Global emissions are linked to increases in global temperature and other changes in climate. Climate models predict that California may experience temperature increases from 1.6 to 3.4 degrees Fahrenheit, with most temperature increases occurring in the warmer inland areas and in summer. GHG emissions produced by the Proposed Action and Alternative 2 may incrementally contribute to the predicted temperature increases that eventually cause changes in the distribution of precipitation and the timing of runoff; and an increase in the frequency and severity of extreme weather events, such as wildfires, floods, droughts, and heat waves (USEPA and DWR 2012). Increased temperatures may increase irrigation water needed due to modified evapotranspiration rates, while changes in precipitation and runoff may lead to reduced availability of California's surface water resources. The projects included in the list in Section 3.0.3, *Related Projects*, as well as other regional projects outside of the Study Areas for this EIS/EIR, would contribute varying levels of GHG emissions. Although these projects would likely not conflict with present regulations on an individual basis, incremental GHG emissions from these actions would cumulatively contribute to climate change. Given the Proposed Action and Alternatives would not result in the generation of new GHG emissions which would exceed adopted thresholds or result in non-compliance with regulations adopted for reducing global and regional GHG emissions, the Proposed Action and Alternatives would not result in a considerable contribution to a cumulatively significant impact to climate change.

The projected effects of climate change on the Proposed Action and Alternative are discussed above, under Impact CC-2, and are cumulative in nature. As described therein, the cumulative effects of climate change are not projected to have a substantial adverse effect on the Proposed Action or Alternatives, and would not result in a cumulatively significant impact from climate change.

3.11.5 References

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3.12 Environmental Justice and Socioeconomics

The following analysis evaluates the potential environmental effects of the Proposed Action and alternatives on environmental justice and socioeconomics in relation to ethnic minority and low-income populations, as well as the local and regional economy. The EPA defines environmental justice as follows:

> Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation [sic]. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work (EPA 2014).

This analysis focuses on whether the Proposed Action and alternatives have the potential to adversely and disproportionately affect minority populations, low-income communities, and sensitive industries, thus creating a conflict with the intent of Executive Order 12898, which addresses environmental and human health conditions from Federal actions in areas of high minority populations and low-income communities.

This section includes demographics, employment, and income statistics from the U.S. Census Bureau. The analysis includes a comparison of this data for the areas that would be affected by the Proposed Action or alternatives to the data for the county and the state in which the Proposed Action would take place. Socioeconomic effects of the Proposed Action and alternatives are related to the potential change in the amount of agricultural-related employment and income in the vicinity of the Proposed Action.

3.12.1 Environmental Setting/Affected Environment

Background

Within the vicinity of the Proposed Action there are relatively high Hispanic and low-income populations in comparison to nearby communities and within the State of California. The vicinity of Proposed Action is predominantly agricultural, an industry that provides 45 percent of the region's employment, especially to Hispanic and low-income populations (U.S. Census Bureau 2015).

Findings from the Previous EIS

The 2004 EIS concluded that the Proposed Action would have a neutral or positive impact related to environmental justice and socioeconomic issues because the water exchange allowed for continued farming in historically farmed areas. Without this exchange water, MPG farmers may have reduced crop yield, resulting in lower employment of area residents. In addition, the majority of seasonal workers on the area's farms were migrant workers, generally of Hispanic origin. Thus, the 2005 Mendota Pool 10-Year Exchange Agreements were projected to help sustain jobs for local minority and disadvantaged populations.

Study Areas

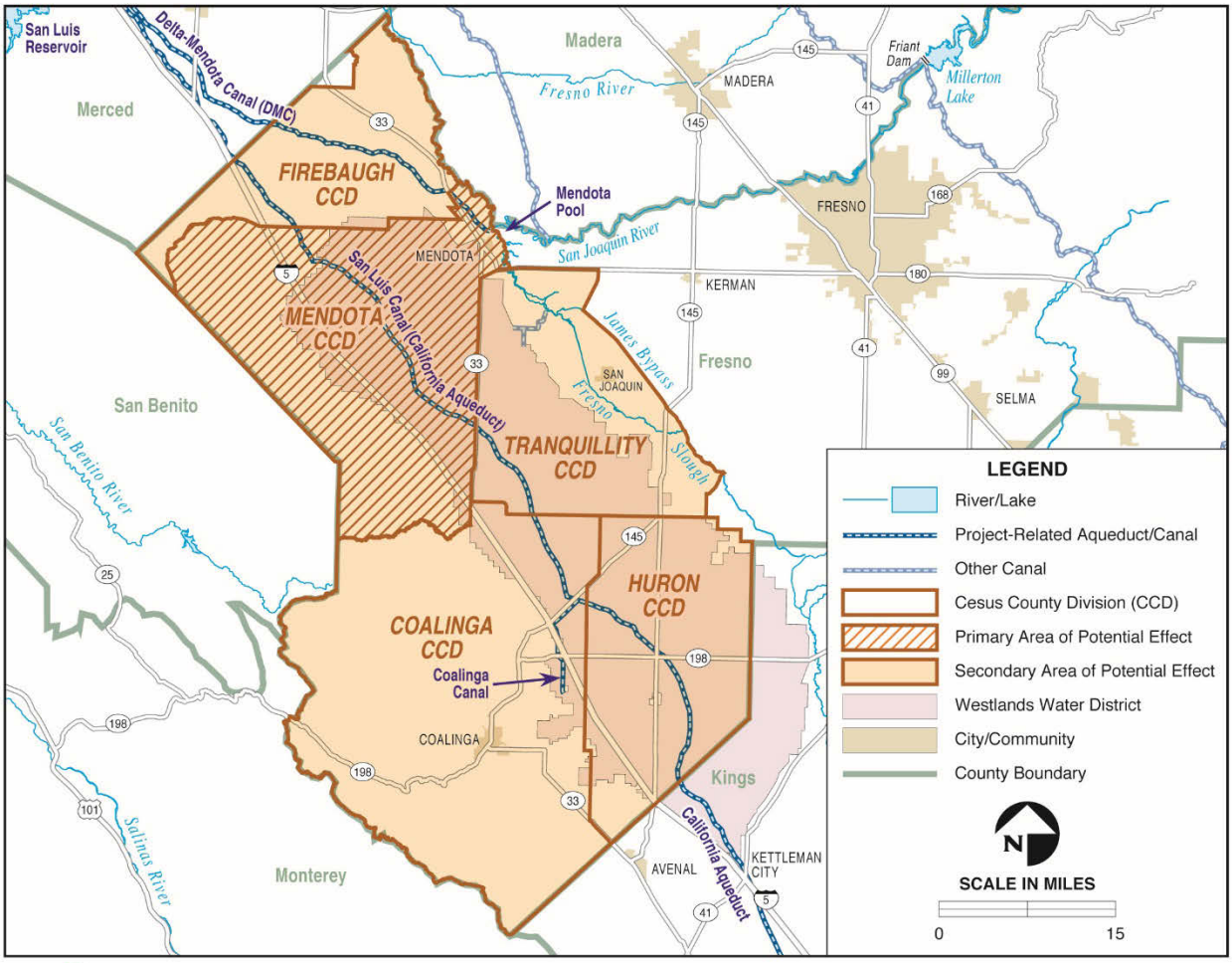
According to the EPA's "Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses" (April 1998), a minority or low-income community is disparately affected when the community would bear a disproportionate level of health and environmental effects when compared to the general population. The guidelines recommend that the communities that are analyzed for potential environmental justice impacts, referred to as the Communities of Comparison, be the smallest governmental unit that encompasses the footprint for each resource analyzed.

For the purpose of this section, the Primary Study Area is the area of groundwater pumping around the Mendota Pool, including the City of Mendota, where local farm workers generally reside. The U.S. Census Bureau uses county subdivisions, referred to as Census County Divisions (CCDs), to divide counties into smaller statistical units. The smallest census unit that represents the Primary Study Area is the Mendota CCD (Figure 46).

The Secondary Study Area encompasses the western portion of Fresno County, including the area receiving exchange water in Westlands. This area includes several small towns that are in the vicinity of MPG irrigated lands that would receive water from the exchange, including Mendota, Firebaugh, San Joaquin, Tranquillity, Coalinga, and Huron; many of these cities support residents that are often employed by the surrounding farms, including MPG farms. This area includes both residents in the Mendota Pool area and residents in Westlands area that could be potentially affected by environmental impacts of the Proposed Action and alternatives, as well as area residents that may rely on the agricultural industry in Westlands for employment. The smallest census unit that represents the Secondary Study Area is the sum of Mendota CCD, Firebaugh CCD, San Joaquin - Tranquillity CCD, Coalinga CCD, and Huron CCD (see Figure 46).

U.S. Census data from 2010 and the 2009-2013 American Community Survey 5-Year Estimates for these CCDs are used to characterize the Study Areas for this analysis. Information on demographic and social characteristics of the Primary and Secondary Study Areas are compared to that of the County of Fresno and the State of California as reference populations (U.S. Census Bureau 2015).

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Areas of Potential Effect

FIGURE 46

3.12.2 Regional Setting

Population

The U.S. Census Bureau designations for the areas in and around the Study Areas, and their associated populations, are as follows (U.S. Census Bureau 2015):

- State of California (population 37,253,956)
- County of Fresno (population 930,450)
- Secondary Study Area comprising the following five County subdivisions: Mendota CCD, Firebaugh CCD, San Joaquin - Tranquillity CCD, Coalinga CCD, and Huron CCD (population 56,025)
- Primary Study Area, represented by the Mendota CCD (population 12,551)

Minority Populations

For the purpose of this analysis, minorities are considered to be all persons classified as a racial minority (e.g., Black, Asian, Native American, etc.), of Hispanic origin, or both a racial minority and of Hispanic origin. Hispanic respondents could be categorized under any of the race classification groups designated by the U.S. Census Bureau, including "other," in addition to the Hispanic classification.

Persons of Hispanic origin comprise the largest minority group within the Primary and Secondary Study Areas representing 96.3 percent and 78.8 percent of the population, respectively. This is a relatively high Hispanic population, compared to regional Hispanic populations in Fresno County (50.3 percent) and the State of California (37.6 percent; Table 68). Further, within Fresno County, more than 95 percent of the two largest occupational groups in the agricultural sector are Hispanic, within 89 percent overall (Shires 2017). Because there is a disproportionately large Hispanic population in the Primary and Secondary Study Areas, and particularly associated with the agricultural sector, potential impacts to Hispanic communities are considered under environmental justice.

Table 68: Race and Ethnicity in 2010

	Primary Study Area		Secondary Study Area		Fresno County		State of California	
	Population	%	Population	%	Population	%	Population	%
Total Population	12,551	100	56,025	100	930,450	100	37,253,956	100
Race								
White	6,527	52.0	29,623	52.9	515,145	55.4	21,453,934	57.6
Racial Minority	6,024	48.0	415,305	44.6	15,800,022	42.4	26,402	47.1
Black	116	0.9	2,184	3.9	49,523	5.3	2,299,072	6.2
Asian	84	0.7	697	1.2	89,357	9.6	4,861,007	13.0
Native American	167	1.3	692	1.2	15,649	1.7	362,801	1.0
Pacific Islander	5	0.0	55	0.1	1,405	0.2	144,386	0.4
Other	5,187	41.3	20,837	37.2	217,085	23.3	6,317,372	17.0
Two or More	465	3.7	1,937	3.5	42,286	4.5	1,815,384	4.9
Origin								
Hispanic[1]	12,092	96.3	44,149	78.8	468,070	50.3	14,013,719	37.6
Race and Origin								
White, not Hispanic	327	2.6	8,718	15.6	304,522	32.7	14,956,253	40.1
Minority[2]	12,224	97.4	47,307	84.4	625,928	67.3	22,297,703	59.9

[1] Hispanic is considered an origin and not a race; therefore, individuals who are Hispanic are also classified under one of the race categories listed above.
[2] The minority population is comprised of individuals who are either a minority by race (i.e., not white) or by origin (i.e., Hispanic)
Source: U.S. Census Bureau 2015, 2010 Census.

Unemployment and Low Income Populations

Census data was analyzed to determine unemployment rates, average income, and poverty status in the Primary and Secondary Study Areas relative to County and State census data. Unemployment rates from 2009 to 2013 were higher in the Primary Study Area (26.0 percent) and Secondary Study Area (14.9 percent) than in Fresno County (14.5 percent) and the State of

California (11.5 percent; Table 69). The median and average household incomes from 2009 to 2013 were lower in the Primary Study Area ($25,470 and $32,852) and the Secondary Study Area ($34,983 and $47,664) than Fresno County ($45,563 and $63,079) and the State of California ($61,094 and $85,408). The Primary and Secondary Study Areas also contain relatively high percentages of residents that live below poverty level, 44.9 percent and 36.6 percent, respectively (Table 69). Given that the Primary and Secondary Study Areas contain a disproportionately high low-income population, impacts to these communities are considered under environmental justice.

Table 69: Unemployment, Income, and Poverty Status

	Primary Study Area	Secondary Study Area	Fresno County	State of California
Percent Unemployed	**26.0%**	**14.9%**	**14.5%**	**11.5%**
Number of Households	3,115	14,347	289,811	12,542,460
Median Household Income	**25,470**	**34,983**	**45,563**	**61,094**
Average Household Income	**32,852**	**47,664**	**63,079**	**85,408**
Population for Whom Poverty Status was Determined	12,227	52,871	922,739	36,913,404
Income Below Poverty Level	5,484	19,339	239,584	5,885,417
Percent Below Poverty Level	44.9%	36.6%	26.0%	15.9%

Source: U.S. Census Bureau 2015. Selected Economic Characteristics (2009-2013 American Community Survey 5-Year Estimates). Median Household Income and Average Household Income for the Proposed Action Area was computed using a weighted average based on the Number of Households in each CCD.

Industries

The Primary and Secondary Study Areas are within an agricultural region in the Central Valley that provides much of the areas employment. Agricultural employment in the Primary and Secondary Study Areas from 2009 to 2013 represents 64 and 42 percent of jobs, respectively, while this industry represents 10 percent of jobs in Fresno County and 2 percent of jobs in the State of California. The second largest Census-designated industry in the Primary and Secondary Study Areas is educational services, health care and social assistance, providing a total of 10 and 16 percent of jobs, respectively (see Table 70).

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Table 70: Employment by Industry

Industry	Primary Study Area		Secondary Study Area		Fresno County		State of California	
	Total	%	Total	%	Total	%	Total	%
Civilian employed population 16 years and over	4,430	100	19,637	100	363,912	100	16,635,854	100
Agriculture, forestry, fishing and hunting, and mining	2,824	63.7	8,314	42.3	37,733	10.4	387,511	2.3
Construction	64	1.4	789	4.0	20,237	5.6	996,922	6.0
Manufacturing	186	4.2	810	4.1	24,731	6.8	1,659,850	10.0
Wholesale trade	226	5.1	531	2.7	14,848	4.1	525,795	3.2
Retail trade	222	5.0	1,427	7.3	39,190	10.8	1,850,696	11.1
Transportation and warehousing, and utilities	127	2.9	1,323	6.7	18,149	5.0	773,145	4.6
Information	0	0.0	151	0.8	4,815	1.3	471,345	2.8
Finance and insurance, and real estate and rental and leasing	23	0.5	370	1.9	18,419	5.1	1,068,711	6.4
Professional, scientific, and management, and administrative and waste management services	49	1.1	649	3.3	30,714	8.4	2,099,358	12.6
Educational services, and health care and social assistance	428	9.7	3,207	16.3	85,735	23.6	3,497,445	21.0
Arts, entertainment, and recreation, and accommodation and food services	135	3.0	990	5.0	30,161	8.3	1,628,085	9.8
Other services, except public administration	66	1.5	411	2.1	17,289	4.8	893,566	5.4
Public administration	80	1.8	665	3.4	21,891	6.0	783,425	4.7

Source: U.S. Census Bureau 2015. Selected Economic Characteristics (2009-2013 American Community Survey 5-Year Estimates).

The agricultural industry provides direct employment for 2,824 of the 4,430 people employed in the Primary Study Area and 8,314 of the 19,637 people employed in the Secondary Study Area. The Primary and Secondary Study Areas also provide employment in industries that rely on agricultural commodities. Examples include manufacturing of agricultural machinery or agricultural inputs such as fertilizer, food processing plants, wholesale trade, and transportation.

Agricultural Land and Production

Drought conditions have historically impacted the agriculture industry and the regional economy in the Central Valley. In Westlands, the amount of farmland that lay fallow or contained non-producing trees and vines increased from an average of 76,586 acres from 2000 through 2004 to an average of 138,584 acres from 2010 through 2014, for a total reduction in productive farmland of 61,998 acres between the two periods (see Table 71). Correspondingly, Fresno County experienced a reduction in harvested farmland of 86,421 acres between 2002 and 2012. During this period, Fresno County also experienced a 207,683-acre reduction in total farmland, indicating farmland retirement and conversion from agricultural to other uses (USDA 2015).

Table 71: Total Acres of Fallow Land and Non-producing Trees and Vines in Westlands

Year	Acres	Year	Acres	Year	Acres
2000	53,825	2005	78,110	2010	138,437
2001	78,161	2006	72,112	2011	70,519
2002	94,672	2007	109,883	2012	110,846
2003	78,672	2008	110,732	2013	142,618
2004	77,600	2009	174,853	2014	230,499
2000-2004 Average	76,586	2005-2009 Average	109,138	2010-2014 Average	138,584

Source: Westlands 2015.

Employment within the Study Area

As previously discussed, the total acreage of MPG farmland adjacent to the Mendota Pool is 7,542 acres, with an additional 42,316 acres of MPG farmlands in Westlands. In total, MPG farmlands equate to 49,858 acres within Fresno County. Based on employment statistics from the 2012 Fresno County Census (USDA), at a ratio of 12.0 full-time and 27.6 season workers per 1,000 acres, MPG employees an estimated 91 full-time and 208 season workers for farmland within the Mendota Pool area. In Westlands, MPG employs approximately 508 full-time and 1,169 season works. In total, MPG employs approximately 1,976 farmland workers throughout the Mendota Pool and Westlands areas.

3.12.3 Regulatory Framework

Applicable Federal and State regulations that address environmental justice issues are summarized in the following section. No specific local or regional regulations regarding environmental justice apply.

Federal Policies and Regulations

Executive Order 12898 On February 11, 1994, President Clinton issued an "Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (Executive Order 12898). This Executive Order was designed to focus attention on environmental and human health conditions in areas of high minority populations and low-income communities, and promote non-discrimination in programs and projects substantially affecting human health and the environment (White House 1994). The Executive Order requires Federal agencies (as well as State agencies receiving Federal funds) to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

State Policies and Regulations

California State Government Code 65040.12(e) The California State Government Code 65040.12(e) defines environmental justice as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies." California State Government Code 65040.12(a) designates the Office of Planning and Research (OPR) as the coordinating agency in state government for environmental justice programs, and requires OPR to consult with various state agencies and local parties, to disclose information to the EPA and other federal agencies, and to develop guidelines for incorporating environmental justice into general plans.

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3.12.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

This analysis considers environmental justice and socioeconomic impacts by determining whether implementation of the Proposed Action or alternatives, including the No Action Alternative, would result in adverse environmental or economic impacts that fall disproportionately on low-income or minority populations in the Primary and Secondary Study Areas, or result in changes to agricultural production value, jobs, or labor income. According to the demographic and economic information provided above, the Study Areas include minority populations that are predominantly of Hispanic origin and have been identified as environmental justice communities of concern. Additionally, these areas are characterized by low income populations and high poverty rates. As such, potentially significant environmental impacts resulting from the Proposed Action and alternatives are also considered an environmental justice issue.

Additionally, as the Proposed Action and alternatives have the potential to result in socioeconomic impacts to minority and low-income communities, these effects were also analyzed. Potential socioeconomic effects could directly or indirectly affect farm operations and workers and result in changes in employment and regional economic activity. In order to determine the scale socioeconomic impacts, County level data from the USDA 2012 Census of Agriculture was used to estimate agriculture production values, jobs, and labor income affected by the Proposed Action or alternatives. The USDA Census of Agriculture reports 992,479 acres of harvested croplands within Fresno County and a crops market value equating $3.7 billion. This data was used to calculate an average agricultural production value of $3,728 per acre. Fresno County has a total of 58,624 hired farm workers, composed of 17,751 full-time workers and 40,873 seasonal workers; these workers are employed on active farmlands, including both harvested cropland and active pastureland.[58] Given that there are 1,479,117 acres of active farmland, this equates to an average of 12.0 full-time workers and 27.6 seasonal workers per 1,000 acres of farmland (USDA 2015).

Labor income and total economic value of agricultural production were calculated based on IMPLAN, an economic impact assessment software system, economic modeling figures for the four-county area encompassing Fresno, Stanislaus, Merced, and Madera Counties listed in the Socioeconomics Technical Report for the San Joaquin River Exchange Contractors Water Authority Water Transfer Program 2014-2038 (Cardno Entrix 2012). According to this data, labor income in the agricultural industry in this area is equal to approximately 22.7 percent of total direct agricultural output. The total value of the agricultural industry can be estimated by summing the direct value of production with the indirect and induced effects of this production. Indirect and induced effects include effects related to industry linkages (e.g., additional sales for fertilizer manufacturers) and household spending patterns (e.g., increased area spending by employees in the farming industry). According to IMPLAN data for this area, indirect and induced values for agricultural production represent an additional 38.4 percent of direct agricultural production value. Therefore, for each $1,000 of direct agricultural production, there

[58] The U.S. Census figure presented in Table 69, above, is different from the USDA 2012 Census of Agriculture figure of 58,624 hired farm workers because the USDA figure is based on the number of jobs, which includes part-time and temporary jobs, rather than the number of residents employed in the industry.

is an additional $384 of value added to the economy due to indirect and induced effects. This data was used to assess socioeconomic changes resulting from the Proposed Action or alternatives.

The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA. The existing setting includes water exchanges and existing historic levels and distribution of farming under the Existing Exchange Agreements, while the No Action alternatives assume a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Thresholds of Significance

Environmental justice criteria for this analysis are based on following the intent of Executive Order 12898. For this analysis, an environmental justice impact would be considered significant if the Proposed Action or alternatives would:

1. Have the potential to disproportionately subject minority and/or low-income populations to environmental, human health, or economic impacts;
2. Have the potential to have a substantial adverse effect on resources used by a minority or low-income group; or
3. Result in a substantial, disproportionate decrease in the employment and economic base of minority and/or low-income populations residing in the project area, relative to region-wide conditions.

Although analysis of social and economic impacts is required under NEPA, there are no standard significance thresholds. Additionally, economic and social effects are analyzed under CEQA, but impacts would not be considered significant unless either (1) an economic and/or social effect from the Proposed Action results in a physical impact or (2) a physical change from the Proposed Action results in an economic and/or social impact which in turn can be shown to create adverse physical impacts on the environment; adverse socio-economic impacts alone are not considered as environmental impacts under CEQA (Section 15131 of the CEQA Guidelines). For this analysis, socioeconomic impacts would be considered significant if the Proposed Action or alternatives would:

1. Result in a substantial loss in agricultural production value within Fresno County; or
2. Result in a substantial loss of regional economic activity (output, jobs and income) within Fresno County.

Impacts and Mitigation Measures

Impact EJS-1: Impacts on Environmental Justice from Agricultural Land Fallowing

No Action Alternative Under this alternative, 2,284 acres of fallowed lands within the Mendota Pool area would be brought back into production and up to 10,000 acres of irrigated lands in Westlands would be fallowed. This would result in a need for approximately 25 permanent and 57 seasonal jobs in the Mendota Pool area, and a loss of approximately 120 permanent and

276 seasonal jobs in Westlands. This shift in land management on MPG farmlands would eliminate jobs in Westlands resulting from overall reduced crop production. Decreases in agricultural production and employments in Westlands would be partially offset by an increase in production and labor demand within the Mendota Pool area (i.e., new jobs in the Primary Study Area); however, an overall net loss in jobs would occur (i.e., total jobs in the Secondary Study Area). Given the ratio of approximately 12.0 full-time workers and 27.6 seasonal workers per 1,000 acres of farmland, the net loss of approximately 7,716 acres of productive farmland is expected to result in a reduction of 93 full-time jobs and 213 seasonal jobs. As the Secondary Study Area is predominately Hispanic and low income, these adverse effects would result in a loss of employment and economic base that disproportionately affect a minority population.

Proposed Action The Proposed Action would prevent the fallowing of irrigated farmlands and help maintain agricultural production in the Secondary Study Area. As the region is heavily dependent on the agricultural industry and provides an estimated 8,314 jobs to disproportionately high Hispanic and low-income populations, this sustained agricultural production would maintain current levels of agricultural employment and farm labor salaries for these populations.

Alternative 2 Similar to the Proposed Action, Alternative 2 would maintain existing levels of agricultural production from irrigated and fallowed lands, thus maintaining the labor demand and jobs predominantly occupied by Hispanic and low-income populations. Construction of the River Ranch Recharge Basin would be of a short duration (approximately two weeks) and would require a small construction crew; therefore, this activity would not have a significant contribution to local area employment.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact EJS-2: Impacts on Socioeconomics from Agricultural Land Fallowing
No Action Alternative MPG lands within the Westlands contain mainly high value crops such as fruit orchards, almonds and vineyards, as well as some lower value crops such as corn, cotton and wheat. These lower value crops tend to require less irrigation than higher value orchards and almond farms. With the cessation of the Existing Exchange Agreements, farmers may remove permanent orchards or vineyards to either allow cultivation of lower water demand/lower economic value crops or fallow, idle or retire a mix of low and high value crops.

As discussed under Impact EJS-1 above, a total net reduction in cultivated crop land of 7,716 acres is anticipated. Given a market value of crops of approximately $3,728 per acre, this reduction in productive farmland would have a direct economic cost of $28.7 million. Because the agriculture industry is a key economic driver within the Primary and Secondary Study Areas, the loss of agricultural production value would ripple through the regional economy to other agricultural support or agricultural dependent industries due to changes in demand for goods and interdependencies on the agricultural industry. Additionally, households dependent on income from the agricultural industry would reduce spending, also impacting the local and regional economy. These effects represent indirect and induced economic losses equating approximately

$11 million, resulting in a total economic cost of $39.7 million to the local economy. This equates to 1.1 percent of the total crop production in Fresno County.[59]

The agricultural industry also provides 7,553 jobs within the Primary and Secondary Study Areas. Fallowing a net 7,716 acres would result in direct job losses equating 93 full-time and 213 seasonal jobs and direct labor income losses equating $6.4 million annually. These losses would be spread over a wide area and in a number of communities primarily in the Westlands area and would represent a small percentage of the total economic activity in these areas. These losses are unlikely to result in direct adverse physical effects in impacted communities (e.g., abandonment and closing of shopping centers, physical blight and deterioration of impact communities).

Proposed Action Continuation of the Exchange Agreements under the Proposed Action would prevent the fallowing of irrigated farmlands and help maintain agricultural production in the Primary and Secondary Study Areas. Regional economic activity related to agricultural industry within the Study Areas would also be maintained.

Alternative 2 Impacts would be the same as the Proposed Action. Construction of the River Ranch Recharge Basin would have short-term and negligible effects to local employment and therefore would not significantly affect the socioeconomic setting.

Significance Determination before Mitigation
CEQA Significance Determination Under the standards of CEQA Section 15131, impacts under the No Action Alternative would be adverse, but *less than significant*. Impacts under the Proposed Action and Alternative 2 would be *less than significant.*

Cumulative Effects

Due to re-occurring drought conditions and increasing water supply restrictions, the loss of productive agricultural lands is likely to perpetuate in the region. Although this change is not attributable to a specific project, it is a part of the changing cumulative conditions and is therefore included in this discussion in the interest of full disclosure. The regional reduction in productive farmland is particularly difficult for minority and low-income populations that rely on agricultural jobs within the region.

Cumulative losses in productive agricultural farmland would be further exacerbated by the No Action Alternative, which would result in the loss of an additional estimated 10,000 acres of productive farmland in Westlands. This loss would be partially offset by the corresponding reactivation of 2,284 acres of currently fallow farmland in the Mendota Pool area; however, it would still result in the loss of an estimated 93 full-time jobs and 213 seasonal jobs as well as a total economic cost of $39.7 million to the local economy and direct labor income losses equating to $6.4 million annually. These losses would be in addition to cumulative regional job losses associated with the loss of productive agricultural land in Westlands and surrounding areas. Therefore, cumulative impacts associated with this alternative related to environmental justice and socioeconomics would be considerable.

[59] This percentage is based on 2012 National Agricultural Statistics Service data, which lists the total market value of crops (including nursery and greenhouse crops) sold in Fresno County as $3.7 billion.

The Proposed Action and Alternative 2 would help to maintain agricultural production, and therefore support existing levels of labor demand and economic generation, which would not cumulatively increase effects on minority and low-income populations. Therefore, these alternatives would not result in cumulative significant impacts to environmental justice and socioeconomics.

3.12.5 References

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3.13 Water Conveyance Infrastructure and Central Valley Project Operations

This section provides an overview of existing water conveyance infrastructure that would be utilized under the Proposed Action, and includes an analysis of potential impacts to CVP operations from the Proposed Action or Alternatives. Neither the Proposed Action nor Alternatives utilize SWP infrastructure, except for portions of that system shared with CVP; therefore, impacts to SWP infrastructure are discussed within the context of overall CVP operations.

3.13.1 Environmental Setting/Affected Environment

Background

Key Water Management Infrastructure

Surface water supplies throughout California's Central Valley are managed through dams and conveyance facilities for water supply, flood control, and hydropower generation. The most significant surface water project in California is the CVP, which is managed by Reclamation and conveys up to nine million AF of water. The CVP was approved for Federal funding in 1935; construction commenced in 1937 and continued until the final major feature was constructed in 1979. The CVP includes 20 dams and reservoirs, 11 power plants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities (Reclamation 2013a). For more information about the CVP, refer to subsections 1.1.1 in Section 1.0, *Introduction*, of this EIS/EIR.

Various State and local water management facilities also play a part in managing water in the Central Valley, including the SWP, which shares some infrastructure with the CVP. The SWP manages up to three million AF of water and includes 34 storage facilities, reservoirs, and lakes; 20 pumping plants; four pumping-generating plants; five hydroelectric power plants; and about 701 miles of open canals and pipelines. The CVP and SWP share the use of the SLR, the O'Neill Dam and Forebay, and the SLC from O'Neill Forebay to Kettleman City (Reclamation 2013b). Water supply and management at State and Federal facilities are also affected by the operation of local facilities, such as the Chowchilla Bypass on the San Joaquin River, located upstream from the Mendota Pool (see Figure 1).

Key CVP infrastructure related to the Proposed Action and Alternatives include the SLR, which is used to store CVP and SWP water on the west side of the San Joaquin Valley; the SLC, which is used to convey CVP and SWP water south through Westlands; the DMC, used to convey water to the central portion of the San Joaquin Valley. The Mendota Pool, a non-federal holding pool formed by the Mendota Dam and used for temporary storage and distribution of surface water supplies.

Central Valley Project

Reclamation makes CVP water available to contractors for reasonable and beneficial uses, but CVP water supply varies widely from year to year and sometimes even within a given year due

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to hydrologic conditions and/or regulatory constraints, and is often insufficient to meet all of the irrigation water service contractors' water needs. As shown in Table 72 below, the south-of-Delta CVP agricultural allocations ranged from 0 percent and 100 percent of contract amounts and averaged 44 percent of contract amounts between 2005 and 2018. For nine out of the last 14 years, the south-of-Delta CVP agricultural allocation was less than 50 percent due to drought conditions and regulatory requirements. Consequently, CVP contractors, including Westlands, adaptively manage water supplies based on current and projected hydrologic conditions (as well as regulatory and environmental requirements) in order to proactively assess their risk in making business, economic, cropping, planting, and irrigation decisions.

Table 72: South-of-Delta CVP Contract Allocations between 2005 and 2018

Contract Year	Agricultural Allocations (%)	Urban Contractor Allocations (%)
2018[1]	45	75[2]
2017	100	100
2016	5	55
2015	0	25
2014	0	50
2013	20	70
2012	40	75
2011	80	100
2010	45	75
2009	10	60
2008	40	75
2007	50	75
2006	100	100
2005	85	100
Average	**44**	**74**

[1] Allocations as of May 25, 2018.
[2] M&I water service contractors are allocated the greater of 75 percent of their historic use for public health and safety needs.
Source: Reclamation 2018.

Findings from the Previous EIS

The 2004 Final EIS found that there is sufficient capacity in the SLC to convey water and in the SLR to store water, if necessary, for the 2005 Mendota Pool 10-Year Exchange Agreements, and that MPG operations would not impact other users of the CVP. Therefore, according to the findings of that EIS, the MPG would not have a significant impact on CVP operations. The 2004 Final EIS did not address potential impacts to the Mendota Pool and DMC.

Study Areas

The Primary Study Area includes all water conveyance infrastructure that may be impacted by the Proposed Action or Alternatives in the Mendota Pool area; this includes the DMC, Mendota Dam, and Mendota Pool. The Secondary Study Area includes SLC and SLR infrastructure.

3.13.2 Regional Setting

Delta-Mendota Canal

The DMC, the second largest of the CVP waterways, was completed in 1951. It includes a combination of both concrete-lined and earthen-lined sections and is about 117 miles in length.

The DMC runs parallel to the California Aqueduct until it passes the O'Neill Forebay, where it veers southeast toward Mendota. The canal transports CVP water from the Jones Pumping Plant to the Mendota Pool, located at the confluence of the San Joaquin River and the North Fork of the Kings River, approximately 30 miles west of the city of Fresno. CVP water from the DMC can be delivered to the O'Neill Forebay via the O'Neill Pumping-Generating Plant or continue to flow in the canal for delivery to water users along the canal or to the Mendota Pool. The capacity of the DMC ranges from 4,600 cfs at its initial diversion point at the Delta to 3,200 cfs at its terminus at the Mendota Pool (Reclamation 2009). Capacity in the DMC is restricted by the physical limitations of the canal and the pumping limits of the Jones Pumping Plant.

The Mendota Pool and Mendota Dam

The Mendota Pool is impounded by Mendota Dam, which is owned and operated by CCID. The Pool primarily serves as a conveyance facility but is also used as a short-term storage and re-regulation reservoir. The Pool is supplied with surface water from the DMC (its' primary source), the San Joaquin River (during Restoration and flood releases from Friant Dam), and the Kings River via Fresno Slough (during flood releases from Pine Flat Dam). In addition, local wells owned by the MPG, Tranquillity Irrigation District, and Fresno Slough Water District also pump groundwater into the Pool, and the MWA drains its waterfowl ponds into the Pool during the spring. Water is diverted from the Pool for agricultural and wildlife uses. Most of this water is used by the members of the Exchange Contractors to irrigate lands within their service areas, but there are other CVP contractors that divert water from the Pool for irrigation purposes. For more information on the Mendota Pool, refer to subsection 1.1.2 in Section 1.0, *Introduction*, of this EIS/EIR.

CCID maintains and operates Mendota Dam; however, the Mendota Pool primarily overlies private land and is largely unmaintained. Historically, CCID drained the Mendota Pool every two years in order to perform routine inspection and maintenance of Mendota Dam. Prior to the 2012 irrigation season, CCID performed a major retrofit of Mendota Dam, which has significantly reduced the frequency with which the Mendota Pool needs to be drained. Maintenance events are now anticipated to be very infrequent, approximately every 10 years (White 2013; 2014).

Although Mendota Dam operations have improved, the Mendota Pool remains a small, unmaintained reservoir. While the size of the Mendota Pool was historically larger, the operating elevation of the Mendota Pool is currently lower than historic use. Private land underlying the Mendota Pool has been flooded due to the presence of the dam. There is no agency with overall responsibility for maintenance of the Mendota Pool through activities such as dredging. Water in the Mendota Pool backs up into the Fresno Slough and the San Joaquin River (White 2013).

The Mendota Pool currently acts as a critical element of water exchange programs that allow for exchanges with Reclamation, including those under the Existing Exchange Agreements and other similar agreements (e.g., the Water Transfer Program for the Exchange Contractors, 2014-2038). Under these types of exchange arrangements, when there is demand at the Pool, Reclamation uses water introduced into the Pool to meet contractual obligations, in exchange, a like amount, less losses, is made available for water delivered to the SLC via DMC Check 13 and the O'Neill Forebay.

San Luis Reservoir, O'Neill Forebay, and San Luis Canal

The SLR, O'Neill Forebay, and SLC are joint Federal/State water management infrastructure elements used to store and deliver water for the CVP and the SWP. The SLR, formed by B.F. Sisk Dam (also known as San Luis Dam), is the major storage facility for this water. This facility has no natural watershed and is supplied with water transported south from the Delta as part of the CVP and SWP (DWR 2013). In order to transport water to the SLR for storage, water is pumped uphill from the O'Neill Forebay, where it is initially delivered into the reservoir via the William R. Giannelli Pumping-Generating Plant (Reclamation 2013b).

The SLR, O'Neill Forebay, and SLC were constructed by Reclamation, starting in 1963 and completed in 1967. The SLR, O'Neill Forebay, and SLC portion of the California Aqueduct are operated and maintained by the DWR for Rec. Costs and use of these facilities are shared approximately 55 percent by the State of California and 45 percent by the Federal government. The SLR has a capacity of 2,041,000 AF, 965,660 AF of which is the Federal capacity and 1,062,180 AF of which is the State capacity. Federal water stored in the SLR varies from 0 to 965,660 AF (DWR 2012).

The O'Neill Forebay acts as a hydraulic junction point for water it receives from the CVP and SWP via the DMC and the California Aqueduct, as well as from releases of water from the SLR through the William R. Giannelli Pumping-Generating Plant. The O'Neill Forebay has a capacity of 56,000 AF, 20,000 AF of which is used to regulate timing of power-generating activities at the William R. Giannelli Pumping-Generating Plant. Federal water from the CVP is pumped into the O'Neill Forebay via the O'Neill Pumping Plant, which consists of a 2,200-foot long intake channel leading off the DMC and six pumping-generating units. The O'Neill Pumping-Generating Plant lifts water 45 to 53 feet into the O'Neill Forebay; each of the units can pump 700 cfs and has a rating of 6,000 horsepower (Reclamation 2013b).

The SLC is the 102.5-mile-long, federally built and operated section of the California Aqueduct that extends from O'Neill Forebay to a point west of Kettleman City and is used to transport both CVP and SWP water. CVP water in the canal is conveyed to users along the SLC or the Federal Coalinga Canal, which branches off of the SLC, while SWP water is transported through the canal and further south in the California Aqueduct. The SLC is 138 feet wide (40 feet wide at the bottom) and 36 feet deep, and is lined with concrete; it has a capacity ranging from 8,350 to 13,100 cfs (Reclamation 2013b). Federal capacity in the SLC is approximately 45 percent of the total capacity, amounting to approximately 3,760 to 5,900 cfs.

3.13.3 Regulatory Framework

This section summarizes the applicable Federal regulations associated with surface water supplies and CVP facility operations. There are no State or local regulations or policies associated with operation of CVP facilities that apply to the Proposed Action or alternatives.

Federal Policies and Regulations

Continued Long-term Operation of the CVP and SWP The CVP and SWP are operated in a coordinated manner in accordance with Public Law 99-546 (October 27, 1986), directing the Secretary to execute the Coordinated Operation Agreement. The CVP and SWP are also operated under SWRCB decisions and water right orders related to the CVP's and SWP's water right permits and licenses to appropriate water by diverting to storage, by directly diverting to use, or by re-diverting releases from storage later in the year or in subsequent years. The CVP and SWP

are permitted by SWRCB to store water, divert water and re-divert CVP and SWP water that has been stored in upstream reservoirs. The CVP and SWP have built water storage and water delivery facilities in the Central Valley to deliver water supplies to CVP and SWP contractors, including senior water users. The CVP's and SWP's water rights are conditioned by the SWRCB to protect the beneficial uses of water within the watersheds. As conditions of the water right permits and licenses, SWRCB requires the CVP and SWP to meet specific water quality objectives within the Delta. Reclamation and DWR coordinate operation of the CVP and SWP, pursuant to the COA, to meet these and other operating requirements.

Section 14 of the Reclamation Project Act of 1939 Section 14 (53 Stat. 1197; 43 U.S.C., subsection 389) authorizes the Secretary, for the purpose of orderly and economical construction or operation and maintenance of any project, to enter into such contracts for exchange or replacement of water, water rights, or electric energy or for the adjustment of water rights, as in his judgment are necessary and in the interests of the United States and the project.

Warren Act of 1911 The Act (as of February 21, 1911; (36 STAT.925; 43 U.S.C., subsection 523) authorizes the Secretary to contract for use of available excess capacity in Reclamation facilities for the impoundment, storage, and conveyance of non-project irrigation water.

Central Valley Project Improvement Act In 1992, the United States Congress passed the CVPIA, Title 34 of Public Law 102-575, which mandates improvements to the Central Valley river system and refuges in order to support river- and wetland-dependent wildlife. This Act includes a mandate to treat environmental water (i.e., water that is used in rivers and wetlands to protect, restore, and/or enhance fish and wildlife populations and associated habitats) with equal priority to other uses, such as agricultural and municipal, and requires the following dedications of CVP water:

- 800,000 AF of water for the primary purpose of implementing the fish, wildlife, and habitat restoration and advancing measures authorized in the CVPIA, as outlined in Section 3406(b)(2); and
- 410,000 AF of water for wetland management at 19 Central Valley refuges and managed wetlands, as outlined in Section 3406(d)(1).

The CVPIA requires delivery of this mandated CVP water allocation, referred to as "Level 2" water, in all year-types except critically dry water year conditions, when Level 2 water can be reduced by 25 percent. The CVPIA also directed the United States Department of Interior to acquire an additional 163,000 AF of water for refuges, referred to as "Level 4" water, through transactions with willing sellers.

Section 3408(c) of the CVPIA, authorizes the Secretary of the Interior to enter into contracts pursuant to Reclamation law and this title with any Federal agency, California water user or water agency, State agency, or private nonprofit organization for the exchange, impoundment, storage, carriage, and delivery of CVP and non-CVP water for domestic, municipal, industrial, fish and wildlife, and any other beneficial purpose, except that nothing in this subsection shall be deemed to supersede the provisions of section 103 of Public Law 99-546 (100 Stat. 3051).

San Joaquin River Restoration Settlement Act of 2009 The San Joaquin River Restoration Settlement Act, part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11),

authorizes and directs the Secretary of the Interior to fully implement the San Joaquin River Settlement, as approved in Federal Court in October 2006. The Settlement is based on two parallel goals:

- Restoration: To restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish; and

- Water Management: To reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

The SJRRP includes channel improvements to Reach 2B, the section between Chowchilla Bypass and the Mendota Pool, to restore floodplain habitat and allow for conveyance of river flows through this section, as well as construction, operation, and maintenance of a bypass channel around the Mendota Pool. These improvements, once completed, will ultimately ensure conveyance of at least 4,500 cfs of water through this section of the river (Reclamation 2014a, SJRRP 2012).

3.13.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

This analysis considers existing capacity and use of water management infrastructure that may be impacted by implementation of the Proposed Action and Alternatives. Infrastructure capacity is then compared to the level of increased use that would potentially occur as a result of the Proposed Action and Alternatives. Existing and pending changes that may impact operation of CVP infrastructure, such as implementation of the SJRRP, were considered when making these determinations.

The baselines used for this analysis is the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is compared to the existing setting for both NEPA and CEQA. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Thresholds of Significance

Neither CEQA nor NEPA provide significance thresholds regarding operation of water management infrastructure in terms of capacity constraints; therefore, significance criteria have been developed using the significance thresholds used in the 2004 EIS for the Existing Exchange Agreements and on comments provided during the scoping process implemented in support of this EIS/EIR. Accordingly, the Proposed Action, or alternatives, would be considered to have a significant impact on CVP operations if it would:

1. Result in an exceedance of the capacity of the Mendota Pool to store or convey water to existing users (based on comments received during scoping meetings conducted in support of this EIS/EIR); or

2. Result in an exceedance of the capacity of the SLC or SLR to store or convey water to existing users (based on the 2004 EIS).

As portions of SLC and SLR are shared with SWP, impacts on CVP operations within the SLC and SLR may also result in impacts to SWP operations.

Impacts and Mitigation Measures

Impact CVP-1: DMC and Mendota Pool Capacities and Flows to Existing Users
No Action Alternative Without the Exchange Agreements, no water would be pumped into the Mendota Pool for exchange with Reclamation. Instead, Reclamation would deliver CVP water directly from the DMC to the Mendota Pool for distribution to CVP contractors, as occurred prior to establishment of the Existing Exchange Agreements. The existing DMC has a capacity of 3,211 cfs at the Mendota Pool terminus, with typical flows of 2,500 cfs to 3,000 cfs during the irrigation season and would have capacity sufficient to accommodate this use (SJRRP 2011a). According to MPG exchange pumping data, MPG farmers have exchanged up to 6,000 AF per month during irrigation seasons, equating to flows of 99 cfs during these peak seasons (Appendix D). Therefore, increased deliveries to the Mendota Pool of up to 99 cfs could be accommodated within the 711 to 211 cfs of remaining capacity in the DMC. Given that the average flow for 25,000 AFY is 34.5 cfs, the 99 cfs figure represents a conservative estimate for the potential increase in flow in the DMC associated with the cessation of the Existing Exchange Agreements. Therefore, this alternative would not exceed the capacity of the DMC or affect flows to existing users.

The Mendota Pool would continue to function as the terminous of the DMC to provide CVP water supplies to existing CVP contractors in the Mendota Pool area. This change would alter the source of the water previously being delivered to CVP contractors that take deliveries through the Pool under the Existing Exchange Agreements, but the total quantity of water delivered through the Pool would remain the same as under existing conditions.

Pumping for use on Adjacent Overlying Lands would increase in the Mendota Pool area; this water could be either applied directly to the farms on which the well is located or delivered to the Mendota Pool for use on MPG-owned land. While water transfers for MPG lands may occur in the Mendota Pool, no water pumped for Adjacent Overlying Lands would be stored in the Pool; the water would be transferred between users with access to the Pool. Correspondingly, this alternative would not affect water levels in the Mendota Pool. Therefore, groundwater pumping for use on Adjacent Overlying Lands under this alternative would not exceed the Mendota Pool capacity or affect flows to existing users.

Proposed Action Under the Proposed Action, the MPG would continue to deliver up to 26,316 AFY of groundwater to the Mendota Pool in exchange for up to 25,000 AFY of CVP surface water from the SLC in Westlands. The quantity of water left in the Mendota Pool (i.e., up to 1,316 AFY over the course of an irrigation season) would compensate for water lost through evaporation, conveyance, seepage or other effects, and would have a negligible impact on the

Mendota Pool capacity. Mendota Pool has a capacity of 3,000 AF, and would be used as a transfer facility to allow for conveyance to CVP contractors operating in the Mendota Pool area; it would not be used for storage of these flows. CVP contractors would take deliveries through the Mendota Pool, with the total quantity of water delivered through the Pool the same as under existing conditions.

The continuation of the Exchange Agreements would also result in the continuation of reduced deliveries through the DMC to the Mendota Pool (reduced by the amount of the exchange); therefore, the Proposed Action would not impact the capacity of the DMC. No additional CVP water would be pumped in order for this to occur as the introduced groundwater would be used to meet CVP demands in lieu of CVP water which would then be delivered to Pool. Introduction and storage of the exchanged water is dependent on available capacity and operational constraints; therefore, the Proposed Action would not interfere with the normal operations of federal facilities nor would it impede any CVP obligations to deliver water to other contractors or to local fish and wildlife habitat nor would the Proposed Action interfere in the quantity or timing of diversions by the CVP from the Delta.

Pumping groundwater for use on Adjacent Overlying Lands would be the same under the Proposed Action as under existing conditions; this water could either be applied directly to the farms on which the well is located or delivered to the Mendota Pool for use on MPG-owned land. While water transfers for MPG lands may occur in the Mendota Pool, no water pumped for Adjacent Overlying Lands would be stored in the Pool; the water would be transferred between users with access to the Pool. Therefore, pumping of groundwater for use on Adjacent Overlying Lands would not exceed the Mendota Pool capacity or affect flows to existing users.

The Proposed Action would primarily use flood flows from the Kings River as a source for groundwater recharge. Recharge would draw from flood flows and would relieve capacity of the Mendota Pool during flood events by incrementally reducing the amount of flows entering the Pool at times of flooding. This would have a beneficial effect on the capacity of the Mendota Pool.

Alternative 2 Impacts to CVP operations and other water conveyance facilities would be the same as under the Proposed Action.

Alternative 2 would include construction of the River Ranch Recharge Basin, which would draw flood flows entering the Mendota Pool and Fresno Slough from either the Kings River or the San Joaquin River. Withdrawals associated with operation of the River Ranch Recharge Basin would incrementally increase capacity of the Mendota Pool during flood events, reducing the potential for downstream flooding.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact CVP-2: SLC and San Luis Reservoir Capacity and Flows to Existing Users
No Action Alternative Under this alternative, no MPG water would be exchanged with Reclamation for water delivered via the SLC, which would result in the reduction of up to 25,000 AFY of water being conveyed in the SLC. Additionally, no water would need to be

stored in the SLR. Therefore, MPG water would not contribute to the potential for exceedances in capacity of the SLC or SLR or affect flows to existing users.

Proposed Action Under the Proposed Action, the MPG would continue to deliver up to 26,316 AFY of groundwater to the Mendota Pool in exchange for up to 25,000 AFY of CVP surface water. The exchange water would either be delivered directly from the SLC to MPG lands in Westlands or stored in SLC for later delivery. Storage of the MPG's non-CVP water would be scheduled annually with Reclamation and would be subject to excess capacity, operational constraints, and environmental requirements, as applicable. No Project Use Power would be used for the Proposed Action.

The Proposed Action would not result in a change to CVP operations that would impact the capacity of the SLC and SLR or flow to other users. The quantity of water delivered to the SLC under the Proposed Action would be the same as existing conditions. Available Federal capacity in the SLC ranges from 3,760 to 5,900 cfs (about 7,456 to 11,699 AF per day). The maximum rate of MPG pumping would be 90 to 120 cfs, approximately 2.2 percent of available capacity. Therefore, the Proposed Action would not significantly affect available flow capacity of the SLC.

The SLR has a capacity of 2,041,000 AF; 965,660 AF of which is the Federal capacity (DWR 2012). In past exchanges between Reclamation and the MPG, exchanged water was usually made available to MPG lands in Westlands within one month and all water was exchanged rather than stored. Under the Proposed Action, non-CVP water may be stored in the SLR up to 12 months facilitated by the exchange in the Pool if the MPG delays direct delivery of the exchanged water. The amount of water stored in SLR would be the equivalent of the prior month's pumpage (up to 25,000 AF and an average of 120 AF) for periods up to 12 months. Any storage of water in SLR would be subject to available capacity and the first to "spill" should the reservoir fill. Storage of up to 25,000 AF of non-CVP water for later release to MPG farmlands in Westlands would result in an incremental increase in water storage at the SLR, approximately 1.2 percent of available capacity. As this water is subject to spill, the additional storage of non-CVP water would not cause the Federal storage to exceed available capacity. Therefore, the Proposed Action would not result in exceedance of either the available capacity in the SLC or the storage in the SLR.

Alternative 2 Impacts under this alternative would remain as described under the Proposed Action.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Cumulative Effects

The Mendota Pool has a limited capacity, and there is potential for increased demand for conveyance through the Mendota Pool related to increased groundwater banking, recirculation of recaptured SJRRP flows, and other future changes to water use in the area. Related Projects that would utilize the capacity at Mendota Pool, DMC, SLC, or SLR are described below:

- **Meyers Water Bank** would utilize capacity at the Mendota Pool to convey up to 10,526 AFY of water to contractors. The FONSI for the Amendment to the Meyers

Groundwater Banking Exchange Agreement (FONSI-11-013) stated Meyers Water Bank would be subject to the requirement that there would be no impact to CVP or SWP operations, including the DMC, Mendota Pool, SLC, and SLR; and that deliveries to the Mendota Pool cannot reduce the amount of water available to other entities (Reclamation 2012a).

- **Recirculation of SJRRP flows** would utilize DMC, Mendota Pool, and CVP infrastructure; however, coordination with Reclamation, Exchange Contractors, FWA, San Luis-Delta Water Authority, and other affected parties would be required to ensure that water deliveries of SJRRP recapture flows would only take place during times when there is available capacity in these facilities (Reclamation 2013d).

Previous environmental review for these projects have concluded that none would adversely impact CVP infrastructure or capacity. Additional projects that may utilize CVP infrastructure outside of the Study Areas are listed in Section 3.0.1, *Related Projects*. Future water contracts and exchanges would also be subject to environmental review prior to approval by Reclamation.

Cumulatively, the volumes of MPG water exchanged or transferred under any of the alternatives are small in comparison to the total amount of water moving through CVP infrastructure within the Primary and Secondary Study Areas and would only have a very incremental effect on existing capacity. The SLC and SLR currently have large available capacities that would be able to accommodate the small volumes of MPG flows and would still have a large remaining capacity that would accommodate future transfers and water deliveries.

Some of these projects may utilize the DMC at the Mendota Pool, which has typical flows of 2,500 to 3,000 cfs and a capacity of 3,211; however, as in the past, Reclamation would continue to coordinate the timing and quantities of water deliveries via the DMC and into the Mendota Pool. These water deliveries would be approved and executed to facilitate water needs based on DMC capacity resulting from fluctuating water supplies.

The Mendota Pool is used as a transfer facility where water deliveries are transferred simultaneously as users extract water from the Pool. As a result, the operating elevation remains relatively constant. Under cumulative conditions, no water would be stored in the Pool long-term, and water transfers via the Pool could continue to take place. Cumulatively, this may result in increased flow through the Mendota Pool, but would not impact CVP operations. Groundwater recharge components under the Proposed Action and Alternative 2 would also assist with relieving Mendota Pool capacity as flood flows into the Mendota Pool would be diverted. Therefore, none of the alternatives would contribute towards cumulatively significant impacts to CVP infrastructure or operations.

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3.14 Archeological, Cultural, and Paleontological Resources

This section comprises an assessment of potential for the Proposed Action and Alternatives to impact archeological, cultural, and paleontological resources. The information presented herein regarding archaeological and cultural resources is based on the Cultural Resources Investigation of the Mendota Pool Group 20-Year Exchange Program. Information regarding paleontological resources is based on relevant record searches and literature review.

Cultural resources is a term used to describe both 'archaeological sites' depicting evidence of past human use of the landscape through material culture and the 'built environment' which is represented in structures (such as dams and roadways) and buildings. Cultural resources also include traditional cultural properties, sites of religious or cultural significance, and sacred sites.

Paleontological resources are the evidence of once-living organisms as preserved in the rock record. They include both the fossilized remains of ancient plants and animals and the traces thereof (e.g., trackways, imprints, burrows, etc.). In general, fossils are considered to be older than recorded human history or greater than 5,000 years old and are typically preserved in sedimentary rocks.

Under the No Action Alternative and Proposed Action, ground-disturbing activities for agricultural purposes and the maintenance of water conveyance infrastructure would continue largely as under existing conditions. While certain farmlands may be fallowed, idled, or reactivated in response to available groundwater supplies, all ground-disturbing activities such as tilling, disking, sowing, and well replacement would occur within areas that have previously experienced extensive ground-disturbing activities associated with agricultural operations. Neither the Proposed Action or No Action Alternative would result in the construction or demolition of physical structures, including water conveyance infrastructure. While the Proposed Action would include a recharge component, the facilities to implement this recharge component were constructed between 2008 and 2011. The activation and use of these recharge facilities under the Proposed Action would not require any modifications or alterations to the existing facilities.

In contrast, Alternative 2 proposes the construction of a new 85-acre groundwater recharge basin on the northern portion of Terra Linda Farms, called the River Ranch Recharge Basin. The construction of this recharge basin would require extensive ground disturbing activities, including the excavation into previously undisturbed soils. Therefore, the primary focus of this analysis is on the area that would experience disturbance as a result of the construction and operation of the River Ranch Recharge Basin on the northern portion of the Terra Linda Farms property.

As discussed in Section 3.0.2, *Resources Areas Considered for Analysis,* no unique geologic resources or features are located on or within the immediate vicinity of MPG farmlands, and thus, the Proposed Action and Alternatives would not directly or indirectly destroy or alter a unique geologic feature. Therefore, impacts to unique geologic features are not further evaluated in this section.

3.14.1 Environmental Setting/Affected Environment

Background

A cultural resource is a broad term that includes prehistoric, historic, architectural, and traditional cultural properties. As the Proposed Action is in part a Federal undertaking, it is subject to the provisions of Section 106 of the National Historic Preservation Act (NHPA).

Findings from Previous EIS

The 2004 Final EIS concluded that the Existing Exchange Agreements would not result in impacts to archaeological and cultural resources. As the Proposed Action and Alternatives were seeking to maintain current land uses and did not include any changes in existing land uses or construction of new facilities, no effects on archaeological or cultural resources were identified. In the ROD, Reclamation approved of the groundwater exchange program without any modifications in terms of cultural resources.

Area of Potential Effect (APE)

The Cultural Resources Study Area includes all MPG farmlands, encompassing portions of western Fresno County and southwestern Madera County (Figures 4 to 7). As discussed above, neither the No Action Alternative or Proposed Action propose any changes in existing land uses or construction of new facilities, and the potential effects on archaeological, cultural, and/or paleontological resources would be remote. In contrast, Alternative 2 proposes the construction of the new 85-acre River Ranch Recharge Basin, which would require extensive ground-disturbing activities, including the excavation into previously undisturbed soils. Therefore, the Project Area of Potential Effect (APE) is defined as the site where the proposed River Ranch Recharge Basin would be located under Alternative 2 and the existing Terra Linda Farms Recharge Canal (Figure 9). Although the recharge canal is located within the APE, it would not be modified or altered during construction of Alternative 2. However, it would be used during operation of Alternative 2 to convey water to the River Ranch Recharge Basin. This activity is in line with anticipated operation of the recharge canal once activated for use. In a broader sense, the APE is located on the northern third of Terra Linda Farms (Figure 8, Figure 9), which is located southeast of the City of Mendota, in the northwestern corner of Fresno County, immediately south of the Madera County line.

The region of influence for cultural and paleontological resources is defined as the Project APE, which includes the River Ranch Recharge Basin and adjacent Terra Linda Farms Recharge Canal for direct effects and considers a broader area for potential indirect effects. Reclamation, in consultation with the State Historic Preservation Office (SHPO), has established the Project APE as including construction activities for the proposed recharge basin and the existing recharge canal between the proposed basin and the Fresno Slough.

3.14.2 Regional Setting

Prehistoric Era

Native American inhabitation of the region began approximately 13,560 years ago, near the end of Pleistocene Era, and continued until the late 1700s, near the time when the Spanish first made contact (Rosenthal et al. 2007). Paleo-Indian occupation in the region is characterized by nomadic, highly mobile hunters and gatherers. While little is known about this period, there is a

probable Terminal Pleistocene site near Tulare Lake in the southern Central Valley. A limited number of artifacts dating to this era have been recovered within the site (Moratto 1984:81-82). Infrequent sites in the foothills dating from the late Paleo-Indian appear to have had seasonal occupation. These sites include a ground stone assemblage which appears to have been used for the processing of nuts.

Five occupation periods have been identified within the Central Valley; Paleo-Indian (circa [ca.] 11,550 – 8,550 years Before Common Era [BCE]), Lower Archaic (ca. 8550 – 5,550 BCE), Middle Archaic (ca. 5,550 – 550 BCE), Upper Archaic (ca. 550 BCE – 1,100 common era [CE]) and Emergent (1,100 CE – historic; Wallace 1978). The Northern Yokut inhabited the San Joaquin Valley from as early as the Paleo-Indian occupation period until the early 1800s (Wallace 1978). In general, the history of this region of California is one of the least understood in the State. Very little is known about the Northern Yokut except from sparse accounts recorded by Spanish missionaries, EuroAmerican settlers, and miners who traveled west during the Gold Rush. At contact with the Spanish, the Yokuts were hunter-gatherers who divided themselves into named tribes that were each politically autonomous and occupied a permanent area, usually on high ground along a major drainage course.

Given prehistoric populations and site occupations are considered to have expanded in number over the region during this time, it is considered that there is a higher probability that unknown sites could have been buried during multiple flooding episodes during the past 2,000 years. As a result, the region is identified as having a very high sensitivity for buried prehistoric occupation (Byrd, Wee and Costello 2009), and a very high potential sensitivity for buried cultural resources. Presently, no prehistoric cultural resources have been identified within the Project APE.

Ethnographic

At the time of contact with European settlers, this region of California was inhabited by the Northern Yokut (Wallace 1978). The San Joaquin River and its main eastern tributaries formed the core of the Northern Yokut's homeland. The Yokut were hunter-gatherers who divided themselves into tribes. Each tribe had a dialect, territory, and village settlements. Villages were characterized by large, semi-subterranean, round dwellings. Some of the larger villages also included communal dance houses. Yokut settlements were largely sedentary (Wallace 1978). Trade was facilitated by the river, where tule rafts were used for transportation. The Yokut reportedly traded dogs to their Miwok neighbors in exchange for baskets and blankets. Yokut populations have been estimated at approximately 41,000 at the time of Spanish contact, with approximately 5,000 living along the east side of the Central Valley. Native American populations in the Central Valley and throughout California dropped drastically as a result of European and Euro-American diseases and by the tremendous influx of nonnative people during the local gold-mining period from the mid-nineteenth and into the twentieth centuries (Wallace 1978).

Historic

In 1868, the Mendota Pool was built to divert rivers and aid in irrigation. In 1910, the earthen Mendota Dam was replaced by a concrete dam with over 180 miles of canals snaking from the Dam over the landscape. By the 1870s major roadways were built in Fresno County, quickly followed by railways in the 1890s (Roper 2004). The continual changing of the landscape due to

road and railway construction and irrigation at the end of the 19th century and the beginning of the 20th century resulted in the current landscape of built up roadways and levees. The Mendota Pool area is surrounded by these roadways and levees. The reconstruction of the Mendota Dam in 1910 aided in irrigating lands surrounding Mendota contributed to the city's agricultural success. Prior to levee and roadway construction and the current regular tilling, a small, intermittent drainage was present within River Ranch North. This drainage was aligned north/south and fed into the Fresno Slough.

Amongst the most historically significant landowners of the region are Henry Miller and Charles Lux. Miller and Lux owned the vast majority of the lands to the west of the Fresno Slough including what later became the city of Mendota (Harvey 1907; Progressive Map Service 1923). Miller and Lux, poor German immigrants turned wealthy American entrepreneurs, owned over 1,000,000 acres of land throughout California by the beginning of the 20th century (Daily Alta California 1887; Clough 1986; Waldschmidt-Nelson 2013).

Although the City of Mendota was not incorporated until 1942, the growth of the business districts around the Mendota railway station led the station to become the largest shipping point on the railway by 1910 (Clough 1986; Progressive Map Service 1923). Amelia Herminghaus and the Miller & Lux Company continued to own land in the Proposed Action area until at least 1923. The land has since remained primarily agricultural yielding cotton, melon, lettuce and other crops (Clough 1986; Roper 2004).

Geologic Setting and Paleontological Resources

The geologic setting is key to understanding potentially important paleontological resources in the area of interest. The Project APE is located in the San Joaquin Valley, which along with the Sacramento Valley, comprise California's Central Valley. The San Joaquin Valley was a marine embayment up until the Pliocene (approximately 2.58–5.33 million years before present) after which a combination of tectonic uplift, changes in sea level, and deposition of basin-filling sediments closed off the basin from the Pacific Ocean. Following closure of the San Joaquin Valley from the Pacific, deposition of the current surficial, and near-surface, deposits of generally Quaternary-age reflect the cycles of deposition and rising land surface in contrast with periods of erosion and subsidence.

Regional and local surficial geologic mapping in the Project vicinity, provided by Jennings and Strand (1958), including the Project APE, describe the following geological rock units:

- **Qb – Recent Basin Deposits in the Great Valley (Holocene[60]).** This unit is comprised of sediments deposited during flood stages of major streams between natural stream levees and fans. This is the surficial unit present within the Project APE.

- **Qsc – Recent River and Major Stream Channel Deposits in the Great Valley (Holocene[1]).** This unit is comprised of sediments along the river channels and major streams including adjacent natural levees. This the surficial unit immediately adjacent to the Fresno Slough within the Project vicinity.

[60] The Holocene is the current geological epoch. It began approximately 11,650 years before present. The Holocene and the preceding Pleistocene together form the Quaternary period.

In addition to these two geological units, the following two geological units potentially underlie the surficial deposits listed above and may be encountered during ground disturbance activities greater than a few feet:

- **Qm – Modesto Formation (Late Pleistocene[61]).** This unit is comprised of granitic sand and silt river terrace or coalescing alluvial fan deposits emerging from surrounding highlands typically overlying the Riverbank Formation.
- **Qc – Riverbank Formation (Middle Pleistocene).** This unit is comprised of granitic sand, silt, and clay older alluvium and dissected fan deposits.

The following is an inventory and assessment of paleontological resource by geologic unit (Table 73). In general, to be considered a fossil, a specimen must be older than recent (older than about 5,000 years before present). Because sediments of the Recent River and Major Stream Channel Deposits in the Great Valley (Qsc) and the Recent Basin Deposits in the Great Valley (Qb) are considered Holocene (recent) in age, these sediments are unlikely to contain significant paleontological resources and are considered to have low paleontological sensitivity. These Holocene-aged units are likely underlain by older Pleistocene-aged units which have produced significant vertebrate fossils (UCMP Fossil Locality Database 2018).

Table 73: Geologic Unit Description in APE

Unit Known or Likely to Occur Within APE	Name/Description of Unit	Age	Paleontological Sensitivity
Qb	Basin deposits	Holocene	Low
Qsc	Stream channel deposits	Holocene	Low
Qf	Modesto Formation	Pleistocene	High
Qc	Riverbank Formation	Pleistocene	High

Source: Jennings and Strand 1958.

A University of California Museum of Paleontology (UCMP) online locality database search for paleontological localities in Fresno County recorded a total of 2,247 localities, of which five were Pleistocene-aged sites from which vertebrate fossils have been collected. Details of the five localities are provided below and in Table 74:

- V4401 – Tranquillity Site: This locality is in the Pleistocene-aged Modesto Formation and located near Tranquillity, California (approximately 10 miles southeast of the Project site). The 149 specimens collected from this locality includes fish, reptiles (turtle and rattlesnake), birds (grebe), and mammals (packrat, gopher, vole, mole, rabbit, badger, gray fox, coyote, elk, deer, bison, and horse).
- V65100 – Riverdale Site: This site is not designated as being from a named formation and was recovered from near Riverdale, California (approximately 35 miles southeast of the Project site). The two specimens collected from this locality include a vertebra and phalanx (toe) of a camel.

[61] The Pleistocene is the geologic epoch before the present Holocene, and occurred between approximately 11,650 and 2.58 million years before present. The Pleistocene is dived into four ages, with the Middle Pleistocene occurring approximately 126–781 thousand years before present and the Late Pleistocene occurred approximately 11,650–126,000 before present.

- V81121 Laguna Seca Ranch: This locality is in the Riverbank Formation. The single specimen collected from this locality is a distal tibia (partial lower leg bone) from a horse.
- V99829 Unnamed: This locality is in the Modesto Formation. The two specimens collected from this locality include a scapula (shoulder blade) from a camel and a partial pelvis from an unknown mammal.
- V99830 Unnamed: This locality is in the Modesto Formation. The seven specimens collected from this locality include a partial pelvis, partial jaw, teeth, rib fragments, leg bones, vertebrae from a mammoth.

Table 74: Pleistocene-Aged UCMP Localities in Fresno County

UCMP Locality Number	Locality Name	Age	Number of Specimens	Paleontological Sensitivity
V4401	Tranquillity	Pleistocene	149	High
V65100	Riverdale	Pleistocene	2	High
V81121	Laguna Seca Ranch	Pleistocene	1	High
V99829	Unnamed	Pleistocene	2	High
V99830	Unnamed	Pleistocene	7	High

Source: UCMP Fossil Locality Database 2018.

3.14.3 Regulatory Framework

Archaeological, cultural, and paleontological resources are regulated by a number of authorities at the Federal, State, and local level. This section provides an overview of the regulatory agencies and specific regulations that are applicable to the Proposed Action.

Federal Policies and Regulations

National Historic Preservation Act of 1966 The NHPA of 1966 (now Title 54 USC § 306108) is the primary Federal legislation which outlines the Federal Government's responsibility to consider historic preservation. Other applicable cultural resources laws that could apply include, but are not limited to, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC 3001 et seq.), the Archaeological Resources Protection Act (ARPA), Advisory Council on Historic Preservation (ACHP) procedures outlined in the "Protection of Historic Properties" (36 CFR 800); National Park Service (NPS) regulations for administering the National Register of Historic Places (NRHP) (36 CFR 60); and the Secretary of the Interior's Standards and Guidelines (FR 190: 44716–44742).

Section 106 of the NHPA requires the Federal government to take into consideration the effects of their actions on historic properties, defined as cultural resources that are listed or eligible for inclusion in the National Register of Historic Places (National Register) and to allow the Advisory Council on Historic Preservation an opportunity to comment. The Section 106 process, outlined in the Federal regulations at 36 CFR Part 800, is a consultative process involving consultations with the State Historic Preservation Officer, Indian tribes, and other interested parties. Although the Section 106 and NEPA process are independent statutes Reclamation uses the Section 106 process as its primary effort to identify cultural resources and to evaluate potential impacts as they apply to NEPA.

The identification of historic properties, or cultural resources that have been listed or found eligible for listing in the NRHP, is outlined under 36 CFR Part 800.4. Criteria for evaluating the eligibility of cultural resources for listing in the NRHP may be found under NPS regulation 36 CFR 60.4. A cultural resource must also retain integrity to be considered eligible for listing in the NRHP. Section 101(d)(6)(A) of the NHPA allows properties of traditional religious and cultural importance to a Native American tribe to be eligible for inclusion in the NRHP.

Other statutes, executive orders, regulations, and guidelines may be applicable to the proposed project depending on the Federal agencies involved, the nature of the permits or authorizations required, and whether or not cultural resources on Federal lands are affected.

State Policies and Regulations

California Environmental Quality Act Under CEQA, historical resources are considered part of the environment, and a project that may cause a substantial adverse change to the significance of a historical resource is one that may have a significant impact on the environment. CEQA Guidelines (14 CCR Section 15064.5) define a historical resource as:

1) A resource listed or determined eligible for listing in the California Register of Historic Resources (CRHR);

2) A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k), or identified as significant in a historical resource survey meeting the requirements of PRC Section 5024.1(g); or

3) Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the lead agency's determination is supported by substantial evidence in light of the whole record (14 CCR Section 15064.5[a][3]).

If a lead agency determines that a cultural resource constitutes a "historical resource," the provisions of PRC Section 21084.1 and *CEQA Guidelines* Section 15064.5 would apply. If a cultural resource does not meet the *CEQA Guidelines* criteria for a historical resource, then the site may yet be regarded as a "unique" archaeological resource following the provisions of PRC Section 21083.

CEQA Guidelines note that if a resource is neither a unique archaeological resource nor a historical resource, the effects of a project on that resource shall not be considered a significant effect on the environment (Section 15064[c][4]). Human remains, including those interred outside formal cemeteries, are protected under several State laws, including PRC Section 5097.98 and Health and Safety Code Section 7050.5. Impacts include intentional disturbance, mutilation, or removal of human remains.

The CRHR is "an authoritative listing and guide to be used by State and local agencies, private groups, and citizens in identifying the existing historical resources of the State and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change" (PRC Section 5024.1[a]). Criteria for evaluating the eligibility of prehistoric and historic period cultural resources for listing to the CRHR are based on NRHP criteria (PRC Section 5024.1[b]). Certain resources are determined to be automatically included in the CRHR,

including California properties formally determined eligible for, or listed in, the NRHP; California Historical Landmarks from No. 770 onward; and California Points of Historical Interest that have been recommended by the State Historical Resources Commission for inclusion in the CRHR.

If nominated for listing in accordance with 5024.1(f), the CRHR may include individual historical resources; historical resources contributing to the significance of a historic district; historical resources identified as significant in historical resource surveys; and historical resources and historic districts designated or listed as city or county landmarks pursuant to any city or county ordinance, if the criteria for designation or listing under the ordinance is consistent with CRHR criteria.

For a cultural resource to be eligible for the NRHP and/or the CRHR, it must also retain integrity. Integrity is the ability to convey the resource's significance. These characteristics are expressed through integrity of location, design, setting, materials, workmanship, feeling, and association. It should be noted that a property found to retain insufficient integrity to be NRHP eligible may be found to possess sufficient integrity to be CRHR eligible.

With regard to paleontological resources, CEQA describes these resources to be objects and sites of the scientific annals of California and requires that public agencies and private interests identify the significance of the impacts of their projects on these resources in compliance with 14 CCR Section 15064.5[a][3] (above). *CEQA Guidelines* include specific reference to impact assessment specifically related to paleontological resources in *CEQA Guidelines Appendix G* (the Environmental Checklist) with the following checklist question, "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geological feature?"

Assembly Bill 52 AB 52, effective on July 1, 2015, amends CEQA and adds new sections relating to Native American consultation and certain types of cultural resources, Tribal Cultural Resources (TCRs). TCRs are either (1) sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American Tribe that is either on or eligible for inclusion in the CRHR or a local historic register; or (2) the lead agency (in this case, Westlands), at its discretion and supported by substantial evidence, chooses to treat the resource as a TCR. Additionally, a cultural landscape may also qualify as a TCR if it meets the criteria to be eligible for inclusion in the CRHR and is geographically defined in terms of the size and scope of the landscape. Other historical resources (as described in California PRC 21084.1), a unique archaeological resource (as defined in California PRC 21083.2[g]), or non-unique archaeological resources (as described in California PRC 21083.2[h]) may also be TCRs if they conform to the criteria to be eligible for inclusion in the CRHR.

AB 52 provides that a project with an effect that may cause a substantial adverse change in the significance of a TCR may have a significant effect on the environment. AB 52 requires the lead agency (in this case, Westlands) to begin consultation with a California Native American Tribe that is traditionally and culturally affiliated with the geographic area of the project if the tribe requests the lead agency, in writing, to be informed by the lead agency through formal notification of projects that are proposed in that geographic area and the tribe subsequently requests consultation. California PRC Section 21084.3 states that "public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource."

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Local Policies and Regulations

County of Fresno General Plan The County of Fresno General Plan identifies environmental, social and economic goals for the region, and sets forth policies, standards, and programs to guide physical development within the County (County of Fresno 2000a). The County's General Plan Open Space and Conservation Element's Historical, Cultural, and Geological Resources contains goals and policies related to archaeological, cultural, and paleontological resources that are relevant to the Project. Specifically, these goals and policies require projects to identify, protect, and enhance Fresno County's important historical, archaeological, paleontological, geological, and cultural sites and their contributing environment.

3.14.4 Impact Analysis/Environmental Consequences

Methodology for Analysis

Identification Methods

The potential for impacts on archeological and cultural resources are determined by the presence of culturally significant sites or structures within the APE. On behalf of the MPG, Amec Foster Wheeler (now Wood Environment & Infrastructure Solutions, Inc. [Wood]) completed a cultural resources inventory of the Project APE which included archival research, a pedestrian cultural resource survey, geoarchaeological modeling, and systematic subsurface archaeological investigations. The Cultural Resources Investigation report (Appendix J) contains confidential information and is not available to the general public in the interest of non-disclosure of sensitive site location information. The NHPA (NHPA, 54 U.S.C. § 307103) and the ARPA (ARPA, 16 U.S.C. § 470hh) provide authority to limit information on the "nature and location" of archaeological resources.

A review of cultural resources surveys, California Historical Resources Information System (CHRIS) records, and known historic structures identified five known pre-historic archaeological sites (Table 75) and four historic-period structures associated with water conveyance infrastructure (Table 76) located within two miles of the APE. No cultural resources have as yet been identified within the Project APE.

Table 75: Previously Recorded Archeological Sites Within 2 Miles of the APE

Site Type	Description
Prehistoric	Burials, Habitation Debris, Lithic Scatter.
Prehistoric; Historic	Bone Scatter, Burials, Habitation Debris; Single Family Property, Outbuilding, Debris Scatter/Privy.
Prehistoric	Lithic Scatter.
Prehistoric	Burials, Lithic Scatter
Prehistoric	Habitation Debris, Lithic Scatter.

Source: Amec Foster Wheeler Environment & Infrastructure, Inc. 2018.

Table 76: Previously Recorded Historic-Period Structures Within 2 Miles of the APE

Structure	Description
Outside Canal	The Outside Canal is an earthen canal that was constructed in 1896-1897 to aid in early farming irrigation. It runs parallel to the DMC northeast of the APE and is fed from the Fresno Slough just northwest of the APE. The Outside Canal crosses over the DMC approximately two miles northeast of the APE.
Mendota Dam	The Mendota Dam was constructed and modified throughout the first half of the 20th century. The dam resulted in water storage capacity that resulted in the construction of many of the canals located across the San Joaquin Valley.
DMC Bridge Crossing	This structure is a section of the DMC that is associated with an historic-period bridge constructed in 1949. Due to its association with the DMC, constructed between 1946 and 1952, the bridge is considered to be a historically significant structure.
Colombia Canal	The Columbia Canal is an earthen and concrete canal that runs along the northern levee of the San Joaquin River. The Columbia Canal was constructed between 1887 and 1924 to aid agricultural irrigation.

Source: Amec Foster Wheeler Environment & Infrastructure, Inc. 2018.

Wood staff conducted a records search to identify resources potentially occurring in the Mendota Pool area, in order to satisfy procedural requirements outlined in Section 106, as amended, and its implementing Federal regulation (36 CFR 800). The report generated following the records search also satisfies the requirements found in CEQA Guidelines Section 15064.5 for the identification and protection of significant cultural resources, and is submitted in support of this EIS/EIR. Wood requested a records search of documents on file with the Southern San Joaquin Valley Information Center (SSJVIC) at California State University, Bakersfield for identified cultural resources and previous investigations conducted in the Mendota Pool area within or adjacent to River Ranch North.

Archival research revealed that 22 cultural resource surveys and investigations have been conducted in the vicinity of the APE, of which only one encompassed the entirety of the APE. Cultural resources recorded in the general vicinity of Terra Linda Farms include prehistoric burials; lithic scatters and habitation debris; and historic structures, properties, and debris scatters; however, no cultural resources were previously recorded within the APE as a result of these investigations. Wood staff also completed a field investigation which included an intensive pedestrian archaeological survey (i.e., site walk) of the APE. The crew surveyed this area using parallel transects spaced from 10 to 15 meters apart. Notes and photographs were taken to document the physiography of the area and GPS coordinates were recorded at the beginning of every even-numbered transect. No archaeological resources were discovered during these pedestrian surveys.

Wood documented high sensitivity for buried soils within the Project's APE landform, which likely dates to the Latest Holocene period. Subsequently, Wood staff under direction of Reclamation completed a subsurface ground truthing investigation and assessment in December 2017 to better define the potential for buried archaeological materials within the Project APE. A systematic subsurface archaeological investigation consisting of 17 backhoe trenches dug to 10-feet below existing grade was undertaken throughout the Project APE. Excavated 5-gallon soil samples were screened from each 6-inch backhoe lift through ¼-inch mesh. No archaeological resources were discovered during these subsurface investigations.

The potential for on-site geologic units to contain paleontological resources was assessed in accordance with the Society of Vertebrate Paleontology's (SVP) Standard Procedures for the

Assessment and Mitigation of Adverse Impact to Paleontological Resources (2010). The SVP standard procedures were then used to determine the likelihood (sensitivity) that that geologic unit and its contained paleontological resources would be impacted by the Proposed Action. Unlike archaeological resources that are defined by their areal/geographic extent, paleontological resources occur in fossiliferous geologic units, where the potential for additional discoveries occurs throughout the entirety of the geologic unit. The SVP standard procedures assign four levels to geologic units based on their potential to contain paleontological resources, which were utilized in the evaluation of the impacts from the Proposed Action and Alternatives:

- **High:** Geologic units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered and are considered to have a high potential for containing additional paleontological resources. These units are typically sedimentary formations and rare volcaniclastic units (e.g., ash) with the potential for yielding abundant or significant vertebrate fossils and associated contextual date (e.g., dateable material).
- **Undetermined:** Geologic units for which little information is available concerning their paleontological content, geologic age, and depositional environment.
- **Low:** Geologic units which are poorly represented by fossil specimens in institutional collections, or based on scientific consensus only contain fossils in rare circumstances (e.g., basalt flows or Recent colluvium).
- **No Potential:** Some geologic units have no potential to contain significant paleontological resources, for instance, high-grade metamorphic rock (e.g., gneiss and schist) and plutonic igneous rocks (e.g., granites).

Wood conducted a review of the collections record of the Pleistocene-aged geological units likely to occur within the Project site and found five localities containing 161 vertebrate fossils from geological units within Fresno County (see Section 3.14.2. above). These geologic units (Modesto and Riverbank Formations) likely underlie the younger, Holocene-aged stream channel and basin deposits at, and near, the land surface.

Consultation

Federal agencies are required to consider the effects of their actions on historic properties pursuant to Title 54 U.S.C. § 306108, commonly known as NHPA Section 106, and its implementing regulations found at 36 CFR Part 800. Reclamation has consulted with SHPO, Indian tribes, and interested parties pursuant to 36 CFR Part 800.

Reclamation contacted the Picayune Rancheria, the Tule River Indian Tribe, and the Santa Rosa Rancheria to provide the opportunity to express concerns and assist in cultural resources identification efforts. Reclamation also contacted several individuals who were identified by the NAHC as possibly having an interest in the general Project area. Reclamation will continue to consult with Tribes or Native American individuals throughout the NEPA and NHPA Section 106 processes, as concerns are identified. Reclamation consulted with and received concurrence from SHPO on a finding of no historic properties affected pursuant to 36 CFR Part 800.4(d)(1).

The baselines for comparison used in this analysis are the No Action Alternative under NEPA and the existing setting under CEQA; however, the No Action Alternative is also compared to the existing setting for both NEPA and CEQA to provide a full disclosure of the potential

impacts. The existing setting includes water exchanges under the Existing Exchange Agreements, while the No Action Alternative assumes a cessation of this program and associated exchanges. For further discussion on the baselines for comparison used in this analysis or the methods used for evaluation of the significance of various environmental effects, see Section 3.0.1, *Environmental Review under NEPA and CEQA*.

Significance Criteria

Archaeological and cultural resource impacts related to the Proposed Action and Alternatives are analyzed under both NEPA and CEQA. Significance thresholds under NEPA include conformance with Section 106 of the NHPA, as defined in 36 CFR 800.5. Although the tasks necessary to comply with Section 106 may be delegated to others, the Federal agency is ultimately responsible for ensuring that the Section 106 process is completed according to statute. An impact is considered adverse when prehistoric or historic archaeological sites, structures, or objects listed in or eligible for listing in the NRHP are subjected to the following effects:

1. Physical destruction of or damage to all or part of the property;
2. Alteration of a property;
3. Removal of the property from its historic location;
4. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
5. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
6. Neglect of a property that causes its deterioration; and
7. Transfer, lease, or sale of the property.

The Proposed Action or Alternative 2 would require compliance with both CEQA and NHPA Section 106. While parallel, the two statutes are separate regulatory processes.

The thresholds of significance under CEQA are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as amended. These thresholds encompass the factors taken into account under NEPA; thus, both NEPA and CEQA criteria are included in the thresholds as defined under CEQA. The Proposed Action and Alternatives would result in a significant impact related to archaeological, cultural, and paleontological resources if they would do any of the following:

1. Cause a substantial adverse change in the significance of a historical resource;
2. Cause a substantial adverse change in the significance of an archaeological resource;
3. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature; or
4. Disturb any human remains, including those interred outside of formal cemeteries.

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CEQA defines a substantial adverse change as: (1) physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource would be materially impaired; or (2) demolition or material alteration of the physical characteristics that convey the resource's historical significance and justify its designation as a historical resource (14 CCR § 15064.5(b)).

Impacts and Mitigation Measures

Impact CR-1: Effects on the Significance of a Historic Resource
No Action Alternative While the No Action Alternative would have the potential to result in changes to farming operations, including the reactivation of fallow farmland in the Mendota Pool area and fallowing or dry farming of farmland in Westlands, these changes would be expected to occur on lands previously disturbed by agricultural activities, thus any archeological resources on these farmlands would likely have already been disturbed. The No Action Alternative proposes no alteration to the four historic-period structures. Therefore, the No Action Alternative would not result in a potentially significant impact on the significance of historic resources.

Proposed Action Construction and ground-disturbing activities would be limited to occasional well replacements located on MPG lands, which would occur on lands previously disturbed by agricultural activities, thus any archeological resources on these farmlands would likely have already been disturbed. Further, these well replacements would take place measurably distant from the four identified historic-period structures. Therefore, the Proposed Action would not result in potentially significant impacts to any historic resources.

Alternative 2 The Cultural Resource Investigation did not identify any known historic resources within or adjacent to the Project APE. The nearest potential historical resource to the Project APE consists of the intake of the earthen Outside Canal, which is located approximately 0.75 mile northeast of the APE. Within the APE, the Terra Linda Farms Recharge Canal is separated from existing fallow farmland by a narrow levy. The canal and levy were constructed in 2010 to facilitate recharge of overflows from the Fresno Slough during periods of high precipitation and snow melt runoff. Neither conveyance infrastructure is of sufficient age to be potential eligible for listing in the NRHP or CRHR pursuant to CEQA Guidelines Section 15064.5(a)(2)(3) and PRC Section 5024.1. Given these elements are neither designated or eligible for designation as a historic resource, Alternative 2 would not result in a potentially significant impact on the significance of historic resource.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for all Alternatives.

Impact CR-2: Effects on an Archaeological Resource
No Action Alternative While the No Action Alternative would have the potential to result in changes to farming operations, including the reactivation of fallow farmland in the Mendota Pool area and fallowing or dry farming of farmland in Westlands, these changes would not be expected to include ground disturbance beyond standard agricultural activity (e.g., tilling) on previously disturbed agricultural lands. Despite the high potential for the presence of buried archaeological and/or cultural resources within the Project APE and study area for Cultural Resources Investigation, significant changes to farming operations would have to occur for ground-disturbance to extend beyond the previously disturbed soils, most of which have been

farmed in some capacity for nearly a century, including routine tilling and disking up to a depth of approximately 6 feet bgs. Significant changes are more likely to be the construction of a new facility to support agricultural operations (like the proposed recharge basin) rather than a switch to a different crop type or fallowing/retirement of farmlands. Such significant changes would require compliance with existing policies, ordinances, standards, regulations, and guidelines in the event that archaeological other cultural resources are identified at any point, and may be substantial enough to require a separate NEPA and/or CEQA analysis of environmental impacts. Therefore, the No Action Alternative would not result in a potentially significant impact to archeological resources.

Proposed Action Construction and ground-disturbing activities would be limited to occasional well replacements located on MPG lands, which are measurably distant from the identified archaeological and cultural resources in the area. Although the Primary Study Area is located at the confluence of two rivers where there is a high probability of archeological resources, these soils are highly disturbed due to nearly 100 years of agricultural activity and historic flooding. Therefore, the well replacement activity would not result in a potentially significant impact to undiscovered archaeological or cultural resources.

Alternative 2 The APE in which ground-disturbing activities would be required for construction and operation of the River Ranch Recharge Basin under this alternative are removed from the identified archaeological resources listed in the Cultural Resources Investigation (Table 75). The Cultural Resources Investigation determined that none of these previously recorded sites would be impacted by Alternative 2 and related basin construction.

Excavation and ground disturbance would be required to construct the River Ranch Recharge Basin. Operation of the recharge basin would require occasional ripping of the basin bottom and inner banks to up to six feet in depth to maintain percolation rates. Although buried archaeological and cultural resources were not encountered during the systematic 17 subsurface investigation locations, it is possible that ground-disturbing activities required to construct and operate the recharge basin may surpass either the upper six feet of soils that are routinely disturbed by normal agricultural operations or the 10-foot depth of the systemic 17 subsurface investigations. In this instance, there remains a very limited possibility of encountering undiscovered archaeological resources, including human remains. Due to the sensitive nature of these soils, ground disturbance in excess of six feet bgs has the potential to encounter previously unidentified archaeological resources below this depth. Because ground disturbance for construction or operation of the River Ranch Recharge Basin may exceed six feet in depth, construction of the River Ranch Recharge Basin would result in potentially significant impacts to previously unidentified archaeological resources.

Minor ground disturbance is also expected to occur in the Primary Study Area as a result of replacing or refurbishing wells on MPG lands. Replacement wells installed by the MPG would require the drilling of a new well and a new 100 square foot pad. However, these lands are not in close proximity to the five identified archaeological sites that are within 2 miles of the Primary Study Area, and therefore would not result in potentially significant impacts to these resources.

Significance Determination before Mitigation
CEQA Significance Determination *Less than significant* for the No Action Alternative. *Potentially significant* for the Proposed Action and Alternative 2.

Mitigation Measures

Mitigation Measure CR-1: Halt Construction and Evaluate Cultural Resource (Proposed Action and Alternative 2). If subsurface deposits believed to be cultural or human in origin are discovered during ground-disturbing activities, then all work must halt within a 50-foot radius of the discovery. A qualified professional archaeologist, meeting the Secretary of the Interior's Professional Qualification Standards for prehistoric and historic archaeologist, shall be retained to evaluate the significance of the find. If the professional archaeologist determines that the find does not represent a cultural resource, then work may resume immediately and no agency notifications are required. If the professional archaeologist determines that the find does represent a cultural resource from any time period or cultural affiliation, they shall immediately notify Reclamation and applicable landowner. The agency shall consult on a finding of eligibility and implement appropriate treatment measures, if the find is determined to be eligible for inclusion in the NRHP. Work cannot resume within the no-work radius until the lead agencies, through consultation as appropriate, determine that the site either: 1) is not eligible for the NRHP; or 2) that the treatment measures have been completed to their satisfaction.

There are numerous California State laws and codes that direct treatment of inadvertently discovered Native American human remains. The laws and codes establish the procedures for protecting the human remains, and impose penalties and punishments for persons acting in violation of the legal code. Specifically, Section 7050.5 of the California Health and Safety Code deals with the discovery of human remains in any location other than a dedicated cemetery, and directs that in such cases the coroner of the county in which the remains are discovered be contacted and further excavation or disturbance in the location of discovery be discontinued until the coroner has examined the remains and made recommendations concerning their treatment and disposition. If the coroner determines that the remains are not subject to his or her authority and if the coroner recognizes the human remains to be those of a Native American, or has reason to believe that they are those of a Native American, the coroner is required to contact the California Native American Heritage Commission (NAHC), by telephone, within 24 hours. Stipulations encouraging private landowners to work with the NAHC and the most likely descendant identified by the NAHC to establish and carry out appropriate treatment of the remains are established in Section 5097.98 of the California Public Resources Code.

Significance Determination after Mitigation

CEQA Findings *Less than significant* for all Alternatives.

Impact CR-3: Effects on Unique Paleontological Resources

No Action Alternative While the No Action Alternative would have the potential to result in changes to farming operations, including the reactivation of fallow farmland in the Mendota Pool area and fallowing or dry farming of farmland in Westlands, these changes would not be expected to include ground disturbance beyond standard agricultural activity (e.g., tilling) on previously disturbed agricultural lands. Standard agricultural activities are unlikely to disturb older, more deeply buried paleontologically sensitive geological units underlying the recent, Holocene-aged stream channel and basin deposits. Therefore, No Action Alternative would not result in a potentially significant impact to paleontological resources.

Proposed Action Under the Proposed Action, ground disturbing activities for agricultural purposes and maintenance of water conveyance infrastructure would continue largely as under

existing conditions. Similar to the No Action Alternative, no ground disturbance would extend beyond standard agricultural activity (e.g., tilling) on previously disturbed agricultural lands. While the Proposed Action would include a recharge component, the facilities to implement groundwater recharge were constructed between 2008 and 2011, and no additional ground disturbance would be required. Therefore, the Proposed Action would not result in a potentially significant impact to paleontological resources.

Alternative 2 Under Alternative 2, an 85-acre groundwater recharge basin would be constructed including gravity drains. The construction of the recharge basin would require extensive ground disturbing activities, including the excavation of previously undisturbed soils and potentially Pleistocene-aged geological units underlying Holocene-aged deposits. These geologic units would include the paleontologically sensitive Modesto (Qm) and/or Riverbank (Qc) Formations that have produced significant paleontological resources elsewhere within Fresno County near the towns of Tranquillity and Riverdale. Similarly, operation of the recharge basin would require occasional ripping of the basin bottom and inner banks to up to six feet in depth to maintain percolation rates. Ground-disturbing activities required to construct and operate the recharge basin may surpass the six feet of upper soils that are routinely disturbed during normal agricultural operations, and thus, may encounter previously undiscovered paleontological resources below these depths. Therefore, construction of the River Ranch Recharge Basin would have the potential to result in potentially significant impact to previously unidentified paleontological resources.

Significance Determination before Mitigation
CEQA Significance Determination Less than significant for the No Action Alternative and Proposed Action. *Potentially significant* for Alternative 2.

Mitigation Measures
Mitigation Measure CR-2: Halt Work and Evaluate Paleontological Resource (Alternative 2). If suspected paleontological resources are discovered during ground-disturbing activities, all work must halt within a 50-foot radius of the discovery. A qualified paleontologist shall be retained to evaluate the significance of the find. If the qualified paleontologist determines that the find does not represent a paleontological resource, then work may resume immediately and no agency notification is required. If the professional paleontologist determines that the find does represent a paleontological resource, they shall immediately notify Reclamation, County, and applicable landowner. The agency shall consult on a finding of importance and implement appropriate treatment measures. Fossils shall be recorded, recovered, and prepared in accordance with the Society of Vertebrate Paleontology Standard Guidelines. Microfossils shall also be collected via the collection of up to 6,000 pounds of matrix per fossil locality per the Society of Vertebrate Paleontology Standard Guidelines as many significant vertebrate fossils and non-vertebrate paleontological indicators, such as plant seeds and shells, are too small to be readily visible and can only be recovered via bulk matrix sampling. Work cannot resume within the no-work radius until the lead agencies, through consultation as appropriate, determine that the treatment measures have been completed to their satisfaction. Upon completion of construction monitoring, a Paleontological Resources Assessment Report shall be prepared with summary findings for submittal to the US Bureau of Reclamation and the County.

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Significance Determination after Mitigation
CEQA Findings *Less than significant* for all alternatives.

Cumulative Impacts

Cumulative impacts are considered in the context of other programs or projects that could impact cultural resources within the same or similar timeframe as the Proposed Action and Alternatives. Although archaeological, cultural, and paleontological resources typically occur at individual sites, the combination of programs and projects within a region can result in the cumulative loss of these resources and their data potential for research. Therefore, if there are impacts to these resources associated with a discrete project, they may also contribute to cumulatively significant impacts.

The Proposed Action and Alternatives would not result in significant impacts to archaeological, cultural, or paleontological resources, and would therefore not contribute to cumulative impacts. The No Action Alternative would have little or no effect on these resources, and would not significantly contribute to cumulative effects. The Proposed Action and Alternative 2 involve varying levels of relatively minor construction and ground disturbances that could potentially result in adverse effects to previously undiscovered cultural resources. The No Action Alternative and Proposed Action would have little or no effect on paleontological resources, and would not significantly contribute to cumulative effects on paleontological resources. Alternative 2 would involve ground-disturbing activities that may extend to sufficient depth that could potentially result in substantially adverse effects or significant impacts to previously undiscovered paleontological resources. Under the Proposed Action **Mitigation Measure CR-1** would require the halt of construction if archaeological resources are discovered. An evaluation of the resources by a professional archaeologist would be required prior to construction resuming. Under Alternative 2, **Mitigation Measure CR-2** (Alternative 2 only) would similarly require the halt of construction and evaluation of paleontological resources by a professional paleontologist should these resources be unexpectedly discovered. These mitigation measures would reduce the potential for significant impacts to result under CEQA. Therefore, the Proposed Action and Alternative 2 would not result substantial cumulative effects on archeological, cultural or paleontological resources.

3.14.5 References

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Section 4 Other Required Disclosures

4.1 Introduction to Other Required Disclosures

Other required disclosures under CEQA and NEPA include the relationship between short-term uses and long-term productivity, the irreversible or irretrievable commitments of natural resources, unavoidable adverse effects, significant and irreversible environmental changes, growth inducing effects, and selection of the environmentally preferred alternative. The following sections evaluate the Proposed Action and alternatives in light of these requirements.

4.1.1 Relationship between Short-Term Uses and Maintenance of Long-Term Productivity

NEPA (40 CFR Section 1502.16) requires disclosure of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Short-term uses of surface and groundwater resources are based on cyclic climatic factors, and therefore impacts from MPG pumping under any of the alternatives can vary substantially between dry, normal, and wet years. These short-term effects include seasonal and annual variations in groundwater pumping and recharge, and TDS concentrations in surface waters. However, impacts from the Proposed Action and Alternatives are analyzed within the context of long-term maintenance and management of surface and groundwater resources over a 20-year period.

Under all alternatives, the benefits of agriculture productivity are at the expense of impacts to other resources (mainly groundwater resources, subsidence, and surface water quality). The Exchange Agreements under the Proposed Action and Alternative 2 benefit long-term agricultural productivity in Westlands, ensuring continued socioeconomic benefits. However, groundwater pumping under all alternatives may contribute to long-term groundwater declines in the Primary Study Area if not managed properly. While this impact would be adverse under all alternatives, continuation of the Exchange Agreements under the Proposed Action or Alternative 2 would avoid substantial long-term impacts to already severe groundwater level declines and subsidence in Westlands through offset reductions in CVP allocations which would reduce the need to pump additional groundwater supplies in Westlands and with the incorporation of design constraints that would minimize impacts within the Primary Study Area from MPG pumping. The Proposed Action includes groundwater recharge components to aid in the replenishment of groundwater, while Alternative 2 also proposes the River Ranch Recharge Basin to further aid groundwater recharge efforts.

MPG farmlands are located within subbasins designated as high priority by the DWR. The GSAs for these subbasins may impose groundwater management strategies on MPG farmers to achieve sustainability, although the nature and scope of such strategies is unknown at this time. A carefully managed exchange program with design constraints that limit pumping under certain

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conditions, such as the one proposed under the Proposed Action, is an example of such programs that will likely be required to ultimately achieve SGMA's goal of sustainable groundwater yield by 2040.

Major construction efforts are included under Alternative 2, with construction of the River Ranch Recharge Basin on Terra Linda Farms. Construction would result in some short-term but minor effects related to air emissions, noise, and biological resources, and would result in long-term beneficial effects to groundwater levels and quality in the immediate vicinity of the proposed basin.

4.1.2 Irreversible or Irretrievable Commitments of Natural Resources

This section describes irreversible and irretrievable commitments of natural resources that would result from the Proposed Action or Alternatives in order to satisfy requirements under NEPA (40 CFR Section 1502.16) and CEQA (CEQA Guidelines Sections 15126(c) and 15127). The irreversible and irretrievable commitment of resources refers to the destruction, loss of production or use, or lost opportunities for use of a natural resource that cannot be replace or restored over a long period of time, or the loss of production or uses.

Potential irreversible and irretrievable effects are associated with the consumption of water resources. Water supplies (whether groundwater or surface water from the Mendota Pool) applied on MPG lands would percolate into the upper aquifer above the Corcoran Clay layer and recharge the groundwater basin. In areas with good groundwater quality such as the FWD, a portion of this recharged groundwater could be pumped and used for its beneficial uses. However, in areas of poor groundwater quality, such as west of the Fresno Slough or much of Westlands, irrigation water would percolate and mix with groundwater with high TDS concentrations, thereby becoming less suitable for agricultural uses and irretrievable.

Groundwater in the shallow depths of much of Westlands contains TDS concentrations over 10,000 mg/L. As any recharge into the upper aquifer would become contaminated, the alternatives involving continued irrigation of MPG lands in Westlands (No Action Alternative, Proposed Action, and Alternative 2) would result in the loss of up to 25,000 AFY of water resources as this water percolates into the ground and mixes with high saline groundwater, becoming near unusable for future irrigation purposes.

Aquifers would continue to receive high-quality recharge from rivers, streambed and rainfall infiltration; and infiltration/percolation of imported CVP water through the irrigation of farmland and subsequent percolation and direct canal recharge. When managed properly, the use of groundwater sources is renewable and not irreversible. The proposed design constraints would reduce impacts to groundwater levels, groundwater quality, and surface water quality so that groundwater resources would continue to be available beyond the 20-year life of the program. Strategies may also be imposed under SGMA to achieve sustainable groundwater yield by 2040, The GSPs to achieve sustainable yield are in the early stage of preparation but are likely include strategies such as adaptive management increased efficiency in irrigation standards, additional groundwater recharge, and spot purchases.

4.1.3 Significant and Unavoidable Environmental Changes

Significant and unavoidable adverse effects refer to environmental consequences that cannot be avoided or lessened through project design, changes to the nature of the project, or

implementation of mitigation. Under NEPA, disclosure of any adverse impacts that cannot be avoided is required by 40 CFR Section 1502.16. CEQA requires that any significant impacts that cannot be avoided, even with the implementation of feasible mitigation measures, are described (Section 15126.2(b)). Section 15126.2(c) of the State CEQA Guidelines states that significant irreversible environmental changes may include the following:

- Uses of non-renewable resources during the initial and continued phases of the project, which would be irreversible because a large commitment of such resources makes removal or non-use thereafter unlikely;

- Primary impacts and, particularly, secondary impacts which commit future generations to similar uses; and

- Irreversible damage, which may result from environmental accidents associated with the project.

Effects on environmental resources were evaluated to determine any significant unavoidable impacts. Sections 3.1 through 3.14 provide a detailed analysis of all significant impacts resulting from implementation of the No Action Alternative, the Proposed Action, and Alternative 2, and outline feasible mitigation measures that could reduce or avoid impacts (Table 77). If a significant impact cannot be mitigated or reduced to a less than significant level, the impact is considered significant and unavoidable. Where feasible mitigation exists, it is included to reduce impacts; however, significant and unavoidable impacts would still occur under the Proposed Action and alternatives.

Neither approval of the Proposed Action or Alternative 2 would be subject to a Statement of Overriding Considerations under CEQA because all impacts would be reduced to a less than significant level after mitigation is applied. In accordance with NEPA (40 CFR Section 1505.2), a ROD would be issued stating the environmentally preferred alternative and identifying whether all practical means to avoid or minimize environmental impacts have been adopted; the ROD would also require implementation of mitigation and a monitoring enforcement program for the selected alternative in order to address potentially significant impacts.

Under the No Action Alternative, impacts would be significant and unavoidable. The No Action Alternative would not implement the Proposed Action or Alternative 2, including the design constraints and mitigation measures intended to reduce impacts to a less than significant level. Thus, although impacts under the No Action Alternative may be significant and unavoidable, and greater than under the Proposed Action or Alternative 2, the No Action Alternative is under no obligation to reduce residual impacts to a less than significant level. In cases where the No Action Alternative results in significant and unavoidable impacts, it is due to the lack of design constraints, management strategies, and mitigation measures included as part of the Proposed Action and Alternatives (Table 77).

Table 77: Summary of Significant Impacts and Mitigation Measures

Alternative	Impact	Significance Under CEQA Before Mitigation	Significance Under NEPA Before Mitigation	Mitigation Measures	Significance after Mitigation
Groundwater Levels					
No Action Alternative	Impact GWL-4: Changes to Groundwater Levels in Westlands	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable
Biological Resources					
No Action Alternative	Impact BIO-2: Effects on Freshwater Habitat in the Fresno Slough and MWA from MPG Groundwater Inputs	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable
Alternative 2	Impact BIO-5: Effects on Biological Resources due to Construction of the River Ranch Recharge Basin	Potentially Significant	Potentially Adverse	MM BIO-5a: Pre-construction Surveys and Biological Monitoring; MM BIO-5b: River Ranch Recharge Basin Maintenance	Less than Significant
Land Subsidence					
No Action Alternative	Impact SUB-1: Subsidence in the Upper Aquifer of the Mendota Pool Area	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable
No Action Alternative	Impact SUB-2: Subsidence in the Lower Aquifer in the Mendota Pool Area	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable
No Action Alternative	Impact SUB-3: Subsidence in Westlands	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable
Land Use and Agricultural Resources					
No Action Alternative	Impact LU-1: Conversion of Important Farmland or Conflict with Williamson Act Contract	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable
No Action Alternative	Impact LU-2: Consistency with Applicable Zoning, General Plans, Policies, and Regulations	Potentially Significant	Potentially Adverse	None	Significant and Unavoidable

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Table 77: Summary of Significant Impacts and Mitigation Measures (Continued)

Alternative	Impact	Significance Under CEQA Before Mitigation	Significance Under NEPA Before Mitigation	Mitigation Measures	Significance after Mitigation
Archaeological, Cultural, and Paleontological Resources					
Proposed Action	Impact CR-2: Effects on an Archaeological Resource	Potentially Significant	Potentially Adverse	MM CR-1. Halt Construction and Evaluate Cultural Resource	Less than Significant
Alternative 2	Impact CR-2: Effects on an Archaeological Resource	Potentially Significant	Potentially Adverse	MM CR-1. Halt Construction and Evaluate Cultural Resource	Less than Significant
Alternative 2	Impact CR-3: Effects on Unique Paleontological Resources	Potentially Significant	Potentially Adverse	MM CR-2. Halt Construction and Evaluate Paleontological Resource	Less than Significant

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The Proposed Action and Alternative 2 identify mitigation measures that would be applied to reduce potentially significant impacts to a less than significant level. Mitigation Measure BIO-5 would reduce potentially significant impacts resulting from the construction of the River Ranch Recharge Basin (Alternative 2) to the burrowing owl, Swainson's hawk, giant garter snake, western pond turtle, American badger, San Joaquin kit fox, and special-status bats by requiring pre-construction surveys and the implementation of appropriate measures if these species are encountered. Mitigation Measures CR-1 and CR-2 would reduce potentially significant impacts to unsuspected archaeological or paleontological resources that are discovered during routine well replacement activities (Proposed Action and Alternative 2) or the construction of the River Ranch Recharge Basin (Alternative 2). These mitigation measures require work to halt in the area of the discovery until a qualified professional can properly record the finding.

4.1.4 Growth-Inducing Effects

Both NEPA and CEQA require analysis of direct and indirect growth-inducing impacts. NEPA requires the analysis of indirect effects and reasonably foreseeable growth-inducing effects caused by the Proposed Action or alternatives as stated in 40 CFR Sections 1502.16(b) and 1508.8(b). Section 15126.2(d) of the State CEQA Guidelines requires analysis of the Proposed Action's influence on economic or population growth, increased housing and construction, and future development.

Growth-inducing impacts are generally associated with the expansion of new infrastructure, housing, or commercial development. The proposed extension of the Exchange Agreements under the Proposed Action and Alternative 2 would involve the exchange of water to meet existing demand and would not directly or indirectly affect growth beyond what is already planned. Socioeconomic effects on income, employment, housing or population are not significant under these alternatives and therefore are not expected to stimulate substantial demand for local services or housing. Therefore, the Proposed Action and Alternative 2 would not have significant growth-inducing impacts.

The No Action Alternative would result in changes to agricultural production by cultivating additional crops on currently fallow lands in the Primary Study Area. Alternatively, the No Action Alternative could result in the fallowing of up to 10,000 acres in Westlands. These changes in agricultural production are expected to result in incremental changes in the number of agricultural jobs, and changes to agriculture outputs. This in turn would result in incremental growth-inducing impacts in the Primary Study Area, but would not substantially strain existing local services, infrastructure, or resources. Specific impacts are described in detail in Section 16.0, *Environmental Justice and Socioeconomics*.

4.1.5 Environmentally Preferred/Superior Alternative

NEPA and the CEQA both require the identification of an environmentally preferred/superior alternative (40 CFR Section 1505.2(b) and State CEQA Guidelines Section 15126.2(e)). The environmentally preferred alternative as defined under NEPA in the CEQ Regulations is "…the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, and enhances historic, cultural and natural resources" (Section 101). This alternative must be identified in the ROD. If the environmentally preferred/superior alternative is found to be a No Action alternative, CEQA requires the

identification of an environmentally superior alternative among the action alternatives (Section 15126(e)(2)).

Based on the information provided in the Draft EIS/EIR, Reclamation and Westlands will identify the environmentally preferred alternative in the Final EIR. In order to identify the environmentally preferred/superior alternative, each alternative will be evaluated based on significance criteria, extent and magnitude of impacts, potential benefits, and relative impacts in comparison to other alternatives. The action alternative with the fewest adverse impacts and relatively greatest benefits is thereby considered the environmentally superior alternative.

As summarized in Table 77, all alternatives would result in potentially significant impacts, although only the No Action Alternative would result in significant and unavoidable impacts that cannot be reduced to a less than significant level. No one alternative is environmentally superior across all resources areas. Therefore, the environmentally preferred alternative depends on the resource or environmental concern under evaluation for impacts and benefits. The No Action Alternative would result in less total pumping in the Mendota Pool area, but may result in increased pumping and resulting subsidence in Westlands and socioeconomic impacts to low-income minority residents in the surrounding communities. Additionally, under the No Action Alternative, the MPG would no longer be required to comply with the design constraints nor continue the existing monitoring and reporting program. The Proposed Action and Alternative 2 would allow for a continuation of the Exchange Agreements and associated farming operations; and pumping for exchange would include revised design constraints to address groundwater levels, surface and groundwater quality, and subsidence, as described in this EIS/EIR. Proposed mitigation measures would reduce impacts to Biological Resources and Archaeological, Cultural, and Paleontological Resources to a less than significant level.

Reclamation and Westlands will weigh the benefits of reduced pumping, with the impacts of reduced water supply and associated agricultural production as well as reduced visibility to the condition of the groundwater basin and surface water bodies, and make their determination of the chosen alternative based on their review of this EIS/EIR. Adoption of the environmentally preferred/superior alternative selected in the Final EIS/EIR is not required and is independent of the implementation of the chosen alternative, although the decision to implement either shall be based on the information presented in this EIS/EIR.

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Section 5 Consultation and Coordination

This section describes the consultation and coordination efforts that have occurred prior to and during development of this EIS/EIR.

5.1 Public Involvement

Both NEPA and CEQA encourage public involvement during preparation of EISs and EIRs. The following sections describe the public involvement opportunities that have occurred or will occur during the EIS/EIR process.

5.1.1 Public Scoping

Prior to the initiation of preparation of this EIS/EIR, Reclamation published a NOI of preparation of the EIS portion of this document in the Federal Register on November 13, 2012. In addition, a notice was placed in the "Public Notices" section of the *Fresno Bee* (the local newspaper) summarizing the NOI and requesting input from the public. Reclamation held two public scoping meetings to solicit public comments on the EIS portion of the EIS/EIR. These two scoping meetings fulfilled the public scoping requirements of NEPA. The first public scoping meeting was held on November 27, 2012, in the City of Fresno, CA and the second public scoping meeting was held on December 10, 2012, in the City of Mendota, CA. A total of five persons spoke at the public scoping meetings. Public comments regarding the scope of environmental review for the Proposed Action were due by January 10, 2013. Two comment letters, one from the EPA and one from Friant Water Authority were received. Reclamation prepared a Scoping Report that summarizes the scoping process and includes the two letters of comment. The Scoping Report is included in Appendix A of this EIS/EIR.

Westlands, the Lead Agency under CEQA, filed a NOP of the EIS/EIR with the OPR State Clearinghouse on April 8, 2013, and sent the NOP to responsible agencies and interested parties. The NOP comment period ran from April 9, 2013 through May 8, 2013. A total of six comment letters were received on the NOP (refer to Appendix B) and consisted of letters from the following: CDFW; the NAHC; Friant Water Authority; Madera Irrigation District; Madera County; and Wonderful Orchards.

5.1.2 Public Review

Reclamation and Westlands will release this Draft EIS/EIR for a 45-day public review period. Public meetings will also be held during the public review period to further solicit public comments.

5.2 Compliance with Federal Statutes and Regulations

This section describes the status of compliance with relevant federal laws, executive orders, and policies.

5.2.1 Clean Water Act

The CWA is the primary Federal law establishing and governing water quality standards in surface waters of the United States, and through various sections, establishes water quality criteria and objectives and regulates the discharge of pollutants into such waters. Under Section 401 of the CWA, applicants for a federal license or permit to conduct activities that may result in the discharge to waters of the United States (including wetlands) must also obtain a Section 401 water quality certification to ensure that any such discharge will comply with the applicable provisions of the CWA. Compliance with Section 401 is required for all projects that have a federal component and may affect state water quality. As demonstrated in Impact SWQ-1 and SWQ-2, neither the Proposed Action or Alternative 2 would substantially degrade the surface water quality in the Mendota Pool, Fresno Slough, or Mendota Wildlife Area. The Proposed Action's revised design constraints and monitoring and reporting of salinity levels at MPG discharge points into the Pool and Slough are intended to maintain the quality of water in these bodies to above acceptable thresholds. Further, the adopted GSPs for the high-priority groundwater basins in Madera County northeast of the Primary Study Area could also slow, stop, or possibly even reverse the migration of the naturally-occurring saline front and improve the quality of groundwater discharged into the Pool and Slough. As a result, the Proposed Action and Alternative 2 would not substantially degrade water quality in these water bodies or impact their beneficial uses.

Under Section 402 of the CWA, a NPDES permit for point sources of pollution discharging into a surface water body is required by the local Regional Board (i.e., the CVRWQCB). Issuance of a Section 402 permit may be required under Alternative 2 for the construction of the River Ranch Recharge Basin, depending in the discretion of the CVRWQCB. Otherwise, the Proposed Action or Alternative would generate no point sources of pollution that would require issuance of a Section 402 permit. Through consultation with the CVRWQCB, all appropriate permits would be acquired prior to implementation of the Proposed Action or Alternative. Thus, the Lead Agencies would be in compliance with the CWA.

5.2.2 Anti-Degradation Policy

The SWRCB's Resolution 68-16 (commonly referred to as the SWRCB's Anti-Degradation Policy) requires the SWRCB to regulate all "activities and factors which may affect the quality of the waters of the state" such that they "attain the highest water quality which is reasonable." The policy further states the project must meet the specific requirements that it be "consistent with the maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial uses of such water and will not result in water quality less than that prescribed in the policies." As discussed in Section 3.2, *Groundwater Quality*, the addition of groundwater recharge under the Proposed Action and Alternative 2 would result in an

improvement to the quality of groundwater supplies compared to existing conditions. Further, as discussed in Section 3.3, *Surface Water Quality*, the proposed design constraints, Monitoring and Reporting Program, and adaptive management procedures would ensure that the Proposed Action or Alternative 2 would not substantially degrade water quality in the Mendota Pool, Fresno Slough, or MWA compared to existing conditions. Thus, the Lead Agencies would be in compliance with the Anti-Degradation Policy.

5.2.3 Executive Order 11990 (Protection of Wetlands)

Under Executive Order 11990, federal agencies must avoid affecting wetlands unless it is determined that no practicable alternative is available. Executive Order 11990 directs federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in implementing civil works. As described in Section 3.4, *Biological Resources*, wetlands and wetland habitat occur within the vicinity and adjacent to MPG lands in the Primary and Secondary Study Areas, with large areas of wetland located in the MWA at the southern end of the Fresno Slough. The Proposed Action or Alternatives could affect wetlands through the introduction of pollutants into water inflows to the Mendota Wildlife Area. However, as discussed in Section 3.3, *Surface Water Quality*, the Proposed Action and Alternatives would not cause the quality of water entering the Mendota Pool, Fresno Slough, or MWA to exceed established thresholds during either a normal year or dry year scenario (Table 24, Table 25, Table 26). If routine monitoring at the MWA (Sampling Location 9) identifies elevated concentrations of salinity, boron, or selenium at the MWA, MPG would coordinate with Reclamation as part of the adaptive management program, and MPG's monitoring team would be responsible for ensuring timely implementation of the pumping design constraints that require shut down of wells along the Fresno Slough. Effective application of this proposed design constraints would allow the MPG to respond to increased pollutants within the MWA in a timely manner. As a result of these findings, Section 3.4, *Biological Resources*, Impact BIO-2 concludes that actions under the No Action Alternative, Proposed Action, and Alternative would not have a physical effect on or result in the loss or degradation of wetlands. As identified in the Biological Resources Technical Report (Appendix H), no additional wetland analysis or formal delineations would be necessary under the No Action, Proposed Action, or Alternative 2. Thus, the Lead Agencies would be in compliance with Executive Order 11990.

5.2.4 Federal Endangered Species Act

Section 7 of the ESA (16 USC Sections 1531-1544) requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior and or Commerce, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species. Under Section 7, if a project could result in incidental take of a listed threatened or endangered species, federal agencies must consult with the USFWS and the NMFS to obtain a Biological Opinion (BO). Section 3.4, *Biological Resources*, describes the sensitive species that have the potential to occur in the area, and potential effects to federal endangered and threatened species. Impacts to species

will be avoided through the implementation of **Mitigation Measure BIO-5a** and **Mitigation Measure BIO-5b**.

As described in Section 3.4, *Biological Resources*, the Proposed Action and Alternatives are not expected to effect NMFS listed species in the San Joaquin River; therefore, consultation with NMFS is not required.

Previous consultation with USFWS for the Existing Exchange Agreements was completed in 2015 when USFWS concurred with Reclamation's determination (1-1-04-I-1482) that the Proposed Action may affect, but is not likely to adversely affect giant garter snake.

Reclamation initiated informal consultation with USFWS on September 6, 2018 for the Proposed Action and Alternative 2. With the incorporation of the design constraints, a monitoring program, an adaptive management, and avoidance and minimization measures required of **Mitigation Measure BIO-5a** and **Mitigation Measure BIO-5b**, Reclamation determined that the Proposed Project and Alternative 2 *May Affect, But Is Not Likely To Adversely Affect* the giant garter snake. Reclamation will not issue a ROD until consultation is complete.

5.2.5 Fish and Wildlife Coordination Act

FWCA requires consultation with fish and wildlife agencies (federal and state) on all water development projects that could affect biological resources. The amendments enacted in 1946 require consultation with the USFWS and State fish and wildlife agencies "whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, or by any public or private agency under Federal permit or license". Consultation is to be undertaken for the purpose of "preventing the loss of and damage to wildlife resources".

As Reclamation will not be permitting or licensing construction of the River Ranch Recharge Basin under Alternative 2, should that alternative move forward, FWCA does not apply.

5.2.6 Magnuson-Stevens Fisheries Act

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 as amended (16 USC 1801 et seq.), is the primary act governing federal management of fisheries in federal waters, from the 3-nautical-mile state territorial sea limit to the outer limit of the United States Exclusive Economic Zone. It establishes exclusive United States' management authority over all fishing within the Exclusive Economic Zone, all anadromous fish throughout their migratory range except when in a foreign nation's waters, and all fish on the continental shelf. The Magnuson-Stevens Fisheries Act establishes eight Regional Fishery Management Councils responsible for the preparation of fishery management plans to achieve the optimum yield from United States fisheries in their regions. The act also requires federal agencies to consult with NMFS on actions that could damage EFH, as defined in the 1996 Sustainable Fisheries Act (Public Law 104-297). EFH includes those habitats that support the different life stages of each managed species. A single species may use many different habitats throughout its life to support

breeding, spawning, nursery, feeding, and protection functions. EFH can consist of both the water column and the underlying surface (e.g., streambed) of a particular area. The San Joaquin River in the Study Area is designated EFH for Chinook salmon. As described in Section 3.4, *Biological Resources*, the Proposed Action and Alternatives are not expected to effect EFH or NMFS listed species in the San Joaquin River; therefore, consultation with NMFS under this Act is not required.

5.2.7 Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Executive Order 13185 (Migratory Birds)

The MBTA (16 USC Sections 703-712) and the Eagle Act (16 USC 668-668d) prohibit the take of migratory birds (or any part, nest, or eggs of any such bird) and the take and commerce of eagles. Executive Order 13168 requires that any project with federal involvement address impacts of federal actions on migratory birds. As described in Section 3.4, *Biological Resources*, the construction of the River Ranch Recharge Basin under Alternative 2 could have potential to impact burrowing owls and Swainson's hawk. However, with **Mitigation Measure BIO-5a**, impacts would be reduced such that effects would not be substantially adverse under NEPA, and *less than significant* under CEQA. Thus, the lead agencies would be in compliance with the MBTA, Eagle Act, and Executive Order13185.

5.2.8 Farmland Protection Policy Act

The FPPA (17 USC Section 4201 et seq.) requires a federal agency to consider the effects of its actions and programs on the nation's farmlands. The FPPA is intended to minimize the impact of federal programs with respect to the conversion of farmland to nonagricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with state, local, and private programs and policies to protect farmland. As described in Section 3.7, *Land Use and Agricultural Resources*, while the potential for fallowing, idling, or retirement of farmland is high under the No Action Alternative due to the loss of a secure source of higher quality water, no long-term conversion of important farmland to non-agricultural use would occur under the Proposed Action or Alternatives. Under Alternative 2, there would be conversion of 85 acres of currently fallow agricultural farmland of local importance to an agricultural support use. However, the potential conversion of this agricultural land to nonagricultural uses has been anticipated by the County of Fresno, and impacts would not be significant. Thus, the Lead Agencies would be in compliance with the FPPA.

5.2.9 Clean Air Act

The United States Congress adopted general conformity requirements as part of the CAA Amendments in 1990 and the EPA implemented those requirements in 1993 (Section 176 of the CAA [42 USC 7506] and 40 CFR Part 93, Subpart B). General conformity requires that all federal actions "conform" with the SIP as approved or promulgated by EPA. The purpose of the general conformity program is to ensure that actions taken by the federal government do not undermine state or local efforts to achieve and maintain the national ambient air quality

standards. Before a federal action is taken, it must be evaluated for conformity with the SIP. All "reasonably foreseeable" emissions predicted to result from the action are taken into consideration. These include direct and indirect emissions, and must be identified as to location and quantity. If it is found that the action would create emissions above de minimis threshold levels specified in EPA regulations (40 CFR 93.153(b)), or if the activity is considered "regionally significant" because its emissions exceed 10 percent of an area's total emissions, the action cannot proceed unless mitigation measures are specified that would bring the proposed project/action into conformance. As described in Section 3.3, *Air Quality*, the study area lies within the San Joaquin Valley Air Basin. Neither the No Action or Proposed Action would result in significant new emissions compared to existing conditions and would not exceed de minimis thresholds. The results of the air quality modeling for Alternative 2 and the construction of an 85-acre groundwater recharge facility would not exceed Federal General Conformity significance thresholds. Thus, the Lead Agencies would be in compliance with the CAA.

5.2.10 Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)

Executive Order 12898 requires each Federal agency to achieve environmental justice as part of its mission, by identifying and addressing disproportionately high and adverse human health or environmental effects, including social and economic effects, or its programs, policies, and activities on minority populations and low-income populations of the United States. As described in Section 3.12, *Environmental Justice and Socioeconomics*, no significant adverse effects would occur to socioeconomic or environmental just from the Proposed Action and Alternatives. Thus, the Lead Agencies would be in compliance with Executive Order 12989.

5.2.11 National Historic Preservation Act of 1966

The purpose of the NHPA (16 USC 470) is to protect, preserve, rehabilitate, or restore significant historical, archeological, and cultural resources. Section 106 of the act requires Federal agencies to take into account effects on historic properties. Once an undertaking has been established, the Section 106 review involves a step-by-step procedure described in detail in the implementing regulations (36 CFR 800). As described in Section 3.14, *Archaeological, Cultural, and Paleontological Resources*, a historic property survey report, a pedestrian survey of the River Ranch Recharge Basin, and a formal Cultural Resources Investigation were conducted and prepared for the Proposed Action and Alternatives. Further, formal consultation has been initiated with Tribes and Native American individuals and will continue to occur throughout the NEPA and NHPA Section 106 process. Reclamation consulted with, and received concurrence from, SHPO on a finding of no historic properties affected pursuant to 36 CFR Part 800.4(d)(1). Thus, the lead agencies are in compliance with the NHPA.

5.3 Agency Coordination

The development of the EIS/EIR required consultation and coordination with Federal, State and local agencies.

5.3.1 Federal Agencies

As described above, USFWS was consulted to evaluate potential impacts of the Proposed Action and Alternatives on federally listed threatened and/or endangered species, particularly the giant garter snake.

5.3.2 State Agencies

The CDFW were consulted as part of the EIS/EIR process to understand and appropriately address their concerns regarding surface water quality at the MWA. This included several meetings over the course of document preparation as well as a field visit to the MWA.

5.3.3 Local Entities

The Exchange Contractors have been consulted throughout the development of the EIS/EIR and supporting Groundwater Model. They have performed review of the methodology used to develop the Groundwater Model as well as the results of the model. They have also participated in the process for refining the Proposed Action (e.g., revised design constraints) and development of Alternative 2. The Exchange Contractors were also consulted during the EIR process and participated in working meetings in April 2016 and March 2017. The Exchange Contractors were further provided a preliminary Draft EIS/EIR for review and comment in September 2017.

Reclamation contacted the Picayune Rancheria, the Tule River Indian Tribe, and the Santa Rosa Rancheria to provide the opportunity to express concerns and assist in cultural resources identification efforts. Reclamation also contacted several individuals who were identified by the NAHC as possibly having an interest in the general project area.

To date, Westlands have received several requests for consultation from local tribal governments for the Proposed Action and Alternatives.

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