Recreation (WSIP Public Benefit)

Physical Quantification

Recreation benefits were valued using visitation estimates for the new recreational areas planned for the Sites project. Annual visitation was estimated using a facilities-based approach that accounts for Sites planned facilities, carrying capacity, the regional population of potential users, the surface acreage of the reservoir, fluctuations in storage throughout the year, and the amenities and visitation levels of substitute reservoirs in the region.

Table A3-13 presents the annual visitor-day estimates and unit day values by activity type. The estimated total annual visitor-days assumed in this analysis was approximately 187,000.

Table A3-13. Annual Recreation Visitation by Primary Activity

Activities	Annual Visitor-Days
Shore fishing	16,254
Boat fishing	8,407
Picnicking	15,457
Sightseeing	27,514
Swimming / beach use	36,992
Walking	42,223
Bicycling/Motorcycling	5,418
Horseback riding	2,429
Boating / water-skiing	29,145
Hunting	560
Other	2,429
Total	186,829

Monetized Benefits

Recreation benefits were quantified using unit day values from Rosenberger, Recreation Use Values Database (RUVD) for North America (2016) and from Loomis, Updated Outdoor Recreation Use Values on National Forests and Other Public Lands for U.S. Forest Service (2005). These values were applied to the visitation projections for Sites Reservoir. It was also determined that 80 percent of the visitor-days at Sites Reservoir would represent new recreational visits, and that the remaining 20 percent of visits would reflect recreational visitor-days that, in the absence of Site Reservoir's development, would otherwise have occurred at nearby reservoirs. Table A3-14 presents the results of the recreation benefits analysis.

Table A3-14. Estimated Annual Recreation Benefits (2015$; $1,000s)

Alternative	Annual Benefits [a]		Annualized Benefit [b]
	2030	2070	
Average Conditions [c]			
Sites Reservoir	$6,997	$6,997	$6,754

[a] Annual benefits reflect consumer surplus value for various recreational activities supported by Sites Reservoir and water operation scenarios under year 2030 and year 2070 levels of development. Benefits were attributed for only 75 percent of future visitation expected as new recreational use after accounting for potential substitution effects on other reservoirs in the region.

[b] Annualized benefits represent avoided costs relative to the Future No Project conditions over the planning horizon (2030 to 2122). Annual average is less than 2030 and 2070 values due to initial short ramp-up period before full benefits are generated.

[c] Averaged over the entire hydrologic sequence (1922 to 2003).

The project's future recreation benefits were estimated to be approximately $7.0 million in 2030. Although future population growth might be expected to increase future recreation demand and visitation, it was conservatively assumed that the 2030 level of benefits would remain constant throughout the future 2030 to 2122 operating period. As a result, the average annual benefit for the future 2030 to 2122 operating period was estimated to be $6.8 million (slightly reduced due to an assumed 50 percent operation during its first two operating years).

Flood Damage Reduction (WSIP Public Benefit)

Physical Quantification

Development of the Sites project would reduce the magnitude of flood events in the area along Funks Creek and Stone Corral Creek, specifically for the town of Maxwell's residential, commercial, and public structures and contents. In addition, the project would reduce flood damage to adjacent agricultural lands and flood-related closures to Interstate 5 and State Route 20.

Hydraulic analysis (HEC-RAS 2-D) was used to quantify the project-related reduction in flood-impacted areas and flooding severity for six different flood event types (ranging from 5-year to 500-year flood events). Geographic information system (GIS) land use analysis inventoried the impacted areas. Flood reduction benefits were estimated for current hydraulic conditions to represent the expected 2030 conditions. No adjustments in the hydraulic modeling or other analytic methods were used to project 2070 conditions (including climate change) because the flood damage benefits are relatively limited and due to difficulty in quantifying the magnitude of changes in future flood events.

Additional details on flood damage reduction benefits are provided under the Sites_A1 Flood Control under the PHYSICAL PUBLIC BENEFITS TAB.

Monetized Benefits

The value of flood damage reduction benefits was estimated based on the average annual cost of flood damages under No Action conditions and the projected reduction in flooded area and damage costs for "with Project" conditions. The resulting Expected Annual Damages savings from the project-related reduction in flood impact incidence and severity were calculated for a comprehensive range of different flood event types (5 year to 500 year) and adjusted for their expected incidence rate. This approach corresponds to the "avoided cost" approach described in the WSIP TR report.

Table A3-15 presents the estimated benefit value of the project-related flood damage reduction.

Table A3-15. Flood Reduction Benefits (2015$; $1,000s)

Alternative	Annual Benefits [a]		Annualized Benefit [b]
	2030	2070	
Average Conditions [c]			
Sites Reservoir	$4,377	$4,377	$4,377

[a] Based on the project-related reduction in expected annual damages from future flood events.
[b] Annualized benefits assume interpolated annual physical benefits between 2030 and 2070 and then constant annual benefits after 2070.
[c] Averaged over the entire hydrologic sequence (1922 to 2003).

The project's future flood reduction benefits were estimated to be approximately $4.4 million in 2030. It was conservatively assumed that 2030 benefit values would remain constant throughout the future 2030 to 2122 operating period. As a result, the average annual benefit for the future 2030 to 2122 operating period was estimated to be $4.4 million.

Water Supply (Non-Proposition 1 Eligible Benefit)

Physical Quantification

Increases in water supply were monetized based on the increase in deliveries. Increases in deliveries for 2030 and 2070 were estimated using CALSIM II. CALSIM II determined future water deliveries for each applicable project purpose by water-year type and location. Corresponding physical benefits were estimated on an annual basis for the interim 2031 to 2069 period by interpolating individually (i.e., for each specific purpose, location, water-year type, and incidence rate). Each year's individual quantified values were then used to determine a corresponding average expected water use amount. Table A3-16 shows the estimated water supply deliveries by water-year type projected in 2030, 2070, and the annual average in the 2030 to 2122 study period. Sites is expected to reduce the flood area by 9,570 acres. Additional details on flood damage reduction benefits are provided in Sites_A1 Flood Control under the PHYSICAL PUBLIC BENEFITS TAB.

Table A3-16. Increase in Water Supply Deliveries (TAF/year)

Period	NOD Agriculture	SOD Agriculture	SOD M&I	SOD Recaptured	Total
2030 Results					
Long-Term Average	110	25	106	11	254
Wet	62	5	15		82
Above Normal	86	68	52		144
Below Normal	125	28	121		273
Dry	157	56	213		426
Critical	153	53	185		391
2070 Results					
Long-Term Average	137	30	117	11	295
Wet	110	5	15		130
Above Normal	146	12	72		230
Below Normal	152	26	116		294
Dry	161	69	257		488
Critical	133	41	145		319
Average (2030–2122)					
Long-Term Average	**131**	**29**	**114**	**11**	**286**

Source: CALSIM II.
M&I = municipal and industrial
NOD = north-of-the-Delta
SOD = south-of-the-Delta