Attachment 1 - WSIP Data and Information Summary for Water Quality Priorities 6 –Groundwater

Methods

The 2015 current conditions data used in the analyses for the application was based on the DWR Delivery Capability Report and base scenario model released in July 2015 with project operations. The year 2015 was used for current conditions because the Delivery Capability Report and base scenario model the most recent and best data available for the analysis. Regional deliveries modeling data for the WSIP application is presented in Sites_A6D Modeling Results Compendium under the ELIGIBILITY AND GENERAL PROJECT INFORMATION TAB.

The 2030 expected with- and without-project estimated deliveries for the Sites Reservoir Project WSIP Application utilized the model products and assumptions described in section 6004(a)(1) of the code of regulations, including the 2030 and 2070 future conditions CalSim-II models provided by the California Water Commission on November 2, 2016. A further description of the modeling used for the analysis is provided in Sites_A1 Modeling under the BENEFIT CALCULATION, MONETIZATION, AND RESILIENCY TAB. Regional deliveries modeling data for the WSIP application "Regional Deliveries DCR 2015 with Project vs without Project" "Regional Deliveries WSIP 2030 with Project vs without Project" and "Regional Deliveries WSIP 2070 with Project vs without Project" are presented in Sites_A6D Modeling Results Compendium under the ELIGIBILITY AND GENERAL PROJECT INFORMATION TAB.

Regional Groundwater Improvements

The Sites Reservoir project would improve groundwater in adjudicated groundwater basins, and medium and high priority basins defined under SGMA, including those in critical overdraft. Sites_A6C Groundwater Basins under the ELIGIBILITY AND GENERAL PROJECT INFORMATION TAB provided a listing of potential groundwater basins that could be affected by the project. Improvements would occur by supplying supplemental surface water that could be used to facilitate increased conjunctive use practices and replenishment to enhance aquifer storage recovery. Sites operations would change the timing of available surface and groundwater supplies by providing Sites participants with supplemental surface water for storage, use or replenishment (typically in above normal and wet year conditions) and then recovering a portion of the water during periods of water supply shortages (in dry and critical year conditions) by groundwater pumping. Increased conjunctive use and replenishment operations would assist with improving chronic lowering of water levels and reduction of groundwater storage within the groundwater basins associated with Sites Participants. Incidental water quality, salt water intrusion and subsidence improvements may also result with increases in storage and water levels.

Conjunctive Use Management by Sites Participants

Several Sites Participants have already implemented or are in the process of implemented groundwater replenishment and conjunctive use programs in order to improve groundwater conditions. For example, Santa Clara Water District manages approximately 300 acres of groundwater recharge ponds and more than 90 miles of creeks that recharge approximately 156,000 acre-feet of groundwater each year (2013 California Water Plan Update). There are also several projects considered in the North Sacramento Valley and Sacramento Valley Integrated Regional Water Management Plans (IRWMP) that could potentially use water from Sites Reservoir to support sustainable groundwater management. These projects include:

- Stony Creek Fan Partnership Conjunctive Management Program
- Foothill stream restoration and recharge enhancement project;
- In-lieu recharge project in north-eastern Glenn County; and

- Glenn County surface and groundwater quality improvement project.
- Cooperative Program for Groundwater Studies between the County of Glenn and the Colusa Basin Drainage District

Increases in Regional Surface Water Deliveries

Table 1 shows the total annual increase in deliveries with the implementation of the project for averages over the long-term and for Dry and Critical water years. An annual breakdown for all water year types is presented in 'Regional Deliveries WSIP 2030 with Project vs without Project" are presented in Sites_A6D Modeling Results Compendium under the ELIGIBILITY AND GENERAL PROJECT INFORMATION TAB.

Table 1: Increases in Deliveries by Hydrologic Region with the Sites Project

CalSim II Modeled Beneficiaries	Average Increase in Deliveries (TAF/yr)	Dry and Critical Increase in Deliveries (TAF/yr)	Average Increase in Deliveries (TAF/yr)	Dry and Critical Increase in Deliveries (TAF/yr)	Average Increase in Deliveries (TAF/yr)	Dry and Critical Increase in Deliveries (TAF/yr)
Sacramento River Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water to CVP Settlement Contractors	2	6	2	5	1	4
Supplemental Water for CVP Service Area Ag	67	119	96	137	121	132
Supplemental Water for CVP Service Area M&I	0	0	0	0	0	0
Supplemental Water for SWP Service Area M&I	0	0	0	0	0	0
Supplemental Water for SWP Service Area Feather River Service Area	3	2	4	5	4	4
Supplemental Water for County of Colusa	7	8	8	9	8	8
Colusa Basin (Incremental Level 4 Refuge Water Supply)	1	0	1	0	1	0
Total	***80***	***136***	***111***	***155***	***136***	***148***
San Joaquin River Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water for CVP Service Area Ag	0	0	0	0	0	0
Mendota Pool (Incremental Level 4 Refuge Water Supply)	29	13	28	10	25	8
San Francisco Bay Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water for CVP Service Area Ag	0	0	0	0	0	0
Supplemental Water for SWP Service Area M&I	35	72	38	72	42	77
Central Coast Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water for SWP Service Area M&I	0	0	0	0	0	0
Tulare Lake Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water for CVP Service Area Ag	12	28	13	27	15	29
Supplemental Water for SWP Service Area M&I	0	0	0	0	0	0
Supplemental Water for SWP Service Area Ag	12	28	13	27	15	29
Tulare Basin (Incremental Level 4 Refuge Water Supply)	7	3	6	2	6	2
Total	***31***	***58***	***33***	***57***	***36***	***61***
South Lahontan Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water for SWP Service Area M&I	1	3	2	3	2	3
South Coast Hydrologic Region	**2015**		**2030**		**2070**	
Supplemental Water for SWP Service Area M&I	60	126	67	126	73	134
Supplemental Water for SWP Service Area Ag	0	0	0	0	0	0
Delta Environmental Water Quality	**2015**		**2030**		**2070**	
Upstream and Delta Inflow	73	72	73	78	68	79

Hydrologic Region and Groundwater Basin Information

The Sites project has the potential to provide improvements to groundwater basins located within the Participant's service area, within Colusa County and near refuges when increases in Incremental Level 4 Refuge Water Supply would be delivered (Table 1). A description of the hydrologic regions is presented in Chapter 6, "Surface Water Resources" of the EIR/EIS. Detailed information regarding groundwater elevation and water wells data for these hydrologic regions can be found on DWR's Groundwater Level Monitoring Website (http://www.water.ca.gov/groundwater/data_and_monitoring/levels.cfm).

The greatest benefits from the Sites Project to groundwater are expected in the Sacramento Valley Hydrologic Region. Sites Reservoir would alter the regional water balance in the Sacramento Valley, thereby protecting the region from the long-term overdraft conditions that have come to characterize the San Joaquin Valley.

Sites Reservoir is an important component of regional water planning for Colusa and Glenn Counties. In 2014 and 2015, the Tehama Colusa Canal received no allocation of water from the Bureau of Reclamation due to the severity of the drought. At the same time, the Colusa subbasin was in an overdraft condition and NASA reported subsidence in the vicinity of Arbuckle, CA (approximately 30 miles south of the proposed location for Sites Reservoir). A recent study concluded that drought, not cropping patterns, is having the dominant effect on declining groundwater levels in this area (Davids Engineering, Inc., *Analysis of Land and Water Use in Relation to Groundwater Conditions in Colusa County*, 2016). The Sacramento Valley consists of fresh water aquifer systems underlain by larger saline water aquifer systems. Groundwater management must prevent mixing of the fresh and saline aquifer systems. Overpumping of groundwater without adequate recharge could result mixing of these system and degradation of water quality. Recharge throughout the area depends strongly on the availability of supplemental surface water. The reservoir would provide a much more stable water supply of surface water throughout the service areas of Sites participants in the Sacramento Valley (i.e., TCCA, RD 108, County of Colusa and Western Canal WD).

Climate Change Risks

Climate change projections indicate that California will experience more extreme weather, such as floods and droughts. At the same time, warming temperatures are expected to raise the snowfall elevation, causing more winter precipitation in the Sierra Nevada to occur as rainfall. This will lead to larger and earlier runoff events. As a result of these changes, several million acre-feet of natural snowpack storage could be lost annually, reducing available water supply. In addition, the increasing severity of storms and increased runoff could overwhelm existing reservoir flood protection capacity and increase flood risks downstream.

By expanding surface storage capacity, water supply systems would have greater flexibility to capture the increased winter runoff and help control larger anticipated flood flows. Additional reserve storage would also allow water to be held over for all uses in dry years and droughts.

Expansion of surface storage capacity can be an effective climate change adaptation strategy because increasing local and regional surface storage can provide greater flexibility for capturing runoff and managing supplies to meet increasingly variable future conditions. The ability to store water from wet years for use in dry years is critical to addressing increasing climate variability. Additional surface storage allows water to be held over from year to year as a hedge against dry years and droughts.

Surface storage provides ability to capture flood flows to protect downstream assets and quickly release large quantities of water when demands increase, or to meet instream temperature requirements.

Reservoirs also allow storage of water that can be released slowly at rates that match groundwater basin percolation rates and facilitate recharge of downstream groundwater basins.

The operational flexibility of Sites Reservoir allows for the delivery of water for public benefits where and when it is needed most while adapting to future conditions to provide sustained public benefits. For further information refer to the Sites_A12 Uncertainty under the BENEFIT CALCULATION, MONETIZATION, AND RESILIENCY TAB.

Source: Prepared by AECOM 2017

Figure Water Quality P – 6a. Hydrologic regions receiving surface water supplies and potential aea of Groundwater Improvement

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