

RECLAMATION

Managing Water in the West

Environmental Assessment 16-7-MP

Volta Wells – 5-Year Incremental Level 4 Groundwater Pumping/ Level 2 Diversification Project

Refuge Water Supply Program
Bureau of Reclamation, Mid-Pacific Region
Sacramento, California



U.S. Department of the Interior
Bureau of Reclamation

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Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to 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.

Section 1 Introduction

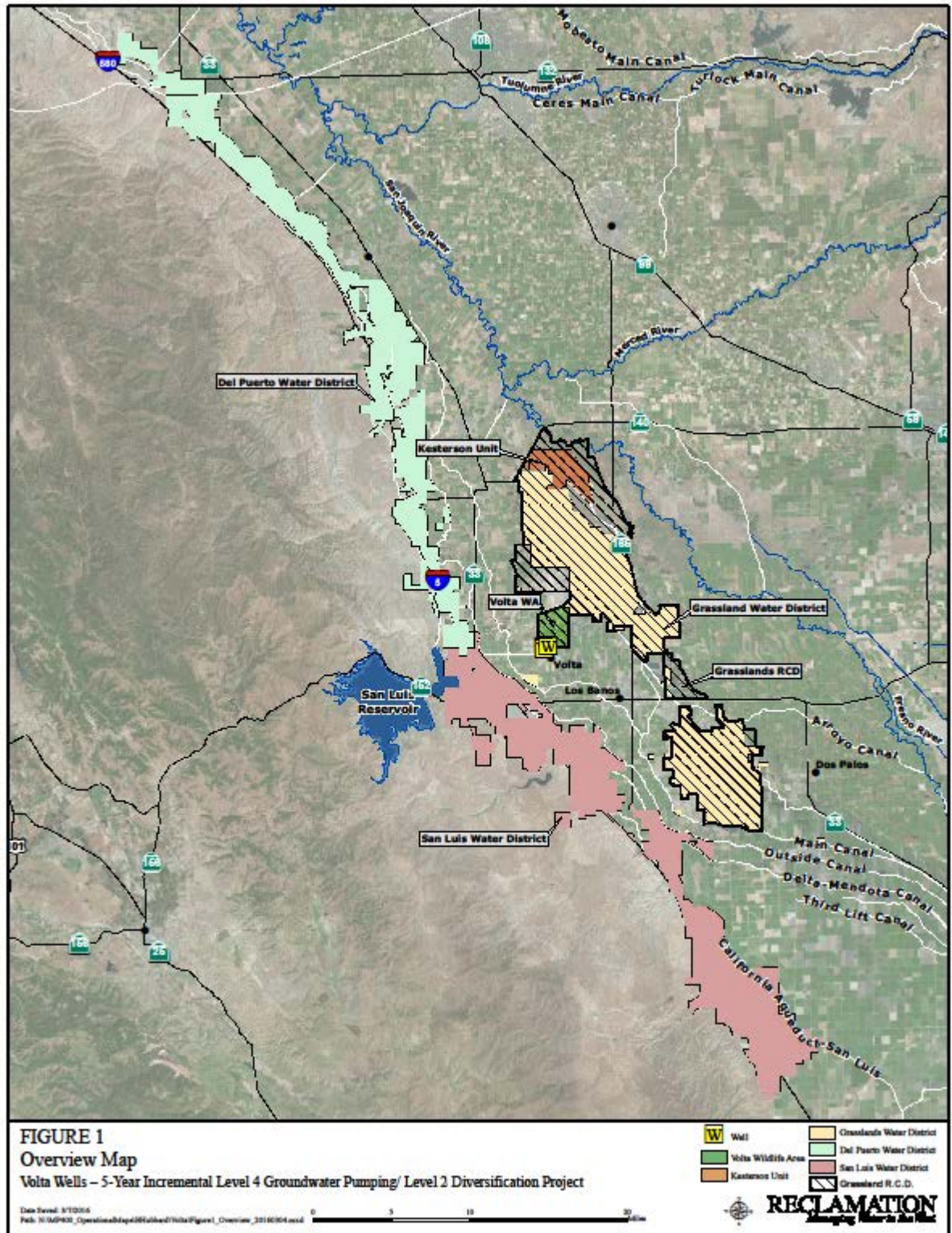
This Environmental Assessment (EA) has been prepared by the Bureau of Reclamation (Reclamation) to examine the potential direct, indirect, and cumulative environmental impacts associated with its development of groundwater and entering into an agreement with the Del Puerto Water District (DPWD) and the San Luis Water District (SLWD) for the Volta Wasteway (VW) Wells (aka “Volta Wells”) 5-Year Incremental Level 4 (IL4) Groundwater Pumping/ Level 2 (L2) Diversification Project (Proposed Action).

The Proposed Action, located in the Merced, San Joaquin, and Fresno counties of California (see **Figure 1**), would allow for the pumping of up to 6,600 af of groundwater per year. Such groundwater would be a) delivered to certain South-of-Delta (SOD) Central Valley Project Improvement Act (CVPIA) designated federal wildlife refuges, state wildlife areas, and private wetlands (collectively referred to as “Refuges”), and b) exchanged for SOD Refuge Level 2 (L2) surface refuge water supplies with the DPWD and the SLWD. The Volta Wells are also located in the Volta Wildlife Area (VWA).

1.1 Need for the Proposal

Pursuant to CVPIA, Reclamation is responsible for providing L2 (422,251 acre-feet, af) and IL4 (133,264 af) water supplies to 19 designated federal, state, and privately owned/managed wetlands and wildlife areas in California’s Central Valley. L2 water supplies are primarily provided from the Central Valley Project’s (CVP) annual surface water yield. Reclamation acquires IL4 water supplies through various means, including spot market purchases, exchanges, and groundwater development. IL4 supplies are not provided directly from the CVP’s annual yield. L2 and IL4 water supplies combined equal full Level 4 (L4) water (555,515 af) for all 19 CVPIA Refuges in the Central Valley.

The need for the Proposed Action is to develop (via groundwater pumping) IL4 groundwater supplies for SOD Refuges through a Reclamation agreement with the DPWD and the SLWD, who would fund the groundwater pumping. The developed groundwater would augment IL4 annual water supplies available for allocation to SOD Refuges. SOD Refuges have a critical need for groundwater supplies to supplement limited surface water supplies (i.e., L2 water, for example) for developing and sustaining wetland habitats in support of resident and migratory birds, particularly during times of severe drought. Having sufficient wetland habitat for birds would help prevent overcrowding and reduce avian bird diseases.



Additionally, a portion (up to 50%) of the groundwater developed and delivered to the SOD Refuges could be exchanged with SOD Refuge L2 water supplies to benefit agricultural irrigation within the DPWD and the SLWD. SOD CVP water districts have experienced severe surface water shortages due to ongoing drought conditions as well as regulatory and environmental limitations placed on surface water exported from the Sacramento-San Joaquin River Delta.

Section 2 Proposed Action and Alternatives

2.1 No Action Alternative

The No Action Alternative would consist of Reclamation not entering into an agreement with the DPWD and the SLWD to fund the pumping of groundwater supplies and/or exchange of Refuge L2 water for groundwater supplies to help meet SOD Refuges' demand for IL4 water, as well as exchange of Refuge L2 water for irrigation and uses. The pumping of the wells for purposes defined in this EA would not occur. Groundwater would not be developed and delivered to SOD Refuges to help meet IL4 refuge water needs. The volume of groundwater pumped would likely decrease. The DPWD and SLWD would not be able to utilize Refuge L2 water.

2.2 Proposed Action Alternative

Reclamation proposes to diversify SOD Refuge L2 and supplement SOD Refuge IL4 water supplies by pumping groundwater from two groundwater wells located at the VW. Reclamation proposes to enter into an agreement with the DPWD and the SLWD to fund groundwater pumping in exchange for Refuge L2 Water (Proposed Action). The groundwater pumping is proposed as a 5-year action (June 2016 through February 2021). The Proposed Action will include monitoring well production, water quality, groundwater levels, and land subsidence. Monitoring would occur at each well location to confirm that groundwater quality is suitable for refuge use. Based on the data acquired, a determination could be made to modify or curtail the groundwater pumping operations at any time during the 5-year period to mitigate potential impacts.

The Volta Wells would collectively produce up to 6,600 AF of groundwater of acceptable quality annually, which can be conveyed to SOD Refuges. Monitoring data would be used to ensure that the Proposed Action would not result in significant impacts to any resources identified in this EA, including water quality within the delivery canals and groundwater levels in the area of the Proposed Action. The Proposed Action would utilize existing facilities and would not involve any ground disturbance or construction. The groundwater would be

conveyed down the VW to Pond 10 where the Grassland Water District (GWD) would divert the water into their internal conveyance system for distribution to various Refuges within the Grassland Resource Conservation District (GRCD). The Volta Wells could pump groundwater up to 24 hours a day all year long as long as the water is of acceptable quality that can be conveyed and used within SOD Refuges.

The groundwater pumping may be directly funded by Reclamation or funded by DPWD and SLWD, , in exchange for a smaller volume of Refuge L2 water supplies. The exchanged Refuge L2 water would be used for agricultural purposes within DPWD and SLWD.

The groundwater would be substituted in lieu of SOD Refuges receiving a portion their Refuge L2 surface water supply. In order for the exchange to be effective, the GRCD must be taking delivery of Refuge L2 surface water supplies during the groundwater pumping. The timing of the GRCD scheduled Refuge L2 water supply deliveries determines the availability of L2 diversified water.

The use of groundwater is expected to free up to 3,300 acre-feet of Refuge L2 water supply annually. The Refuge L2 water freed up by groundwater substitution would be delivered to the DPWD and the SLWD. The DPWD and the SLWD would utilize the Refuge L2 water supply within their service areas for reasonable and beneficial use. The Proposed Action would diversify Refuge water supply, improve water supply reliability, and minimize adverse impacts to CVP agricultural contractors.

Section 3 Affected Environment and Environmental Consequences

This section discusses the affected environment and environmental consequences of the Proposed Action and the No Action Alternative, in addition to environmental trends and conditions that currently exist.

Potential impacts to the following resources were considered and found to be minor. Brief explanations for the impacts are provided below:

- **Indian Trust Assets (ITA):** ITAs are legal interests in assets that are held in trust by the United States for federally recognized Indian tribes or individuals. The closest ITA to the Proposed Action activity is the Native American land allotment (50H CA12519) about 36.6 miles to the south/southeast. Based on the nature of the planned work it does not appear to be in an area that will impact Indian hunting or fishing resources or water rights nor is the proposed activity on actual Indian lands. The Proposed Action does not have the potential to affect ITAs.
- **Indian Sacred Sites:** The Proposed Action would not affect and/or prohibit access to and ceremonial use of Indian sacred sites.
- **Cultural Resources:** Reclamation has determined that the proposed action is the type of undertaking that does not have the potential to cause effects on historic properties, should such properties be present, pursuant to 36 CFR § 800.3(a)(1). As such, Reclamation has no further obligations under 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA).
- **Environmental Justice:** Executive Order 12898 requires each Federal agency to identify and address disproportionately high and adverse human health or environmental effects, including social and economic effects of its program, policies, and activities on minority populations and low-income populations. No significant changes in refuge management or in agricultural communities or practices would result from the Proposed Action, other than potential production of groundwater or exchange of water. These changes are not likely to have effects to any individuals or populations within the action area. Accordingly, the Proposed Action would not have disproportionately negative impacts on low-income or minority populations within the study area.

The overall study area includes specific analysis for each resource that may be directly or indirectly affected by groundwater pumping and the use of groundwater for habitat management purposes within or near the GRCD, and the Grassland Ecological Area (GEA). The overall study area also includes the DPWD and the SLWD. These districts are expected to be part of the Proposed Action as signatories to an exchange agreement. DPWD and SLWD are located on the west side of San Joaquin, Merced, and Fresno counties and the GRCD and GEA are located in Merced County (**Figure 1**). The counties are bounded by the Sierra Nevada Mountains to the east and the Pacific coastal range to the west. The Refuges that can receive water from the Proposed Action are also located in this general vicinity and are also shown on **Figure 1**. The study area region is characterized by flat valley lowland wetlands and agricultural lands, with a climate that is cool and moist in the winter and hot and dry in the summer.

The 58,000 acre GRCD is located in western Merced County, several miles away from the City of Los Banos (**Figure 1**). The GRCD has primarily been managed as a seasonally flooded wetland to provide for the habitat needs of migratory waterfowl and associated species. The GRCD provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, and wading birds. Black-necked stilts, sandpipers, dunlins, and dowitchers are the dominant shorebird species.

3.1 Surface Water Resources

3.1.1 Affected Environment

Volta Wildlife Area and Volta Wasteway

The VWA is owned by Reclamation and managed by the California Department of Fish and Wildlife through a lease agreement. Refuge full L4 water is to be provided to SOD State Wildlife Areas by Reclamation (Contract No. 01-WC-20-1756, signed January 19, 2001). The total amount of Refuge L4 water allocated to the VWA is 16,000 acre-feet per year (13,000 AF L2, and 3,000 AF IL4). The contract also identifies 3,000 acre-feet/year of L4 “replacement” water which was provided to the VWA prior to CVPIA. Refuge L2 water is delivered to the VWA from the San Luis Reservoir and O’Neill Forebay via the DMC and the VW. The VW enters the VWA at the southwest corner and passes through the center. Surface water is lifted into two ditches by low lift pumps near Ingomar Grade Road. The ditches convey water to the eastern and western sections of the VWA. Water flows from the boundary ditches to the internal ditches by gravity. The ditch along the southern boundary contains runoff from an adjacent dairy. Water is also diverted from the VW via outtake pipes located near a check dam in the center of the VWA. (Reclamation, 2001a)

GRCD-Private Wetlands

Reclamation is to provide full Level 4 water to the GWD for delivery to the GRCD's private wetlands (Contract No. 01-WC-20-1754, signed January 19, 2001). The total amount of Refuge L4 water allocated under contract to the GWD for delivery to the GRCD's private wetlands is 180,000 acre-feet per year (125,000 AF L2, and 55,000 AF IL4). Refuge L2 surface water is delivered to the GWD from water pumped from the Delta by the CVP Jones Pumping Plant and conveyed via the DMC to the Mendota Pool in the San Joaquin River. A series of GWD's canals and ditches convey Refuge water supplies to private wetlands within the GRCD. (Reclamation, 2001b)

Refuge water supplies flow through the VW into Pond 10 at the northern end of the VWA, from there it is delivered to the GWD for certain GRCD private wetlands. This is one of the many GWD water delivery locations for the GRCD. GWD delivers IL4 water supplies to the GRCD's private wetlands from a variety of sources. Historically, Reclamation has made annual purchases of up to 49,000 AF of IL4 water from the San Joaquin River Exchange Contractors (SJREC). Reclamation also acquires up to 29,000 AF of groundwater from wells that are within or in close proximity to the GRCD as part of other GWD water supply projects.

GRCD- Other Local Refuges, Wildlife Areas and Refuge Conveyance

In 1998, Reclamation and the GWD entered into a cooperative agreement to obtain the conveyance of a firm water supply of suitable quality by the District to the Kesterson and Freitas Units of the San Luis National Wildlife Refuge Complex, Salt Slough Unit of the North Grasslands Wildlife Area, Los Banos Wildlife Area, the GRCD, and private wetlands. This agreement is scheduled to end on February 28, 2023. (Reclamation, 1998).

Agricultural Areas

In the early 1950's, the DMC was constructed by Reclamation. During and after construction of the DMC, major development of farmland occurred on the western side of the San Joaquin Valley and led to the formation of DPWD, SLWD and other water districts in the area.

DPWD has a water service contract with Reclamation for 140,210 acre-feet of agricultural water (DPWD 2011, page 3-4). DPWD serves approximately 45,229 irrigable acres with agricultural water supplies. No urban population is served by DPWD. All water deliveries are made "canalside" from the DMC through turnouts installed and owned by Reclamation, licensed for DPWD's use, and operated and maintained by the San Luis Delta-Mendota Water Authority. The few natural water resources within DPWD boundaries include ephemeral streams that flow primarily through open natural channels into neighboring water districts before entering the San Joaquin River.

On June 18, 1974, Reclamation and SLWD entered into a long term water service contract that provided for both agricultural and M&I service from either the DMC or SLC and increased SLWD's firm water supply to 128,000 acre-feet. This contract does not identify specific quantities of agricultural versus M&I water nor does it identify specific quantities to be delivered from the DMC versus the SLC. SLWD also entered into a contract with Reclamation at this same time for a Public Law 130 construction loan to build distribution facilities for ID 2 and ID 3. These facilities were constructed during 1975 and 1976. Water deliveries to ID 2 and ID 3 began in January and March of 1977, respectively. SLWD's water service contract was amended in December of 1975, as a result of excluding land from the District, to reduce the contract quantity by 2,920 acre-feet. SLWD's current contract quantity is 125,080 acre-feet. (SLWD, 2012, page 2)

Supplemental water transfers have always been used extensively by SLWD, however the projected decreases in average CVP allocations will result in expensive supplemental water becoming the largest share of SLWD's water portfolio. (SLWD, 2012, page 3) Virtually all of the transfers into SLWD are for a single year only and cannot be relied upon as a long-term supply. The District has an extensive internal water transfer program for landowners and water users to better manage their water supplies to meet their needs. (SLWD, 2012, page 3)

3.1.2 Environmental Consequences

No Action

Under the No Action Alternative, there would be no change to existing conditions and current trends of the affected environment.

Proposed Action

The Proposed Action would not impact surface water supplies because a net increase or decrease in CVP surface water supplies being delivered south of the Delta would not occur. The total amount of CVP surface water delivered south of the Delta would remain the same. Surface water and pumped groundwater would be comingled for reasonable and beneficial use within the GRCD, to meet habitat needs for wildlife. DPWD and SLWD would receive Refuge L2 surface water supplies through exchange. Delivering Refuge L2 water to DPWD and SLWD would not trigger new surface water resources' impacts or impacts of greater magnitude than those impacts already considered in the exchange parties' CVP water service contracts.

Cumulative Impacts

No adverse impacts to surface water resources would result from implementation of the Proposed Action, therefore, the Proposed Action would not contribute to cumulative impacts to surface water resources.

3.2 Groundwater and Geologic Resources

3.2.1 Affected Environment

Volta Wildlife Area and Volta Wasteway

Geographically the VWA is located in Merced County within the Delta-Mendota Subbasin of the San Joaquin Valley Groundwater Basin. Groundwater supplies are present in unconsolidated deposits extending to 800 feet or more below grade. An upper, semi-confined aquifer extends from approximately 50 to 450 feet below grade (DWR 2003). The Corcoran Clay aquitard provides a confining layer that is thick enough to separate the upper semi-confined aquifer from deeper alluvial deposits, which form the lower aquifer (DWR 2006). Wells screened above the Corcoran Clay may be in hydraulic communication with overlying surface water features, such as refuge wetlands, whereas wells screened in the lower aquifer are not likely to affect surface waters. Due to the potential for mixing waters between the two aquifer units, the Merced County Environmental Health Department prohibits the construction of wells that are open to both aquifers within the same casing (Merced County Ordinance 9.28.060). This Ordinance was passed and approved by the Merced County Board of Supervisors on March 17, 2015 (Merced County, 2015). This Ordinance passed after Reclamation constructed the wells.

During 2010 and 2011, Reclamation constructed two production wells—Well #1 and Well #2—near the Volta Wasteway. The wells are approximately 1,500 feet apart, at locations selected by Reclamation. The wells were constructed to depths of 770 and 780 feet below ground surface (bgs), respectively, with 0.25-inch-thick, 18-inch-diameter, mild steel, blank well casings and 0.040-inch-diameter, mild steel, wire-wrap well screens in the confined aquifer below the regionally extensive Corcoran Clay aquitard.

GRCD

Geographically the GRCD is located in Merced County within the Delta-Mendota Subbasin of the San Joaquin Valley Groundwater Basin. Approximately 29,000 AF of groundwater is expected to be used for Refuges' purposes in and near the GRCD annually. The groundwater developed for IL4 purposes will be used at SOD Refuges. In addition, a portion of the groundwater pumped is used to exchange with SOD Refuge L2 water supply, by freeing up a portion of Refuge L2 surface water supplies for use by agricultural contractors. SOD Refuges receive 100% of the groundwater pumped.

Surrounding Region

The region is heavily groundwater reliant. Within the region, groundwater accounts for about 30 percent of the annual supply used for agricultural and urban purposes. Groundwater use in the region accounts for about 18 percent of statewide groundwater use for agricultural and urban needs. Groundwater

use in the region accounts for 5 percent of the State's overall supply from all sources for agricultural and urban uses (DWR 2003).

Groundwater wells commonly extend to depths of up to 800 feet. Aquifers include unconsolidated alluvium and consolidated rocks with unconfined and confined groundwater conditions. Typical well yields in the San Joaquin Valley range from 300 to 2,000 gallons per minute with yields of 5,000 gallons per minute possible. The region's only significant basin located outside the San Joaquin Valley is Yosemite Valley. The Yosemite Valley Basin supplies water to Yosemite National Park and groundwater wells in the basin have substantial well yields (DWR 2003).

Groundwater supplies in the region are declining due to a long-term overdraft condition caused by over-pumping. However, due to reliable surface water deliveries to the refuges in the area and the neighboring SJREC, the groundwater level in the vicinity of the proposed wells remains stable and the pumping of the wells for refuge water purposes is not expected to impact local groundwater resources (GWD 2011).

Based on well completion reports received by the California Department of Water Resources (DWR) in 2014 (through September 2014), more than 200 water supply wells are reported in Merced County. (DWR 2014 pages vii, 5 and 9). The Delta-Mendota subbasin is listed by DWR as a High Priority Unmonitored Basin as of October 7, 2014. (DWR 2014, Table 1 page 25)

Land subsidence due to groundwater withdrawal is triggered by decreases in pore pressure in a confined aquifer system containing clay layers (typically montmorillonite or kaolinite clay). The decrease in pore pressure increases the effective stress on the aquifer skeleton. If this effective stress exceeds the maximum stress to which the aquifer skeleton has been subjected in the past, the clay layers can undergo permanent compaction (USGS 2009).

Elastic subsidence occurs in response to seasonal changes in pore pressure within the aquifer system. Elastic subsidence is a characteristic of any confined aquifer system and does not result in permanent compaction (USGS 2009).

DPWD

California DWR Bulletin 118 has identified that the DPWD is in two sub-basins of the San Joaquin Valley Groundwater Basin. These are the Tracy Subbasin and the Delta-Mendota Subbasin. The Tracy Subbasin has a surface area of 1,170 sq. mi. with no published groundwater values. In DPWD, groundwater is used when and where surface water is unable to meet demands (as available). Groundwater from private wells is introduced into the DMC under the auspices of the DPWD's Warren Act Contract and redelivered to lands commonly held by the individuals that pump the groundwater supply. However, groundwater is spotty in many areas of the DPWD and/or lacks the quality requirements for cropping.

SLWD

SLWD does not own any groundwater wells. Approximately 6,000 acres within SLWD overlie usable groundwater supplies. The quality of the groundwater is poor, averaging in excess of 1,000 parts per million of total dissolved solids. Some of this acreage is served exclusively by wells, while in other cases the wells are used to supplement water supplies. All wells in this area are privately owned and operated. SLWD does not have specific pumping information regarding these wells, but it is estimated that approximately 10,000 acre feet of groundwater are pumped annually (SLWD 2012).

3.2.2 Environmental Consequences**No Action**

The No Action Alternative would consist of Reclamation not entering into an agreement for the funding of operations and maintenance of the wells or for exchange of L2 water for groundwater supplies to help meet the demand for IL4 water in the GRCD, and the pumping of the wells for purposes defined in this EA would not occur. Groundwater would not be developed and delivered to GRCD lands to help meet IL4 refuge water needs. The volume of groundwater pumping within the GRCD would likely decrease. Some agricultural water users would not be able to utilize L2 water.

Proposed Action

Groundwater would be produced from the two Reclamation owned wells for use within GRCD. Groundwater would be pumped in an amount up to 6,600 AF annually for refuge water supplies. The actual amount of groundwater produced in a given water year would be dependent on the productivity of the wells and other factors, such as water quality and refuge demand. Groundwater produced by the production wells would be discharged into the VW conveyance system and mixed with surface water for dilution (when available). All groundwater produced during the Proposed Action would be used for refuge management purposes in the GRCD. Pumping would only occur if monitoring data indicates water quality is suitable for refuge use and groundwater levels are projected to be sustainable during the life of the Proposed Action.

Increased use of groundwater in Merced County could potentially affect groundwater levels, surface water groundwater interactions, and rates of inelastic land subsidence. These types of potential impacts would not occur beyond the VW, the GRCD and the immediate vicinity as a result of the Proposed Action. Although an increase in groundwater extraction would occur, the amount is minimal when compared to total groundwater use in the San Joaquin Valley hydrological region. Average groundwater usage in the region accounts for about 30 percent of the annual supply used for agricultural and urban purposes. DWR estimates that total groundwater pumping from the Delta-Mendota Subbasin is 500,000 AF per year (DWR 2003). Average

pumping in the general area of GRCD, however, is minimal due to relatively stable surface water supplies. In addition, there are very few domestic residences located within the GRCD, and the majority of GRCD land is not used for irrigated agriculture. GWD estimates that annual groundwater recharge from its water conveyance system is approximately 29,000 AF per year, which provides an equivalent amount of groundwater recharge to offset the amount of proposed refuge groundwater pumping (GWD 2011). Total groundwater recharge for all of GWD's wetland habitat management activities is estimated to be much higher. The exchanged Refuge L2 Water would be delivered to the DPWD and SLWD for beneficial use to meet unmet demand due to the ongoing shortage of surface water in their respective district areas.

Reclamation's June 1, 2010 Finding of No Significant Impact and Environmental Assessment analyzed the impacts of pumping the Volta Wells on local groundwater and geologic resources including the cumulative effects from associated with other local wells (Ingomar Packing Company and Morning Star Packing Company). This groundwater level and aquifer impact analysis included on pages 17-20 of Reclamation's existing NEPA Environmental Assessment for the *Volta Wildlife Area Level 2 Diversification/ Incremental Level 4 Development Pilot Project*, May 2010 (Reclamation 2010). This analysis on pages 17, 18, 19 and 20 of this 2010 EA is incorporated by reference. An evaluation shows that there are no new circumstances or changes in the action or its impacts that would result in significantly different environmental effects.

Groundwater Levels

Monitoring data indicates that groundwater levels in the vicinity of the Proposed Action are relatively stable. Groundwater levels fluctuate somewhat throughout the year, and recharge of the subbasin generally occurs from October through February (GWD 2011). Under the Proposed Action, 6,600 AF per year would be a minimal increase to the average regional groundwater use. If monitoring indicates a significant sustained decline in groundwater levels in the relevant vicinity of the proposed wells, and that any such decline is not directly attributable to a cause other than the Proposed Action, then pumping would be modified or terminated as necessary to avoid any significant adverse impacts.

The Volta Wells are each equipped with a pressure transducer (sensor) that measures the water pressure above the sensor in the well casing that is reported as the depth of water, in feet, above the sensor. A comparison of the "depth of water above the sensor" data for Water Years 2011 – 2014 shows that groundwater levels at the two wells have remained remarkably constant, with the difference in pre-pumping and post-pumping "depth of water above sensor" values varying less than a few feet over the four year period. Again, this indicates the very high transmissivity of the soils in the vicinity of the wells and the rapid response of the aquifer and recovery of groundwater levels in the vicinity of the wells after well shut off. This rapid recovery of groundwater levels in the Volta Wells is also an indication of the stability of groundwater levels due to the

tremendous groundwater recharge associated with the large volume of imported surface water in the region. This comparison is included in existing NEPA analysis within the Reclamation's December 2015 Environmental Assessment for the *5-Year Groundwater Acquisitions for South of Delta Central Valley Project Improvement Act Refuges* (Reclamation 2015). This analysis on pages 15, 16, and 17 of this 2015 EA is incorporated by reference. An evaluation shows that there are no new circumstances or changes in the action or its impacts that would result in significantly different environmental effects.

Land Subsidence

One of the generally unrecognized limitations in groundwater availability is subsidence from groundwater withdrawal. If pumpage demands are large enough and certain geologic formations are present, subsidence can occur. In the San Joaquin Valley, land subsidence has resulted in damage to buildings, aqueducts, well casings, bridges, and highways and has caused flooding. These damages have cost millions of dollars (USGS 2009). Subsidence is unlikely to occur as a result of the Proposed Action. The total volume of groundwater produced would be minimal when compared to regional groundwater pumping in the western San Joaquin Valley. The United States Geological Survey (USGS) recently completed a thorough subsidence study that documented land subsidence to the south of the GRCD, but not within GRCD (USGS 2013). Subsidence has been minimal or nonexistent within the VWA and the GRCD. Continued deliveries of L2 and IL4 surface water for wetland habitat management, in combination with precipitation from winter storms, would allow for sufficient recharge to offset any minor decreases in pore pressure caused by the Proposed Action.

Land subsidence is caused by subsurface movement of earth materials. Principal causes of subsidence within the San Joaquin Valley include: aquifer compaction due to groundwater pumping, hydrocompaction caused by application of water to dry soils, and oil mining. Large withdrawals of groundwater within the San Joaquin Valley between the 1920s and 1960s for agricultural irrigation caused significant overdraft within the central west side of the valley and most of the southern valley causing substantial land subsidence within those areas. Importation of surface water from the CVP and State Water Project (SWP) starting in the 1970s decreased the rate of groundwater withdrawal allowing aquifer levels to recover subsequently reducing subsidence rates. Recently, groundwater pumping rates have increased throughout the San Joaquin Valley due to regulatory and drought-related curtailments placed on water deliveries from the CVP and SWP, resulting in groundwater level declines and renewed compaction.

In 2013, the USGS, in cooperation with Reclamation and the San Luis & Delta-Mendota Water Authority, published a Scientific Investigations Report which assessed land subsidence and water levels in the vicinity of the Delta-Mendota Canal (DMC) from 2003-2010 (USGS 2013). Analysis of land surface deformation determined that the northern portion of the DMC was relatively stable between 2003-2010 but that the area around Checks 15-21 (below O'Neill Forebay to the Mendota Pool) was part of a large area of subsidence located south

of the town of El Nido, indicating a shift northeast of the area of maximum subsidence previously recorded for the 1926-1970 period. The area affected by 0.07 feet or more of subsidence extended about 50 miles west-east, from Check 17 of the DMC to the town of Madera, and 25 miles north-south, from near Merced to near Mendota. Maximum subsidence was at least 1.8 feet during 2008–2010.

Various entities, including Reclamation, USGS, DWR, San Luis & Delta-Mendota Water Authority, and the SJREC have been monitoring subsidence trends within the Central Valley. In 2011, Reclamation established the San Joaquin River Restoration Program (SJRRP) Geodetic Control Network to begin monitoring subsidence within the SJRRP Restoration Area. Subsidence in the SJRRP Restoration Area has been conducted biannually since 2011. In addition, due to significant subsidence rates along the flood control bypasses that parallel the San Joaquin River (some localized areas showing rates of more than 1 foot per year), DWR has collected levee survey data to help further refine the estimated annual rates along the levees of the flood bypasses.

To provide a general estimate of the potential subsidence rates and trends within the Restoration Area and surrounding areas, Reclamation developed an exhibit map (see **Appendix A** for all subsidence figures and maps) that combined data from various sources prior to the 2011 data collection effort. Subsidence data collected in 2015 indicates that subsidence rates in the study area declined (improved) in the July 2013 to December 2015 period with rates ranging from +0.15 to -0.15 feet per year, or essentially neutral (Reclamation 2015). The overall subsidence rates in the study area for the period of December 2011 to December 2015 were again in the +0.15 to -0.15 feet per year, or essentially neutral. These measured subsidence rates and the associated analysis indicates that land subsidence in and around the study area are not being impacted by groundwater pumping (See **Appendix A**).

Although land subsidence has been measured within the Delta-Mendota Subbasin, most of it has occurred south and east of the GRCD and has been associated with pumping from the lower confined zone, beneath the Corcoran Clay. The area in the vicinity of the Proposed Action wells has not been identified as a critical land subsidence area. Subsidence is unlikely to occur as a result of the Proposed Action. Although pumping would occur from beneath the Corcoran Clay, the total volume of groundwater produced is minimal when compared to regional groundwater pumping in the San Joaquin Valley. Most of the groundwater production in the San Joaquin Valley occurs above the Corcoran Clay. In addition, there would be sufficient recharge during the non-pumping periods which would offset any decreases in pore pressure caused by the Proposed Action.

As part of the Groundwater Level and Subsidence Monitoring Plan (**Appendix A**) and as part of GWD's ongoing Groundwater Management Plan, GWD and other

water districts included in the Proposed Action would collaborate with the San Luis & Delta-Mendota Water Authority and the Central California Irrigation District, which maintain local land subsidence monitoring programs. Reclamation will annually review the results of all of these monitoring programs and work with the monitoring agencies to the extent practical to address any regional problems associated with land subsidence.

Cumulative Impacts

When added to past, present, and future foreseeable action, the Proposed Action would contribute a minor increase in groundwater production in the general vicinity. Private and publically owned wells in and near the study area would continue to be utilized for groundwater development during the Proposed Action. It is not anticipated that pumping during the Proposed Action would substantially impact the upper aquifer system or the lower aquifer beneath the Corcoran Clay.

The impact of pumping up to 6,600 AF per year under the Proposed Action when compared to the pumping that occurs under the 5-Year Groundwater Acquisitions for South Of Delta CVPIA Refuges Project (up to 29,000 AF per year total) and the 15-year Department of Fish and Wildlife groundwater pumping project (up to 16,520 AF per year total) for South of Delta Refuges (titled: *AGREEMENT FOR THE REIMBURSEMENT OF PUMPING COSTS FOR REFUGE WATER SUPPLIES AT DEPARTMENT OF FISH AND WILDLIFE REGION 4 WILDLIFE AREAS BETWEEN THE UNITED STATES AND THE STATE OF CALIFORNIA – Agreement No. 15-WC-20-4671*) would contribute to a minimal increase in groundwater pumping in the vicinity of the wells during the 5-year Proposed Action. This cumulative impact would not be substantial because groundwater levels would be monitored, and if required, actions would be taken to avoid adverse impacts. Monitoring has indicated pumping from existing wells over the course of many years has not had a negative impact on groundwater elevations (GWD 2011; GWD 2012).

3.3 Water Quality

3.3.1 Affected Environment

Volta Wildlife Management Area

The Volta Wells' water qualities have been extensively monitored since their operation began in 2011. The most recent water quality monitoring results are attached in **Appendix C** for reference.

From measurements taken at these two wells and from the local monitoring wells (See **Figure 2** – Location Map): Total dissolved solids (TDS) concentrations generally range from 100 to 3,600 milligrams per liter (mg/L) (Reclamation 2010



pages 20-21). The 2014-2015 data for EC at the well head ranged from 939 to 1599 $\mu\text{S}/\text{cm}$. The 4 Week running average for EC upstream vs downstream measurements is shown on **Figure 3**. Well # 1 has higher levels of EC than Well #2. Boron concentrations from the two wells typically range from 0.8 mg/L to 1.1 mg/L. Selenium concentrations from the wells are low.

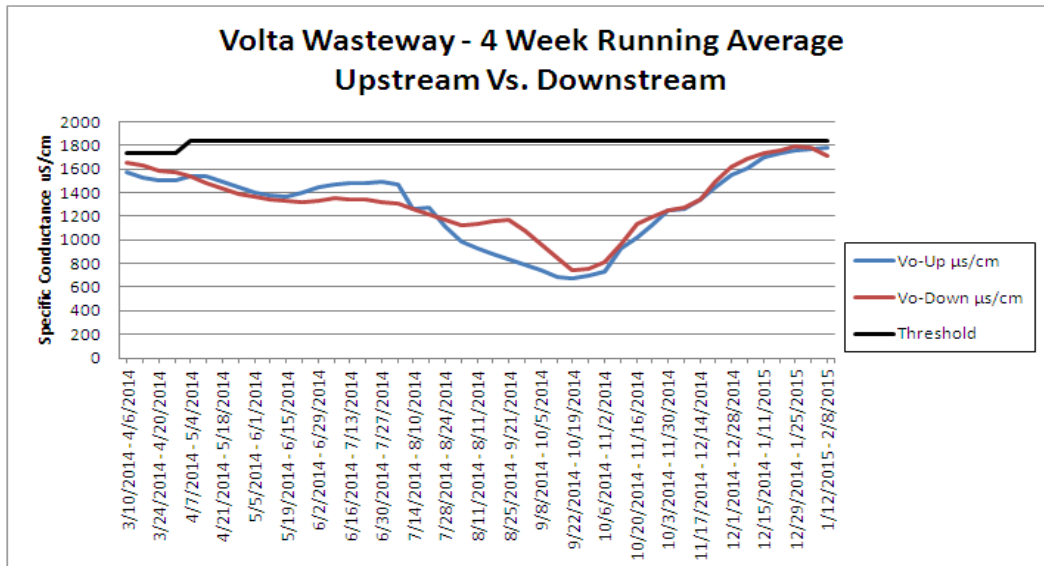


Figure 3. From the Volta Pilot project data: Four week running average electrical conductivity (EC) upstream and downstream of the Volta Wasteway well discharges.

3.3.2 Environmental Consequences

No Action

The No Action Alternative would consist of Reclamation not entering into agreements with water districts to fund groundwater pumping supplies or exchange of L2 water for groundwater supplies to help meet the demand for IL4 water in the GRCD, and the pumping of wells for IL4 purposes would not occur. The production wells would not be operated for refuge water supply purposes. Groundwater pumping would likely decline within the GRCD.

Proposed Action

Groundwater Quality

Various water-management actions potentially have groundwater quality effects. Therefore, water quality needs to be considered in conjunction with information about changes in water levels and water in storage in evaluating the availability and sustainability of groundwater. The Proposed Action would implement a water quality monitoring plan (see **Appendix B**) to ensure that water quality

standards for TDS and selenium are not exceeded. If water quality monitoring indicates unsuitable water quality, pumping operations would be modified or curtailed as necessary to stay in compliance with established thresholds. Further detail is provided in the Water Quality Monitoring Plan (WQMP) included in **Appendix B**.

The potential for poor-quality water to be extracted under the Proposed Action exists, however, based on the results of the Pilot study over the last few years, it is unlikely to occur. The WQMP would avoid or mitigate for unsuitable water quality to ensure that no adverse impacts occur to surface water supplies during the Proposed Action.

Within the local area and within the GRCD, GWD regularly monitors for three water quality constituents: total dissolved solids (TDS), selenium (Se), and boron (B). GWD uses instantaneous monitoring techniques through a grab sample analysis, and all grab samples are promptly and independently analyzed by a federally approved laboratory. GWD also regularly monitors water temperature and pH.

Surface Water Quality

Current groundwater monitoring plans require GWD to monitor for TDS, selenium, and boron in GWD's surface water channels. For selenium, the Regional Water Quality Control Board (RWQCB 2015) has established a maximum surface water concentration of 2 µg/L. There is no adopted surface water quality objective for boron within the GRCD, because boron is primarily an agricultural constituent of concern. If any water quality objectives are exceeded, Reclamation would modify groundwater pumping operations or curtail groundwater pumping until water quality objectives are again met.

Under the Proposed Action, surface water quality sampling and analysis for selenium will be conducted upstream and downstream of well discharges to help ensure compliance with surface water quality objectives set by the RWQCB. If a surface water quality objective is exceeded groundwater pumping will be modified or curtailed or additional surface water will be routed into the receiving conveyance channel until surface water quality objectives are met. Weekly monitoring of the EC, pH and temperature upstream and downstream of each well discharge will continue. The water quality monitoring and reporting for the Proposed Action is described in the WQMP included as **Appendix B**.

Delivering Refuge L2 water to the DPWD and SLWD would not trigger new water quality impacts or impacts of greater magnitude than those impacts already considered in the exchange parties' CVP contract.

Cumulative Impacts

The 2015 water quality analyses conducted on samples taken from the Proposed Action wells are included in a table in **Appendix C**. Selenium concentrations were well below the Water Quality Monitoring Plan's threshold. TDS levels in the wells ranged from 548 mg/L to 918 mg/L, which is of good quality for wetland habitat use. Boron concentrations at the well heads were below the RWQCB's objective for the lower San Joaquin River.

Under the Proposed Action, impacts to water quality would not be significant and continual monitoring would occur along with any follow-on actions required under the Water Quality Monitoring Plan. Therefore, the Proposed Action would not contribute to cumulative impacts to water quality.

3.4 Biological Resources

3.4.1 Affected Environment

Wetlands

The wetlands of GRCD are maintained primarily by surface water, and water conveyance infrastructure is in place to service each of the numerous ponds or cells. In GRCD, wetland habitats consist of seasonally flooded marshes, including moist soil impoundments, and permanent ponds and summer water. Vernal pools or seasonal wetlands occur within the GRCD.

Seasonally flooded marsh is by far the most numerous and diverse of the wetland habitat types on the state and federal refuges and private wetland areas of the San Joaquin Valley River Basin. Seasonal wetlands are inundated fields or ponds that are managed primarily to provide wildlife habitat, grow seed and to produce invertebrates for migratory waterfowl, shorebirds and other wetland-dependent wildlife. These wetlands are usually flooded from October through March, and are dry for the rest of the year except for summer irrigation.

The diversity of seasonal wetlands is the product of a variety of water depths that result in an array of vegetative species that, in combination, provide habitat for the greatest number of wildlife species throughout the course of a year. Through the fall and winter, seasonally flooded marshes are used by large concentrations of waterfowl and smaller numbers of egrets, herons, ibis, and grebes, to name a few. In addition, a full complement of raptors takes advantage of the water bird prey base. Water is removed in the spring, so large concentrations of shorebirds use the shallow depth and exposed mudflats on their northern migration. Seed-producing plants germinate and grow to maturity on the moist pond

bottoms during the springs and early summer. Wetland flooding in the fall makes this food available to early migrant waterfowl and other waterfowl.

Moist soil impoundments are similar to seasonally flooded marshes, except that they are irrigated in the summer to improve production of water grass, sprangletop, and swamp timothy, the primary food species for waterfowl. Moist soil impoundments are typically irrigated during the summer to bolster plant growth and to enhance seed production. During irrigation periods, these units are often used by locally nesting colonial water birds (egrets, herons). Once flooded, these units provide an abundant food source for waterfowl. In addition, a number of wading bird species frequent them throughout the year.

Semi-permanent and permanent wetlands provide wetland habitat for year-round and summer resident species. Semi-permanent wetlands are flooded for 8 or months of the year, while permanent wetlands remain flooded throughout the year. Characterized by both emergent and submergent aquatic plants, semi-permanent and permanent wetlands provide brood and molting areas for waterfowl, secure roosting and nesting sites for wading birds and other over-water nesters, and provide feeding areas for species like cormorants and pelicans.

Riparian

There are no large or sensitive riparian habitats that occur in the Proposed Action area or near the water delivery areas.

Agricultural Lands

Agricultural lands within and adjacent to the study area include flood irrigated pastures, orchards, and row crops. Pastures are typically cultivated in alfalfa (*Medicago sativa*), rescue grass (*Bromus catharticus*), Johnson's grass (*Sorghum halepense*), tall fescue (*Festuca arundinaceae*), and Italian ryegrass (*Festuca perennis*). Some of the key orchard crops in the vicinity of the Proposed Action are apricot (*Prunus armeniaca*), English walnut (*Juglans regia*), and almond (*Prunus dulcis*) cultivars. Row crops include broccoli (*Brassica oleracea*), corn (*Zea mays*), and tomatoes (*Solanum lycopersicum*), among others. Flood irrigated pastures provide food, cover, and nesting grounds for wildlife species; the value of the habitat varies with crop type and agricultural practices. Bird diversity can be high in irrigated pastures. Species commonly utilizing pasture lands include red-winged blackbird (*Agelaius phoeniceus*), Brewer's blackbird (*Euphagus cyanocephalus*), western meadowlarks (*Sturnella neglecta*), European startling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), killdeer (*Charadrius vociferous*), American crow (*Corvus brachyrhynchos*), and American kestrel (*Falco sparverius*). Some pasture lands and crop fields provide suitable breeding habitat for northern harrier (*Circus cyaneus*). Small mammals in flood irrigated pasture and row crops provide important prey resources for raptors such as red-tailed hawk (*Buteo jamaicensis*) and Swainson's hawk (*Buteo swainsoni*).

Developed/Disturbed

Developed and disturbed areas include major roads, highways, and buildings and structures within more urban areas, but also facilities and access roads which are located throughout the GRCD and near each well location.

Wildlife

The list of Federally listed, proposed and candidate species is included in **Appendix D** and was obtained by accessing the U.S. Fish and Wildlife [database at http://www.fws.gov/sacramento/es_species/Lists/es_species_lists-overview.htm](http://www.fws.gov/sacramento/es_species/Lists/es_species_lists-overview.htm) (USFWS 2016). Accessed on February 29, 2016: Consultation Code: 08ESMF00-2016-SLI-0943, Event Code: 08ESMF00-2016-E-02042. Although there are 35 species identified in the list, only those species that could potentially occur in the action area are analyzed in detail.

Sensitive Plants

Major representative plant communities and habitat types present include seasonally flooded freshwater emergent wetland and alkali sink scrub. As groundwater will be used to continue wetland management practices in the Proposed Action area, impacts to sensitive plant species are not expected.

Giant Garter Snake

The giant garter snake (GGS) inhabits wetland habitats and vegetated permanent water channels in scattered subpopulations in the Central Valley from Butte County in the north to Fresno County in the south. It is believed extirpated from the vicinity of Buena Vista and Tulare Lakes south of Fresno County. Giant garter snakes are present within the GRCD, primarily within the Volta Wildlife Area.

Giant garter snakes are always found in close proximity to permanent or semi-permanent water with vegetated perimeters. The GGS is an aquatic feeder specializing in capturing small fish and frogs in or under water. The giant garter snake spends the winter in upland retreats above the high water level.

Aleutian Canada Goose, Bald Eagle, Peregrine Falcon, and Yellow-Billed Cuckoo

The Aleutian Canada goose, Bald Eagle, Peregrine Falcon, and Yellow-Billed Cuckoo are occasional visitors to the study area. The Proposed Action would provide additional loafing, foraging, and roosting sites within the GRCD for Aleutian Canada Geese, Bald Eagles, and Peregrine Falcons. There is no suitable riparian habitat within GRCD for the Yellow-billed Cuckoo.

Swainson's Hawk

This species is the most migratory of all North American buteos. It breeds and summers in the arid and semiarid regions of western North America and winters on the pampas of Argentina. The breeding population in California has declined by an estimated 90 percent. In 1979, the breeding population in California was estimated at 375 pairs. This species arrives in the vicinity of the North Grasslands Wildlife Area and Los Banos Wildlife Area in late February to early March each year, and nests within an intermix of trees. Trees commonly used for nesting in this area are cottonwoods, willows, and valley oaks. The principal foods in the Central Valley are meadow mice and small birds. Use of the area by Swainson's hawk coincides with the time of year when most of the seasonal wetlands have been allowed to dry for their annual growing season. Likewise, this species migrates south prior to the seasonal wetlands being flooded for wintering wildlife populations arriving in the fall.

Based upon The California Natural Diversity Database records and observations by CDFG staff, no known Swainson's hawk nest sites occur within the GRCD Comprehensive Management Plan project area. Nest sites do occur along the San Joaquin River, which is not located in the Proposed Action area. Swainson's hawks are featured species in the GRCD management plan and would benefit from the Proposed Action. Grassland foraging areas and potential nest trees would not be disturbed.

San Joaquin Kit Fox

The San Joaquin kit fox, a State-listed threatened and Federally-listed endangered species, is a small nocturnal canid which now occurs in scattered populations from Contra Costa County south to Kern County. Historically, this species occupied extensive areas of semiarid lands in the San Joaquin Valley. Flat topography in valley bottoms with valley sink scrub, valley saltbush scrub, interior coast range saltbush scrub, nonnative grassland and alkali playa plain communities (described in Holland, 1986) are the typical habitat, but substantial populations have always inhabited the surrounding low foothills where slopes do not exceed 40 degrees (O'Farrell 1983). Agricultural, industrial, and urban developments have caused rapidly increasing rates of habitat loss.

The San Joaquin kit fox is an obligate year-round burrow dweller which feeds largely upon lagomorphs and kangaroo rats (but would utilize whatever prey is locally abundant). Numerous dens are excavated and inhabited in the course of a year and individuals may cover great distances while foraging and/or dispersing.

The San Joaquin kit fox is considered here because of the potential foraging habitat (irrigated pasture and seasonally flooded grassland and alkali sink scrub). No known active or potential kit fox dens have been observed within the study area.

3.4.2 Environmental Consequences

No Action

Conditions would remain the same as existing conditions if no action were taken. There would be no impacts to wildlife, including threatened and endangered species, their critical habitat, or general habitat types.

Proposed Action

The pumping and conveyance of groundwater within VW would not affect aquatic species or their habitat. Habitat for Delta smelt, Chinook salmon (spring and winter run), central valley steelhead, or green sturgeon would not be affected because no construction or flow modifications are proposed on natural waterways. There would be no effect to federally listed fish species mentioned above and there would be no modification of critical habitat for the species as a result of the Proposed Action.

Based on extensive biological monitoring occurring at this project site as part of the Volta Wells pilot project since 2011, direct and indirect impacts are not expected to occur from water quality affecting the prey base of the GGS (Hansen, 2015). Groundwater from the two existing production wells would be pumped into the VW and then ultimately into the GWD conveyance system and delivered downstream throughout the GRCD, similar to all GWD refuge water supplies. The majority of Refuge water deliveries primarily occur in the fall, winter, and spring, during a period when the GGS is not active, and no effects to GGS are anticipated. In a memo dated February 19, 2016, Reclamation requested concurrence from the USFWS that the Proposed Action is not likely to adversely affect GGS (Reclamation, 2016). Pumping will not commence from the wells until Section 7 consultation with USFWS is complete. Any and all conservation measures included in the Section 7 consultation will be adopted and implemented.

Water is expected to continue to be of suitable quality for other aquatic species that use Pond 10 and wetland areas within the GRCD. Water quality would be continually tested during the Proposed Action at the outflow of the production wells and immediately upstream and downstream. If groundwater quality is determined to be of unsuitable quality, pumping into the GWD conveyance system would be modified or curtailed.

Overall, the Proposed Action would provide a benefit to waterfowl, shorebirds, and raptors, as the water would be used for refuge management to sustain wetland habitats. The Proposed Action would not adversely affect any riparian habitats. The Proposed Action may benefit GGS in that it would provide additional habitat. Delivering Refuge L2 water to the DPWD and SLWD would not trigger new biological resources impacts or impacts of greater magnitude than those impacts already considered in the exchange parties' CVP contract and existing BOs.

Cumulative Impacts

Implementation of the Proposed Action would not result in effects to biological resources, and therefore could not contribute to cumulative impacts.

Section 4 Consultation and Coordination

4.1 Public Review Period

Reclamation intends to sign a Finding of No Significant Impact for this Proposed Action, and will make the EA available for a two week period beginning in April, 2016. All comments will be addressed in the FONSI. Additional analysis will be prepared if substantive comments identify impacts that were not previously analyzed or considered.

4.2 Endangered Species Act (16 USC § 1531 et seq.)

Section 7 of the ESA requires Federal agencies, in consultation with the Secretary of the Interior, 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.

In a memo dated February 19, 2016, Reclamation requested written concurrence from the USFWS on the determination that the Proposed Project is not likely to adversely affect giant garter snake.

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