The Bay Delta Conveyance Facility: Affordability and Financing Considerations

California Debt and Investment Advisory Commission

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I. Executive Summary

The Bay Delta Conservation Plan (BDCP) is a collaborative effort involving numerous state and federal agencies with the goal of restoring and protecting the environmental health of the Sacramento-San Joaquin Delta while also improving the reliability of an important source of California's water supply. Currently, the Delta provides vital water supplies to municipal, industrial and agricultural water users in the Central Valley and coastal and Southern California. These water deliveries are crucial to the state's economy and represent a critical source of water for more than 25 million California residents. According to the BDCP documents, in the absence of the various conservation measures proposed in the plan, Delta water supplies are expected to become increasingly unreliable, water quality in the Delta would be vulnerable due to sea level rise and associated saltwater intrusion, and the state would be exposed to potentially severe public health consequences resulting from a major seismic event that could damage Delta facilities and temporarily halt water exports.

This report provides a preliminary assessment of the affordability and financing considerations of the Delta conveyance facility. The report does not address the merits of the BDCP per se or the question of whether the state and other parties involved in the project should proceed with this project.

BDCP Overview and Costs

An integral part of the BDCP is a proposal to construct a conveyance facility consisting of two 40-foot diameter tunnels reaching a maximum depth of more than 150 feet below ground that could carry up to 9,000 cubic feet per second (cfs) of water approximately 30 miles from the Sacramento River to the existing California Department of Water Resources' (DWR) State Water Project (SWP) and the U.S. Bureau of Reclamation's (USBR) Central Valley Project (CVP) south Delta pumps located approximately 17 miles southwest of Stockton at the Clifton Court Forebay. The BDCP currently estimates this new conveyance facility will have capital costs of about $14.57 billion in 2012 dollars.[1] With construction cost inflation, the actual outlays will be higher. The SWP and CVP contractors that are participating in the development of the BDCP are expected to pay for the construction costs of the new facility, along with the associated mitigation measures, the facility's operating costs, and a share of the cost of a number of the other BDCP conservation measures.[2] In 2012 dollars, these additional costs represent another $2.45 billion in BDCP-related capital costs and operating and maintenance (O&M) costs, for a total of about $17 billion to be paid by the water contractors and their ratepayers, out of the total estimated BDCP costs of

[1] This report primarily reports expected costs in nominal, or "year of expenditure dollars" ($YOE), unless otherwise stated. Note that the most current (2013) draft of the BDCP presents the expected costs in constant 2012 dollars. In some instances we also report expected costs in constant dollars. To avoid confusion, whenever values in constant dollars are presented here, they are reported in constant 2012 dollars ($2012).

[2] Specifically, those water contractors that receive their water deliveries via the pumps at the Clifton Court Forebay are expected to provide the financing for the BDCP. These contractors are referred to collectively as the "south-of-Delta" water contractors.

almost $25 billion. Funding for the remaining $7.8 billion, which consists primarily of ecosystem restoration activities, is expected to come from various state and federal sources, including future state General Obligation bond measures approved by the voters. Specifically, $4.1 billion is identified as potentially coming from existing and new state water bonds and other state sources. Approximately $3.5 billion is identified as potentially coming from existing and new federal funding authorizations for habitat restoration. The remaining $0.2 billion is anticipated to come from interest income on fund balances.

While the actual allocation of the water contractor costs between the SWP and CVP contractors has yet to be determined, the November 2013 version of the BDCP public draft documents assumes that they are shared equally, with 50% paid by the SWP contractors and 50% paid by the CVP contractors. Alternative allocations that have been discussed include a 60/40 split, with the SWP contractors paying 60% of the costs and the CVP contractors paying 40%. We have looked at both allocations in this analysis. While costs likely would be allocated based on an initial split, there may be a "true-up" at the end of each year based on the actual allocation of water deliveries. For the purpose of the estimates presented here, however, the cost allocation is treated as fixed for either a 50/50 or 60/40 split and estimated water deliveries taken as given regardless of which cost allocation is used.

Debt Financing by the Water Contractors

The tunnels represent by far the largest component of contractor BDCP costs, and are expected to be financed via revenue bonds according to the BDCP.[3] These bonds would be repaid by revenues from the SWP and CVP water contractors and their ratepayers rather than state taxpayers. While the security, structure, and other details of these bonds have not been finalized, the State Treasurer's Office has developed a number of bond financing scenarios to estimate the associated annual debt service costs and to illustrate how these costs might increase or decrease under different assumptions regarding changes in construction costs and timing, changes in interest rates, and higher or lower reserve requirements, among other factors. Under the current "Base Case" scenario, the bonds would begin to be issued in 2015,[4] debt-financed construction costs as currently estimated would be $14.7 billion in 2012 dollars, or $19.7 billion in "year-of-expenditure" dollars ($YOE), which factor in the timing of when these costs will actually be incurred and the associated construction cost inflation.[5] Interest rates for the bonds would be equal to the 20-year average of the Municipal Market Data (MMD) AA-rated general revenue bond index (adjusted for a 95% confidence sensitivity cushion) rather than simply using today's historically low rates. Under these assumptions, debt service costs would rise to almost $1 billion annually by 2026, leveling off to just under $1.4 billion by 2032 and staying there through about 2060. Total debt service costs under the Base Case scenario would equal $55.4 billion ($YOE)

[3] The total capital costs expected to be financed via revenue bonds includes $14.6 billion for the tunnels (Conservation Measure 1) and $89 million for "Tidal Natural Communities Restoration" (Conservation Measure 4), for a total of $14.7 billion in 2012 dollars.
[4] Note that because of anticipated design changes in the project, bonds would not likely begin to be issued until 2016 or 2017.
[5] Note that the BDCP uses an expected construction cost inflation rate of 2% rather than the 3% used here. The 3% rate used for this analysis results in a more conservative (higher) estimate of the year-of-expenditure costs (see Section IV and Appendix A for more detail).

(assuming no refunding savings). Other BDCP-related pay-as-you-go capital costs and O&M costs are expected to add an additional $100-200 million annually during this same period. Over the 10 years with the highest total costs, this represents a total average annual cost of just under $1.6 billion.

In addition to the "Base Case" scenario, we also examined a "Best Case" scenario where capital costs are 10% less than anticipated and interest rates are 1 percentage point lower, as well as a "Worst Case" scenario where capital costs are 30% higher than expected, interest rates are 2 percentage points higher, and the project is delayed by 3 years.[6] The peak annual cost estimates for all three scenarios are provided in the following table, with these costs split between the SWP and CVP contractors using both 50/50 and 60/40 allocation alternatives.

Financing Assumptions	Base Case	Best Case	Worst Case
Debt Financed Costs ($YOE)	$19.7B	$14.8B (Base - 10%)*	$25.2B (Base+ 30%)*
Par Amount of Bonds Issued ($YOE)	$20.5B	$15.4B	$26.4B
Interest Rate	20 year avg MMD AA-rated** (all-in true interest cost of 5.964%)	Base Minus 1% (all-in true interest cost of 4.947%)	Base Plus 2% (all-in true interest cost of 7.998%)
Issuance Start Yr	2015	2015 (Base)	2018 (Base + 3 Yrs)
Total Peak Annual Cost ($YOE)* **	**$1,576.6M**	**$1,084.3M**	**$2,502.4M**
50/50 Split for SWP/CVP ($YOE):			
SWP Share	**$788.3M**	**$542.1M**	**$1,251.2M**
CVP Share	**$788.3M**	**$542.1M**	**$1,251.2M**
60/40 Split for SWP/CVP ($YOE):			
SWP Share	**$945.9M**	**$650.6M**	**$1,501.4M**
CVP Share	**$630.6M**	**$433.7M**	**$1,001.0M**

* For the Best Case and Worst Case the pre-contingency costs are adjusted by -10% and +30%, respectively. The contingency amount is then set to either 10% in the Best Case and 20% in the Worst Case or the original percentage, whichever is lower.

** Base interest rate = 20 year average of the MMD AA-rated general revenue bond index adjusted for a 95% confidence sensitivity cushion for interest rates in effect as of December 18, 2013.

*** Peak annual costs represent the average annual costs for the highest 10 years, though total costs are fairly constant for over 30 years (see Figure 7).

These scenarios are intended to test the impacts of changes in the underlying financing assumptions, rather than represent the absolute best and worst case scenarios possible. They aim

[6] Note that that the 10% decrease and 30% increase applies only to the costs themselves, and not the contingency amounts included in the current cost estimates. The contingency amounts were treated separately, as explained below on page 22. Also, in addition to the Base Case, Best Case and Worst Case, numerous additional financing scenarios were also prepared, and are summarized in Appendix A.

to illustrate the impact of a significant deviation from the base case in terms of costs, timing, interest rates and a number of other parameters. It is possible, for example, that construction costs ultimately could exceed the cost estimate we use for the Worst Case scenario. However, it is unlikely that the value of all of the parameters in each scenario would move in the same direction (that is, so as to all increase costs or all decrease costs). Thus, our Best and Worst Case scenarios are intended to illustrate a reasonable range in terms of the impact of changes in these parameters on the project's total cost.

To place these costs in context it is helpful to estimate the cost per acre-foot of expected water deliveries. Current estimates of average annual total SWP and CVP exports for all south-of-Delta water contractors range from 4.7 to 5.6 million acre-feet (AF) depending upon how much water is assumed to be needed to meet the environmental needs of the Delta.[7] Under the Base Case financing scenario, this implies that the average peak annual costs represent additional costs to the water contractors of about $289 to $343/AF.

The costs per acre-foot for the SWP and CVP overall depend upon how the costs are allocated and on the average annual water deliveries each group is expected to receive. Expected annual deliveries to the south-of-Delta SWP contractors on average range from 2.4 million AF to 3.2 million AF, implying that a 50/50 split would result in their Base Case average costs per acre-foot ranging from $248/AF to $322/AF. For the CVP, south-of-Delta average annual deliveries range from 2.2 to 2.3 million AF; thus, a 50/50 split results in their peak annual average costs ranging from $345 to $367/AF. As one would expect, allocating the costs 60/40 between the SWP and CVP results in somewhat higher costs for the SWP and lower costs for the CVP.

Costs to Specific Water Contractors and their Ratepayers

To illustrate the issues that affect the affordability of the BDCP for specific contractors, we considered four contractors that represent some of the largest agricultural and municipal and industrial (M&I) contractors from the SWP and CVP: the Metropolitan Water District (MWD), the Kern County Water Agency (Kern), the Westlands Water District (Westlands), and the Santa Clara Valley Water District (Santa Clara). MWD is the largest south-of-Delta SWP contractor, accounting for 46% of the SWP's "Table A" water commitments, and Kern is the second largest with 24%.[8] Westlands is the largest south-of-Delta CVP contractor, with 36.4% of the "maximum contract quantity" value of water potentially delivered to south-of-Delta CVP contractors. Santa Clara is a water contractor with deliveries from both the SWP and CVP, accounting for 2% of the SWP and 5% of the CVP. Altogether, these four contractors account for over 70% of the SWP Table A south-

[7] Note that the total forecast deliveries are 4.6 to 5.4 million AF, which are lower than total exports due to system losses and evaporation.

[8] The SWP's "Table A" is the summary of the volume of water allocated and delivered under SWP contracts. The "Maximum Table A" amounts determine the maximum amount of water a contractor may request in any year. The Table A amounts are also used as a basis for allocating some SWP operating costs among the contractors. Note that while actual Table A deliveries vary from year to year depending upon the amount of water available for export, they remain proportional to the maximum Table A amounts for each SWP contractor (i.e., MWD's Table A deliveries consistently represent 46% of the total Table A deliveries, etc.) The CVP contractors have a similar "Maximum Contract Quantity" that represents the maximum amount of water deliveries each contractor may receive if existing supplies enable the CVP to fulfill 100% of all water contracts in a given year.

of-Delta contract amounts and 40% of the maximum annual south-of-Delta CVP deliveries. MWD and Santa Clara provide water primarily to M&I users, while Kern and Westlands provide mostly irrigation water to agricultural users. Many issues remain to be resolved for how the BDCP costs will be allocated among the individual SWP and CVP contractors, but for the purpose of our analysis we have allocated the SWP costs proportionately to each SWP contractor's Table A allocation, and have allocated the CVP costs based primarily on each CVP contractor's expected average annual water deliveries. [9] Because so much uncertainty remains as to how costs will actually be allocated among water contractors and their customers, however, all of the results presented here should be considered preliminary and illustrative.

MWD is estimated to face increased average annual costs from the BDCP of $365 to $438 million under the Base Case financing scenario using a 50/50 and 60/40 split, respectively. This translates to a range of $260 to $400/AF using the estimated average annual deliveries, though the effective annual cost could vary substantially between wet years and dry years. Santa Clara's share of the average peak annual BDCP costs are estimated to be around $56 to $61 million per year using the Base Case scenario, which translates to a range of $290 to $360/AF based on average year deliveries. Additional average annual payments in this range likely are manageable to contractors like MWD and Santa Clara, which have a diverse portfolio of water supplies and a large number of municipal and industrial water users, allowing them to spread these additional costs across a wider base and therefore should result in lower rate increases to their residential, industrial and commercial customers.

Unlike MWD and Santa Clara, however, Kern and Westlands provide water mainly to agricultural users; thus, their ability to pay for the BDCP-related costs depends primarily upon their agricultural customers' capacity to absorb these higher water costs. Kern's average peak annual BDCP costs are estimated to be in the range of $187 to $225 million under the Base Case financing scenario, or an effective cost of $225 to $350/AF in $YOE, depending upon the overall level of water exports and whether the costs are split 50/50 or 60/40 between the CVP and SWP. This range corresponds to $113 to $178 in $2012 for additional BDCP-related costs. According to data from the DWR, Kern paid an average of $100/AF for SWP water over the five-year period from 2008 to 2012. Adding the expected BDCP costs to these existing costs results in total estimated costs of $213 to $278/AF ($2012). Using recent agricultural production and revenue data, it is estimated that Kern's current crop mix could support a price of $277/AF for irrigation water, which is basically the same as the top end of the range for total estimated costs. It should be noted, however, that the estimated "capacity to pay" for water is much higher for permanent crops and vegetable crops, and much lower for row crops.

For Westlands, the estimated BDCP-related costs are $172 to $215 million per year under the Base Case financing scenario, or $290 to $380/AF on average in $YOE, which corresponds to $144 to $192/AF in $2012. Agricultural customers in Westlands have paid around $109/AF for water on

[9] Note that these estimates assume all south-of-Delta SWP and CVP water contractors will participate in financing the BDCP; should this not be the case, the water deliveries used for these estimates would be lower, resulting in higher costs to participating contractors and a corresponding higher average cost per acre-foot. In addition, these estimates assume that some costs (i.e., deliveries for refuges) are borne by all CVP contractors, not just the south-of-Delta CVP contractors.

average in recent years, indicating that the total cost for water when expected BDCP costs are added should range between $253 and $301/AF ($2012). An analysis of the current crop mix in Westlands indicates that it could support a price of $291/AF for irrigation water. As such, the estimated capacity to pay for Westlands' current crop mix is slightly below the high end of the range of expected total costs for water once the BDCP costs are included. A summary of the "capacity to pay" analysis for both Kern and Westlands is provided in the following table.[10]

Kern ($2012)							
Crop Category	**2008-2012 Avg. SWP Water Costs ($/AF)***	**Est. Avg. Base Case BDCP Costs ($/AF) Low**	**High**	**Current SWP Costs + Est. Avg. BDCP Costs Low**	**High**	**Payment Capacity ($/AF)**
Permanent	$100	$113	$178	$213	$278	$526
Vegetable	$100	$113	$178	$213	$278	$583
Field	$100	$113	$178	$213	$278	$13
OVERALL	**$100**	**$113**	**$178**	**$213**	**$278**	**$277**
Westlands ($2012)						
Crop Category	**WY 2011-2013 Avg. "Cost of Service" Rate For Ag Users ($/AF)****	**Est. Avg. Base Case BDCP Costs ($/AF) Low**	**High**	**Current Costs + Est. Avg. BDCP Costs Low**	**High**	**Payment Capacity ($/AF)**
Permanent	$109	$144	$192	$253	$301	$418
Vegetable	$109	$144	$192	$253	$301	$510
Field	$109	$144	$192	$253	$301	$43
OVERALL	**$109**	**$144**	**$192**	**$253**	**$301**	**$291**

* SWP water charges for Kern provided by DWR for 2008-2012.

** Average agricultural "Cost of Service" rate for water years 2011, 2012, and 2013 taken from data contained in Westlands Water District 2012 Water Plan and from the presentation entited "Westlands Water District Annual Water User's Workshop" (March 19, 2013).

As the table above shows, if the mix of crops were shifted toward higher value vegetable and permanent crops, the capacity to pay for water could be as high as $500/AF or more in 2012 dollars for both Kern and Westlands; however, doing so may inhibit these growers from fallowing land in dry years or quickly rotating or substituting crops when growing conditions or market forces would otherwise encourage them to do so. In addition, while it may still be possible to reduce water use by switching to more efficient irrigation techniques, many growers have already converted to drip/micro irrigation—for example, almost 70% of the irrigated Westlands farm land already uses drip irrigation, up from only 13% in 2000. Thus, while some strategies exist to allow agricultural users to cope with the expected cost increases associated with the BDCP, there are ultimately limits to how far they can go.

Key Financing Considerations

There are a number of important financing issues that will need to be resolved before bonds could be issued to support construction of the BDCP's conveyance facility. Foremost among these

[10] Note that this analysis uses current estimates of the costs, yields, and crop prices to estimate the current capacity to pay for water for Kern and Westlands. To the extent non-water production costs, yields, and crop prices differ in the future, these estimates may not be representative of their future capacity to pay for water.

is the certainty of the revenue stream required to pay debt service on the bonds. Debt service to finance the Delta tunnel conveyance necessitates annual principal and interest payments. However, as described further in this report, the effective cost of fixed debt service as a function of water deliveries would vary significantly due to fluctuations in deliveries due to the Delta's hydrology. If water contractors could "opt out" of paying debt service in low water years in favor of potentially cheaper alternative supplies, this would result in an uncertain revenue stream to support the bonds.

SWP contractors that contract with DWR to pay for the operation, maintenance, planning and capital costs of the State Water Project are subject to a number of important requirements under the terms of their water supply contracts, which provide the security for DWR's revenue bonds. For example, the contracts include a so-called "take or pay" provision. This requirement ensures that revenues to cover bond debt service are available regardless of whether water deliveries are reduced because of drought or other conditions. In addition to a take-or-pay requirement, these contracts include provisions that require DWR to charge amounts sufficient to repay all project costs and produce net revenues at least equal to 1.25 times annual debt service on DWR's bonds plus the amount needed for operation and maintenance costs. Most contracts also include so-called "step-up" provisions whereby DWR can increase amounts billed to other contractors by up to 25% if needed if another contractor defaults on a payment. These and other provisions of the DWR contracts have resulted in very strong credit ratings of AAA/Aa1 on DWR's bonds, enabling DWR to borrow at low interest rates. Moreover, seven of the SWP contractors have two AA/Aa or higher category credit ratings themselves, including MWD which carries ratings of AA+/AAA/Aa1 on over $4.2 billion of outstanding revenue bonds. More than 56% of the assumed financial responsibility for the conveyance facility, is expected from SWP Contractors that have two AA/Aa or higher category ratings by Standard & Poor's (S&P), Fitch Ratings (Fitch) or Moody's Investor Service (Moody's), according to information obtained from the three rating agencies' websites.[11]

In contrast, since USBR has provided the funding for the capital costs of the CVP, the CVP has not had a program of revenue bond issuances backed by contractor revenues similar to DWR. The average credit profile of the CVP contractors is also significantly different from those of the SWP contractors. The largest SWP contractors are wholesale agencies while the majority of CVP contractors are agricultural districts. Three of the CVP contractors, representing approximately 5% of the CVP contractors' assumed financial responsibility for the conveyance facility, have two AA/Aa category ratings.[12]

The CVP contractors will need to develop a new credit to finance their share of the conveyance facility. In order to issue bonds for their portion of the conveyance facility, CVP contractors will likely need to agree to "take-or-pay" contracts since debt service on bonds must be paid irrespective of hydrologic conditions or the amount of water delivered in a given year. However, fixed payments from contractors that don't vary as a function of the amount of water delivered

[11] Eleven of the SWP contractors, representing 63% of the assumed financial responsibility, have at least one AA/Aa category or higher rating.

[12] Nine of the CVP contractors, representing 49% of the assumed financial responsibility, have at least one AA/Aa category rating.

are potentially challenging. During a period of low water deliveries, at the same time contractors are securing alternative water supplies, they would be obligated to continue to make debt service payments. This could be problematic particularly for small agricultural contractors because their revenues will likely be constrained either simply as a function of crop prices or because they would fallow a portion of their acreage, resulting in lower crop yields to bring to market.

The financial pressure on contractors having to make annual debt service payments, potentially in addition to securing alternative water supplies in dry years, might be able to be partially mitigated in a number of different ways, including the establishment of a large rate-stabilization reserve. However, such a reserve would need to be funded initially, and rules would need to be established to govern how it would be replenished when it is utilized during dry periods.

Even if the CVP contractors develop a new credit with a take-or-pay obligation and similar credit features to the DWR bonds, it is not clear at this point whether $10.25 billion of bonds (assuming a 50/50 split) in the Base Case could reasonably be issued without a large rate stabilization fund or other credit enhancement or subsidy from the federal government, state government, or SWP contractors.

Key Financing Risks

Finally, there are a number of important risks that could pose significant obstacles to a successful financing of the proposed conveyance facility. Construction cost overruns and delays, which are not uncommon for large infrastructure projects of this type, could result in substantially higher debt service costs for the SWP and CVP contractors, which they may or may not be able to pass on to their water users. Regulatory uncertainty, whereby the efforts to restore the fragile Delta ecosystem are not as successful as planned, could lead to reductions in exports from the Delta such that the water deliveries are insufficient to generate the revenues necessary for the water contractors to meet their debt service obligations. If the BDCP's anticipated state and federal funding for habitat conservation is not ultimately forthcoming, the ability to operate the tunnels could be jeopardized. Climate change also presents a financing risk, both by causing unforeseen changes to precipitation patterns such that deliveries from the Delta fall below the levels preliminarily anticipated based on current modeling of the impact of climate change and through greater than anticipated sea level rise leading to increased salinity in the west Delta, again reducing water deliveries to the extent that water contractors will be unable to raise the revenues needed to pay their debt service.

II. Introduction

Project background and overview

The Bay Delta Conservation Plan (BDCP) is a collaborative effort involving numerous state and federal agencies that are endeavoring to restore the Sacramento-San Joaquin Delta and protect the state's water supply. The BDCP provides a regulatory framework for implementing various habitat restoration measures and operating criteria for the Delta water systems. The regulatory process involves securing approval of permits for various projects from various agencies.[13]

Prominent among those projects is a proposal to construct a conveyance facility that would transport water from the Sacramento River north of the Delta to the existing State Water Project (SWP) and federal Central Valley Project (CVP) south Delta pumps to serve municipal and industrial (M&I) and agricultural water users in the Central Valley and coastal and Southern California. This conveyance facility (referred to as Conservation Measure 1 (CM1) in the BDCP) would consist of two 40-foot diameter tunnels reaching maximum depths of more than 150 feet below ground that could carry up to 9,000 cubic feet per second (cfs) of water approximately 30 miles from the Sacramento River to the existing SWP and CVP pumps located approximately 17 miles southwest of Stockton at the Clifton Court Forebay.

The project is designed to improve the Delta habitat and the reliability of the water supply coming from the Delta. As envisioned by the BDCP planning process, in the absence of the various conservation measures proposed to be undertaken under the plan, SWP/CVP south Delta exports would continue to be unreliable, water quality in the Delta would be vulnerable due to sea level rise, and the state would be exposed to potentially severe public health consequences resulting from a major seismic event that could damage Delta facilities and temporarily halt water exports.[14]

The Delta is subject to future sea level rise as a result of climate change and to the risk of earthquakes, both of which could lead to a catastrophic collapse of Delta levees and, potentially, severely disrupt delivery of water from the Delta. The resulting loss of water supplies could result in significant economic losses to the state, depending on how long deliveries were disrupted. By taking water from the Delta north of the existing pumps, the project also creates the potential for higher water exports during the December through June period.

In addition, under the BDCP, along with the expenditure of the $14.57 billion in 2012 dollars (or $19.7 billion when factoring in construction cost inflation) capital cost of the new conveyance facility, approximately $5.28 billion in 2012 dollars in capital spending would be invested in habitat restoration and efforts to reduce the impact of stressors on various covered species

[13] http://baydeltaconservationplan.com/PlanningProcess/BDCP/BDCPProcess.aspx
[14] BDCP EIR/EIS, Chapter 3, Description of Alternatives (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_EIR-EIS_Chapter_3_-_Description_of_Alternatives.sflb.ashx

(including responses to changed circumstances).[15] An additional $4.9 billion in non-capital expenditures are expected to be incurred over the 50-year life of the plan. Of the $24.75 billion ($2012) total cost of the BDCP, the water contractors are anticipated to contribute $16.93 billion. The remaining $7.8 billion, which consists primarily of ecosystem restoration activities, is expected to come from various state and federal sources, including future state General Obligation bond measures approved by the voters. Specifically, $4.1 billion is identified as potentially coming from existing and new state water bonds and other state sources.[16] Approximately $3.3 billion is identified as potentially coming from existing and new federal funding authorizations for habitat restoration.

Purpose of this report

This report provides a preliminary assessment of the affordability and financing considerations of the Delta conveyance facility. Chiefly, it estimates the cost of financing the conveyance facility under different sets of assumptions, estimates the amount of debt service cost a selected group of SWP and CVP water contractors would face, and sets those costs in context in terms of the payment capacity of different types of agricultural products. The report also addresses a number of issues related to how bonds to finance the construction of the facility would need to be structured in order to be issued successfully. Finally, the report explores a number of risks to successfully financing construction of the facility. This report does not address the merits of the BDCP per se or the question of whether the state and other parties involved in the project should proceed with this project.

In the third section of the report, we describe the project and the current estimate of its cost.

In the fourth section of the report, we explore the issue of affordability in some detail by identifying the effective cost of water delivered from the Delta in terms of required debt service payments. We also compare these costs to the cost of alternative supplies for a selected group of water contractors and to the capacity for water purchase for various agricultural crops.

The fifth section of the report evaluates various financing considerations that would need to be addressed in order to successfully bring the issuance to market.

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[15] Of this amount, the SWP and CVP contractors would be responsible for the entire capital cost of the new conveyance facility and a portion of the habitat restoration costs. For the breakdown of these costs, see Figure 5 of this report and Tables 8-37 and 8-38, BDCP Chapter 8, Implementation Costs and Funding Sources (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx)

[16] See Table 8-37 of BDCP Chapter 8 Implementation Costs and Funding Sources (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx). Since Chapter 8 was drafted, the Legislature removed the water bond that had previously been placed on the November 2014 ballot and replaced it with a water bond designed to be "tunnel neutral," according to various media reports. As such, the bond measure voters will consider this year contains little if any funding for Delta habitat restoration activities of the sort contemplated as part of the BDCP.

The last section of the report discusses a number of important risks associated with the project for the purpose of evaluating the extent to which these risks might pose significant obstacles to a successful financing.

Among these risks are:

- Construction cost overruns and delay – Construction delay or a significantly higher than anticipated cost to construct the conveyance facility would drive up the effective cost of water exported from the Delta, thereby putting pressure on the ability of contractors to make debt service payments.

- Regulatory uncertainty – Regulatory uncertainty refers to the risk that, despite substantial investments in habitat restoration and an effort to manage the flow of water in the Delta, these efforts prove to be less successful at improving Delta ecology than preliminarily estimated, resulting in the need to reduce exports from the Delta to a degree that jeopardizes the willingness or ability of water contractors to pay for the exported water. This could, in turn, potentially put repayment of debt service at risk.

- Climate change and sea level rise – There is a risk that precipitation patterns evolve in a direction that differs significantly from the pattern currently anticipated under the BDCP planning process such that exports from the Delta are substantially below the anticipated level, again potentially jeopardizing the willingness or ability of water contractors to pay debt service. Because the risk of a significant deviation – should one occur – is likely greater further out in time when the balance of financing costs remaining to be paid is diminishing, this mitigates the risk associated with these issues.

III. Project Description and Estimated Project Cost

Description of the project

The BDCP process has defined the current preferred conveyance facility for purposes of regulatory and environmental review and public input as follows: The facility would consist of two 40-foot diameter tunnels that would carry water approximately 30 miles from north of the Delta to the existing SWP and CVP pumps south of the Delta. Three pumps would be used to divert up to 9,000 cfs from the Sacramento River. The existing Clifton Court forebay south of the Delta would be expanded to temporarily store water before being pumped to SWP and CVP contractors via the existing system of SWP and CVP aqueducts and canals.

How much is the facility estimated to cost?

The preliminary estimate of the capital cost of the facility is $14.57 billion in 2012 dollars (or $19.7 billion when factoring in construction cost inflation), including design, project management, construction management, construction costs, construction cost contingency and land acquisition. The $14.57 figure includes a contingency of $2.6 billion for tunneling work and $658 million for all other construction work.[17]

According to the BDCP planning staff, this estimate has a range of minus 10 percent to plus 30 percent, based on the type of the estimate at this stage of the project planning process.[18] The estimate reflects the application of contingencies, is the type typically used for preliminary budget approval and would be refined as the planning and design process proceeds. The Association for the Advancement of Cost Engineering International practice guidelines specify the range of the estimate could be exceeded if there are unusual risks associated with the project.[19]

The preliminary estimate for the operating cost of the facility is $36.9 million per year starting in the 11th year (2025) following approval of permits for the facility. These costs are anticipated to rise to approximately $79.3 million annually 16 years after the approval of permits with the inclusion of capital replacement costs, which are anticipated to begin in the 21st year (2035).[20]

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[17] Table 8–5 BDCP Chapter 8, Implementation Costs and Funding Sources (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx).

[18] Note that the current BDCP draft indicates the estimates have a range of -25% to +50%, but discussions with BDCP planning staff confirm that that range is in error, and the current estimates in fact have a range of -10% to +30%.

[19] http://www.aacei.org/non/rps/56R-08.pdf

[20] We have used a figure of $40.2 million ($2012) as the basis for calculating our estimate of future operating costs of $79.3 million ($YOE) starting in 2035. Note that Table 8.5 of the draft BDCP Chapter 8 reports annual operating costs rising to $38 million ($2012); however, the more detailed data presented in the BDCP's Appendix 8A shows annual costs rising to $40.2 million. Discussions with the DWR have confirmed that the $40.2 million figure is in fact correct.

IV. Financing Costs and Affordability of the Project

Overview

To assess the affordability of the BDCP project, we first examine the expected resulting water deliveries as projected by the California Department of Water Resources (DWR). We also estimate the annual debt financing costs under various financing scenarios, plus any additional BDCP-related Operations & Maintenance (O&M) costs or additional capital costs allocated to the SWP and CVP contractors, to estimate the range of annual total costs. We then examine these costs in two ways – as total annual costs in dollar terms, and in terms of total cost per acre-foot of delivered water. Because the annual debt service and BDCP-related operational costs are fairly consistent through time, but annual water deliveries can vary considerably, we estimate the cost/AF for an average delivery year as well as across various exceedance levels[21] to better capture the impact of this water delivery variability. Ultimately, if contractors are obligated to pay debt service irrespective of the amount of water delivered – a so-called "take-or-pay" arrangement – the cost of debt service would likely be a relatively fixed annual cost. However, even under this arrangement, debt service cost per acre-foot of delivered water provides us with insight into the cost pressures contractors would face in securing alternative supplies during dry years. This analysis is conducted for total overall water deliveries to all south-of-Delta contractors and then separately for the total SWP deliveries and the total CVP deliveries. Finally, we construct estimates of costs for a select group of SWP and CVP contractors and discuss some of the factors that affect the affordability of the BDCP costs to those agencies and their water users.

Water Deliveries

The analyses that follow rely on water delivery estimates based on modeling work done by DWR as part of the preparation of the BDCP draft plan. That modeling uses the 81-year hydrologic period used by the CALSIM II model to simulate SWP and CVP operations.[22] Specifically, we have used the delivery estimates associated with the proposed project from the draft BDCP (equivalent to Alternative 4 from the draft BDCP EIR/EIS). The proposed project assumes a dual conveyance with two 40-foot diameter tunnels and 3 intakes, capable of conveying up to 9,000 cfs from the north Delta. Water would be conveyed from three fish-screened intakes between Clarksburg and Walnut Grove to an expanded Clifton Court Forebay south of the Delta.[23]

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[21] See the glossary for an explanation of exceedence levels.

[22] According to the DWR, CALSIM II is a peer-reviewed generalized water resources simulation model for evaluating operational alternatives of large, complex river basins. It currently uses historical hydrologic conditions from 1922 through 2002 to simulate SWP/CVP operations under various scenarios. The model is a product of joint development between DWR and Bureau of Reclamation. For more information see the DWR website: http://modeling.water.ca.gov/hydro/model/index.html.

[23] For a detailed description see Chapter 3 of the EIR/EIS, Description of Alternatives (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_EIR-EIS_Chapter_3_-_Description_of_Alternatives.sflb.ashx), and the August 2013 document BDCP Refinements Respond to Community and Statewide Needs.

The draft BDCP also includes different modeling scenarios to analyze the environmental impacts of requiring higher or lower amounts of water to flow through the Delta into the San Francisco Bay at different times of the year. Some Delta species may benefit from higher flows at certain times of the year, while other species may benefit from lower flows during those times; thus, it is currently uncertain whether the optimal environmental outcomes will result from higher or lower outflows in the Spring or in the Fall, or in both. Higher outflows to benefit the Delta ecosystem will result in lower water deliveries to SWP and CVP contractors, all things equal, as the water that might otherwise be exported to water users is instead allowed to flow through the Delta and out to the Pacific Ocean through the San Francisco Bay. Therefore, a “low outflow” scenario provides more water for SWP and CVP contractors, while a “high outflow” scenario provides less water to SWP and CVP water users.

Scenarios have been created that test the combinations of expected high and low seasonal outflows and the resulting impact on Delta water exports to the SWP and CVP contractors. At the most basic level, these scenarios can be divided into high and low outflow in the Spring and high and low outflow in the Fall, resulting in four scenarios. We have used those four scenarios in our analyses, along with the “No Action Alternative” (NAA), as defined in the draft EIR/EIS, to serve as a baseline.

Finally, multiple water delivery scenarios have been prepared for the draft BDCP to correspond to different points in time in the implementation of the BDCP. The “Early Long-Term” (ELT) scenarios use the expected conditions as of 2025, while the “Late Long-Term” (LLT) scenarios use the conditions expected in 2060.[24] For our analyses we have used the ELT scenarios under the assumption that they best represent the conditions that will be in effect during the period of peak annual costs for the water contractors. Specifically, we have used the following ELT scenarios:

- No Action Alternative (NAA) = absence of BDCP
- Low Outflow Scenario (LOS) = low fall outflow, low spring outflow
- Evaluated Starting Operation (ESO) = high fall outflow, low spring outflow
- Spring High Outflow (SprHOS) = low fall outflow, high spring outflow
- High Outflow Scenario (HOS) = high fall outflow, high spring outflow

As described above, the delivery scenarios are estimated based on the hydrologic conditions that existed over an extended 81-year period. The CALSIM II output we received from the DWR provides annual export and delivery estimates corresponding to the hydrologic conditions for the years 1922 through 2002. This provides a sense of the variability of potential Delta exports through time, as well as the prevalence of extended periods of high or low exports. Figure 1 provides a graph of the delivery data in chronological order as received for the delivery scenarios used.

[24] For a detailed description see BDCP Chapter 5, specifically Table 5.2-3. “Analytical Conditions of the Modeled Scenarios.” (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_5_-_Effects_Analysis.sflb.ashx).

Figure 1: Total Estimated South-of-Delta Water Deliveries for ELT Scenarios

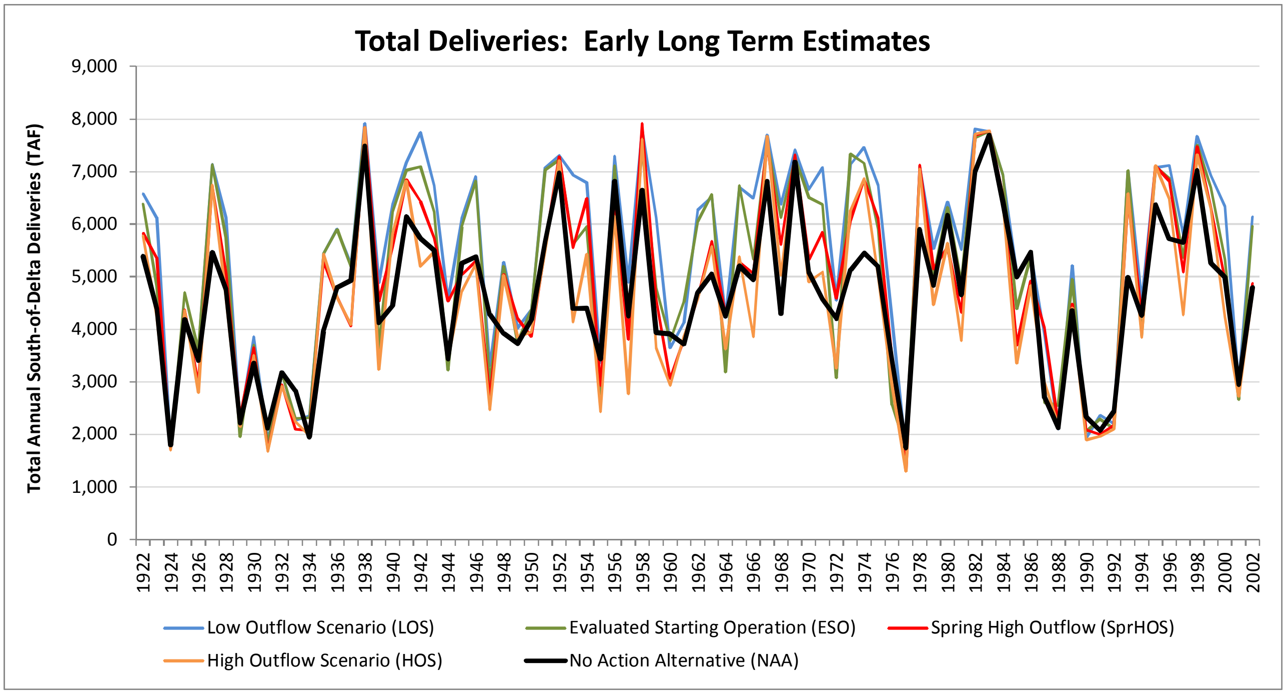


Figure 2 provides a summary of the minimum, average, and maximum annual deliveries in thousands of acre-feet for each of the scenarios analyzed. In addition, the table shows the total deliveries by exceedance level, which represents the percent of years in which a value is equaled or exceeded, and is often used to illustrate the probability of water deliveries meeting or exceeding a specific level. For example, using the delivery estimates for the NAA scenario, the table shows that 20% of the time deliveries are estimated to meet or exceed a level of 5,673,000 AF. Similarly, 80% of the time the estimated deliveries will be 3,436,000 AF or greater. Thus, lower exceedance levels are associated with the wettest years, as there are very few years when deliveries are expected to be higher; conversely, higher exceedance levels are associated with the driest years. The 50% exceedance level represents the median estimated annual deliveries, with half of the years expected to be higher and half lower.

Figure 2: Total Estimated Annual Water Deliveries (CVP+SWP) by ELT Scenario (AF, thousands)

Delivery	Annual Deliveries			Driest Years	<----------		Exceedance Level			---------->	Wettest Years	
Scenario	Min	Avg	Max	90%	80%	70%	60%	50%	40%	30%	20%	10%
NAA	1,744	4,628	7,693	2,433	3,436	4,123	4,297	4,698	4,987	5,259	5,673	6,647
LOS	1,622	5,464	7,921	2,349	3,862	4,539	5,278	6,123	6,424	6,792	7,079	7,420
ESO	1,738	5,138	7,804	2,314	3,163	3,871	4,891	5,386	5,959	6,513	7,025	7,227
SprHOS	1,313	4,896	7,915	2,189	3,421	4,216	4,569	5,050	5,327	5,734	6,495	7,124
HOS	1,292	4,596	7,843	2,168	2,930	3,626	4,080	4,572	5,028	5,472	6,288	7,114

Data taken from CALSIM II output as received from DWR.

Of the four BDCP scenarios, the Low Outflow Scenario (LOS), which assumes low outflows through the Delta in both the Spring and in the Fall, provides more water for export from the Delta and thus results in the highest estimated water deliveries. The High Outflow Scenario (HOS) assumes high outflows through the Delta and out to the Pacific in both periods, resulting in the lowest estimated deliveries of the four. Note that it is somewhat misleading to compare the NAA scenario against the other BDCP scenarios because those scenarios include estimated adjustments in outflow expected to be required to meet the environmental goals laid out in the BDCP, whereas the NAA scenario does not include such adjustments.

Figure 3: Total Estimated Deliveries for ELT Scenarios by Exceedance

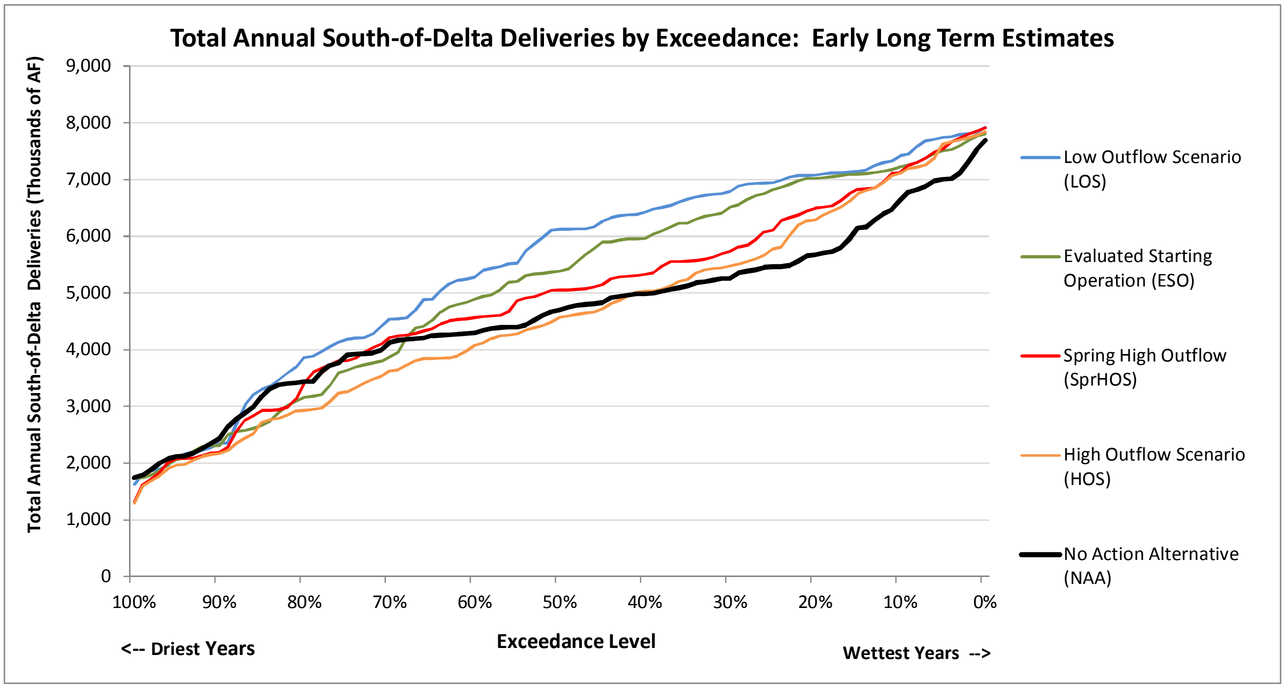


Figure 3 graphically compares the exceedance values for each scenario, and confirms that the spread among the scenarios is greatest at the lower exceedance levels (wetter years), specifically in the 50% to 20% exceedance level range. As Figure 3 indicates, the differences among the BDCP scenarios are less pronounced at the higher exceedance levels (driest years). That is, the difference between the LOS and HOS scenarios in the driest years is generally not as great as the difference in the average or wetter years.

In addition to examining total estimated deliveries, we also used more detailed annual data series to break out the exports into CVP total deliveries and SWP total deliveries, and to estimate the deliveries for specific CVP and SWP contractors. Specifically, the individual series received were as follows:

- Total exports (all CVP and SWP South-of-Delta (SOD) water exports)[25]

[25] Total exports include all water exported via pumping at the Banks and Jones Pumping Plants in the Delta. It includes both diversions at the proposed north Delta intakes and the existing south Delta intakes. It includes any water diverted from the Delta for deliveries to South-of-Delta CVP refuges, Exchange Contractors, Ag and M&I service contractors, as well as additions to the San Luis Reservoir. To maintain consistency, our estimates of total water deliveries throughout this report uses the sum of the

- CVP Ag and M&I deliveries via the San Felipe Division Project
- CVP Ag and M&I deliveries via the San Luis & Delta Mendota Water Authority (SLDMWA)
- CVP Ag deliveries to contractors via the Cross Valley Canal
- CVP Refuge Level 2 deliveries
- CVP Exchange Contract deliveries
- Individual Ag & M&I deliveries to each of the 26 SWP SOD contractors, with separate series for “Normal” deliveries, Article 21 deliveries, and Article 56 deliveries.[26]

Because the CALSIM II model provides detailed delivery estimates for each of the 26 SOD SWP contractors, we are able to sum those annual deliveries to estimate the total SWP deliveries. Similarly we took the sum of the CVP delivery series to estimate the total for the CVP contractors. These SWP and CVP totals are provided in Figure 4.

Figure 4: SWP and CVP Deliveries by Early Long Term Scenario (thousands of AF)

SWP/	Delivery	Annual Deliveries			Driest Years		<----------	Exceedance Level			---------->	Wettest Years	
CVP	Scenario	Min	Avg	Max	90%	80%	70%	60%	50%	40%	30%	20%	10%
SWP	NAA	725	2,545	4,427	1,197	2,026	2,279	2,472	2,682	2,798	2,852	3,175	3,567
	LOS	578	3,180	4,655	1,189	2,170	2,632	3,188	3,666	3,927	4,061	4,154	4,340
	ESO	711	2,949	4,539	1,070	1,497	2,228	2,846	3,374	3,710	3,880	4,093	4,265
	SprHOS	354	2,630	4,690	995	1,711	2,277	2,501	2,659	2,916	3,139	3,689	3,939
	HOS	360	2,446	4,577	936	1,396	1,798	2,266	2,478	2,685	2,902	3,520	3,895
CVP	NAA	987	2,083	3,266	1,230	1,499	1,735	1,928	1,988	2,161	2,423	2,632	3,128
	LOS	1,025	2,284	3,266	1,230	1,666	1,838	2,087	2,410	2,600	2,756	2,943	3,207
	ESO	1,014	2,189	3,266	1,230	1,492	1,746	1,992	2,172	2,405	2,701	2,923	3,191
	SprHOS	958	2,266	3,266	1,230	1,647	1,872	2,073	2,283	2,588	2,714	2,936	3,213
	HOS	932	2,150	3,266	1,230	1,585	1,699	1,902	2,051	2,238	2,592	2,901	3,203

Data taken from CALSIM II output as received from DWR.

Estimated Costs

Chapter 8 of the BDCP planning documents provides a breakout of the estimated capital and operational costs associated with the BDCP, and it also presents the fraction of those costs

individual deliveries rather than the total exports, as some exports are lost to evaporation or canal seepage, or represent additions to the San Luis Reservoir. On average the sum of all deliveries was equal to 95 to 97% of the total exports depending upon the scenario.

[26] Of the 29 SWP contractors, three (County of Butte, Plumas County FC&WCD, and City of Yuba City) receive water from the Upper Feather River rather than the Delta and are therefore excluded from this analysis.
The DWR defines Article 56 and Article 21 water as follows:
Article 56 (“carryover”) water: “Table A water that is allocated to a contractor in a given year, but is unused and stored in SWP supply reservoirs (when storage capacity is available) for use by that contractor in a following year. The water is temporarily stored or carried over in SWP reservoirs, primarily San Luis Reservoir.”
Article 21 water: “Water identified in an article of SWP long-term water supply contracts between the California Department of Water Resources (DWR) and each SWP water contractor. The article addresses non–Table A water that becomes available on an intermittent, interruptible basis.”
(from http://www.water.ca.gov/calendar/docs/DWR_SWP_IS-ND_071613_repro.pdf)

allocated to the SWP and CVP contractors.[27] A summary of these contractor costs is provided in Figure 5.

Figure 5: BDCP Funding Provided by Participating Water Contractors ($2012 Millions)

BDCP Implementation Elements with Contractor Payment Responsibilities	Total Capital Cost	Operational Cost (50-Yr Permit Term)	Total Cost	% Paid by Contractors	Total Amount Paid by Contractors	Contractors' Debt Financed Capital Costs
CM1 Water Facilities and Operation	$14,570.9 *	$1,456.0	$16,026.9	100.0%	$16,026.9	$14,570.9
CM3 Natural Communities Protection and Restoration	$460.1	$0.0	$460.1	20.2%	$92.8	-
CM4 Tidal Natural Communities Restoration	$1,909.6 *	$0.0	$1,909.6	12.6%	$240.6	** $88.8
CM6 Channel Margin Enhancement	$120.2	$0.0	$120.2	13.0%	$15.6	-
CM7 Riparian Natural Community Restoration	$47.6	$0.0	$47.6	2.7%	$1.3	-
CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration	$1.7	$0.0	$1.7	9.0%	$0.2	-
CM10 Nontidal Marsh Restoration	$52.7	$0.0	$52.7	4.0%	$2.1	-
CM11 Natural Communities Enhancement and Management	$138.1	$236.6	$374.7	20.2%	$75.6	-
CM15 Localized Reduction of Predatory Fishes	$2.8	$102.2	$105.0	40.7%	$42.8	-
CM16 Nonphysical Fish Barriers	$763.0	$508.7	$1,271.7	14.3%	$181.7	-
CM22 Avoidance and Minimization Measures	$0.0	$36.3	$36.3	24.4%	$8.9	-
Program Administration	$0.0	$336.4	$336.4	9.4%	$31.5	-
Monitoring and Research	$0.0	$912.8	$912.8	8.3%	$75.4	-
Property Tax Revenue Replacement	$0.0	$226.0	$226.0	43.3%	$97.7	-
Changed Circumstances	$184.0	$0.0	$184.0	20.2%	$37.1	-
TOTAL					**$16,930.2**	**$14,659.7**
Total Other Costs: EIR/EIS Mitigation Measures Not Counted Elsewhere	$0.0	$141.8	$141.8	65.2%	$92.5	-
TOTAL ALL COSTS	**$18,250.7**	**$3,956.8**	**$22,207.5**		**$17,022.7**	**$14,659.7**

* The capital costs for these items are expected to be paid through debt issuances, all others are PAYGO.

** This analysis assumes only those CM4 capital costs incurred by 2028 will be debt-financed, and the rest will be PAYGO.

As the table above shows, these costs include both capital costs and O&M costs associated with the specific BDCP implementation elements. The capital costs associated with item CM1, the construction and operation of the conveyance facilities, account for the largest single cost item for the contractors at $14.57 billion ($19.7 billion factoring in construction cost inflation) in capital costs and an additional $1.46 billion in O&M costs ($4.2 billion when adjusted for inflation) over the 50-year permit period. The capital costs associated with CM1 and a portion of CM4 are currently anticipated to be debt-financed, while the remaining capital costs paid by the water

[27] See generally BDCP Chapter 8, Implementation Costs and Funding Sources (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources.sflb.ashx) and BDCP Appendix 8.A, Implementation Costs Supporting Materials (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_8A_-_Implementation_Costs_Supporting_Materials.sflb.ashx) for more detail.

contractors are expected to be PAYGO funded ("pay-as-you-go").[28] Under these assumptions, the total capital costs expected to be financed by the SWP and CVP contractors is approximately $14.7 billion in 2012 dollars ($19.7 billion when factoring in construction cost inflation) and the combined contractors' share of the PAYGO capital costs and O&M costs total approximately $2.3 billion in 2012 dollars (or $6.2 billion when adjusted for inflation), for a total of just over $17 billion in 2012 dollars ($25.9 billion when factoring in construction cost inflation and general inflation of 3% for O&M costs).

Using the expected annual cost schedules provided by Chapter 8 of the draft BDCP documents (November 2013 revision) and consultants to the BDCP, we then constructed annual payments for the debt-financed capital costs, PAYGO capital costs, and O&M costs. For the capital costs that are expected to be financed with debt, financing schedules were constructed to estimate the total annual principal and interest payments that would be required to finance these debt issuances. Numerous assumptions were necessary to construct these debt schedules, including the expected construction cost inflation rate issuance schedule, term of the bonds issued, assumed rating and interest rates, underwriting costs and other costs of issuance, and the amount of debt service reserve funds that would also be financed. The assumptions used for the "Base Case" financing scenario are presented in Figure 6 below. As shown in Figure 6, the construction cost inflation rate used here is 3% rather than the 2% inflation rate used in the BDCP. The 3% rate is based on historical averages for construction costs of similar large infrastructure projects, and is described more fully in Appendix A. The use of 3% rather than 2% results in higher year-of-expenditure costs, and thus provides a more conservative estimate of the total debt financing costs.

[28] Only those CM4 construction costs that are expected to occur through 2028 were included due to the low amounts needed for CM4 costs after that. For the purposes of this analysis, the remaining CM4 construction costs after 2028 are included with the other capital PAYGO contractor costs.

Figure 6: Assumptions for "Base Case" Debt Financing Payment Schedule

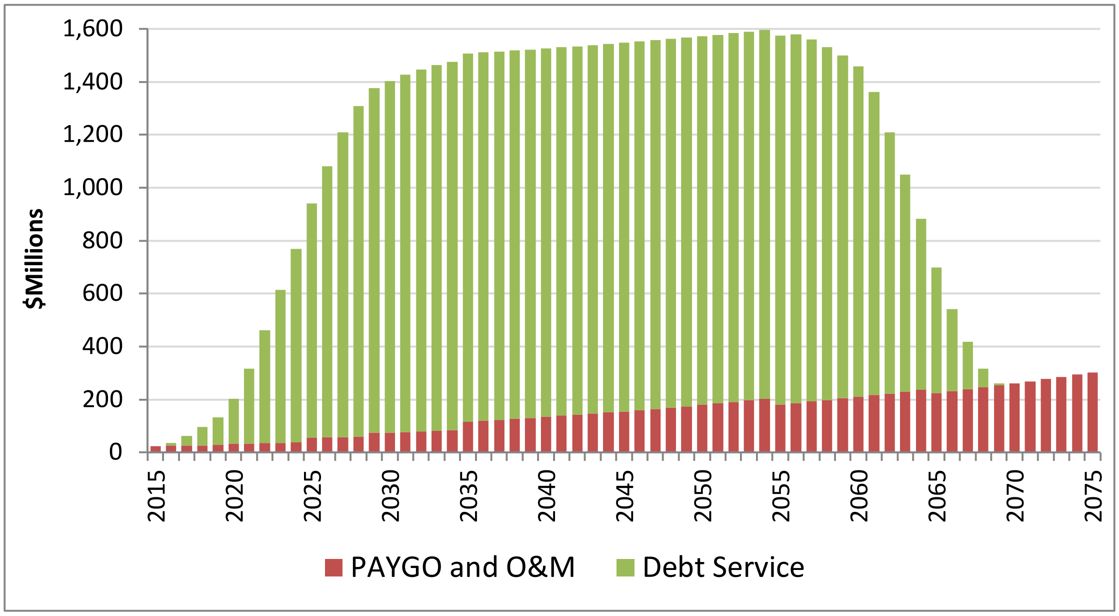
Project Cost	$14.57 B for CM1 + $88.8 M for CM4 = $14.66 B ($2012) Represents a total of $19.68 B in Year of Expenditure dollars
Construction Cost Inflation Rate	0 % in 2012; 3% thereafter [29]
Bond Issuance Schedule	2015 - $351,522,021 2022 - $2,452,383,543 2016 - $496,084,700 2023 - $2,424,236,929 2017 - $527,029,058 2024 - $2,319,817,762 2018 - $660,368,235 2025 - $1,831,407,038 2019 - $1,481,937,250 2026 - $1,554,490,901 2020 - $2,211,346,578 2027 - $889,480,983 2021 - $2,390,480,267 2028 - $93,067,126 Total par amount of bonds to be issued: $20,503,670,000
Final Maturity	40 years from date of each issuance
Assumed Ratings	AA/AA/Aa
Interest Rates	All-in true interest cost (TIC) of 5.96%. This is the 20-year average of the MMD AA-rated general revenue bond index adjusted for a 95% confidence sensitivity cushion for rates in effect as of December 18, 2013. The spread between 30 and 40 years was assumed to be 30 basis points. The TIC reflects costs to issue the bonds.
Underwriter Discount	$5 per $1,000
Cost of Issuance	$1,500,000 per issue
Debt Structure	Five years of interest only followed by 35 years of level debt for each issue
Type of Debt	Tax-exempt, fixed rate
Bond Funded Debt Service Reserve	50% of maximum annual debt service for each issue: 3.74% investment rate, which is the 20-year average of the 3-Year U.S. Treasuries adjusted for a 95% confidence sensitivity cushion.
Capitalized Interest	None

To estimate the total costs to the water contractors associated with the implementation of the BDCP, these annual financing costs were then added to the contractors' annual PAYGO and O&M costs.[30] The debt service portion of these costs totals are estimated to reach just under $1.4B per year and the PAYGO and O&M costs contribute an additional $74 million by 2030 to just over $200 million by 2054. Figure 7 shows these combined costs through time.

[29] The 3% inflation rate for construction costs is based on combined historical averages for similar construction projects as described in Appendix A.

[30] Note that the PAYGO and O&M costs were also converted to year-of-expenditure dollars using the same 3% inflation rate used for the debt financed capital costs, as the general inflation rate is also assumed to be 3%. For the purposes of this analysis, the PAYGO capital costs are assumed to end after 50 years while the O&M costs are assumed to continue.

Figure 7: Estimated Base Case Annual Contractor Costs



As shown in Figure 7, the annual costs vary somewhat from year to year. To investigate the affordability of the BDCP costs to the contractors, we looked at those years where real costs are highest. To do this, we have defined "Peak Annual Costs" as the average annual costs across the highest ten years. For the Base Case, this represents the period from 2048 through 2057 and is approximately $1.58 billion. It should be noted that the actual annual costs contractors would face will depend on how the debt issuance for these costs is structured and the resulting pattern of debt service costs over time. For example, the financing and resulting debt service could be structured to be "wrapped around" existing debt service obligations on the part of contractors so that the cost of financing the BDCP is not simply added to existing debt service obligations on an annual basis. However, because additional future non-BDCP debt service obligations are unknown and because the structure of the BDCP issuance has not been determined, our results should be regarded as illustrative.

In addition to the Base Case, financing costs were also estimated based on a "Best Case" scenario and a "Worst Case" scenario to test the impacts of changes in the underlying financing assumptions. Rather than representing the absolute best and worst case scenarios possible, these alternative cases are intended to illustrate the impact of a significant deviation from the base case in terms of costs, timing, interest rates and a number of other parameters. It is possible that for example, construction costs ultimately could exceed the cost estimate we use for the Worst Case scenario. However, it is unlikely that the value of all of the parameters in each scenario would move in the same direction (that is, so as to all increase costs or all decrease costs). Thus, our Best and Worst Case scenarios are intended to illustrate a reasonable range in terms of the impact of changes in these parameters on the total cost of the project. Both alternatives start with the Base Case, but the Best Case assumes that construction costs are 10% lower than current estimates and interest rates are decreased by 100 basis points, while the Worst Case assumes that real construction costs are 30% higher than the Base Case, interest rates are 200 basis points higher than the Base Case, and there is a three-year delay for the start of the bond issuances from 2015 to 2018.[31] In this way, the Worst Case financing scenario results in cost increases not only from increased real construction costs due to increased scope or unforeseen additional costs, but also from cost increases due to construction cost inflation caused by the delay in the start of the construction process itself. [32]

Finally, to complete our analysis we also allocated the total cost estimates between the SWP and CVP contractors using two allocation assumptions. The first assumes that the costs are split equally (50/50) between the SWP and CVP contractors, with each group responsible for 50% of the costs, as presented in the current draft BDCP plan. The second uses an alternative allocation of 60/40, with the SWP contractors responsible for 60% of the costs, and the CVP contractors responsible for 40%. Figure 8 presents a summary of the differences in assumptions in the Base Case, Best Case and Worst Case scenarios, along with the peak annual cost in total for the SWP and CVP contractors under the 50/50 split and the 60/40 split. While costs likely would at least initially be allocated based on some defined split between the SWP and CVP, there may be a "true-up" at the end of each year based on the actual allocation of water deliveries, so that the costs actually paid by SWP and CVP contractors could vary from year to year as relative deliveries vary. For the purpose of this analysis, however, the cost allocation is treated as fixed for either a 50/50 or 60/40 split and estimated deliveries taken as given regardless of which cost allocation is used.

[31] The current cost estimates include estimates for the costs themselves plus an additional contingency amount. In the BDCP draft this contingency is estimated at 20% for most cost items, but for the construction costs associated with the tunnels it is set at 36%. The 10% decrease in costs for the Base Case decreases the costs by 10% and lowers the contingency amounts to reflect 10% of this lower figure unless a particular cost item is already below 10%, in which case the percent contingency is kept the same. For the Worst Case, the costs are raised 30% and the contingency is lowered to 20% of this lower cost figure unless it is already below 20%. In this way, the Best Case lowers debt-financed contractor costs (including contingency) by 24.5%, and the total contractor costs (including contingency) by 23.1%. For the Worst Case scenario, the debt-financed contractor costs (including contingency) are raised by 17.4%, and the total contractor costs (including contingency) are raised by 18.6%.

[32] A number of alternative scenarios were also prepared by the State Treasurer's Office to illustrate the impact of specific changes in the assumptions used, such as an increase or decrease in construction costs, construction delays, higher or lower interest rates, etc. A summary of these scenarios is provided in Appendix A.

Figure 8: Summary of Financing Scenarios

Financing Assumptions	Base Case	Best Case	Worst Case
Debt Financed Costs ($YOE)	$19.7B	$14.8B (Base - 10%)*	$25.2B (Base+ 30%)*
Par Amount of Bonds Issued ($YOE)	$20.5B	$15.4B	$26.4B
Interest Rate	20 year avg MMD AA-rated** (all-in true interest cost of 5.964%)	Base Minus 1% (all-in true interest cost of 4.947%)	Base Plus 2% (all-in true interest cost of 7.998%)
Issuance Start Yr	2015	2015 (Base)	2018 (Base + 3 Yrs)
Total Peak Annual Cost ($YOE)* **	**$1,576.6M**	**$1,084.3M**	**$2,502.4M**
50/50 Split for SWP/CVP ($YOE):			
SWP Share	**$788.3M**	**$542.1M**	**$1,251.2M**
CVP Share	**$788.3M**	**$542.1M**	**$1,251.2M**
60/40 Split for SWP/CVP ($YOE):			
SWP Share	**$945.9M**	**$650.6M**	**$1,501.4M**
CVP Share	**$630.6M**	**$433.7M**	**$1,001.0M**

* For the Best Case and Worst Case the pre-contingency costs are adjusted by -10% and +30%, respectively. The contingency amount is then set to either 10% in the Best Case and 20% in the Worst Case or the original percentage, whichever is lower.

** Base interest rate = 20 year average of the MMD AA-rated general revenue bond index adjusted for a 95% confidence sensitivity cushion for interest rates in effect as of December 18, 2013.

*** Peak annual costs represent the average annual costs for the highest 10 years, though total costs are fairly constant for over 30 years (see Figure 7).

Estimated Costs per Acre-Foot

To estimate the resulting total cost per acre foot for all water exports, we divide the total peak annual costs presented in Figure 8 by the water exports in Figure 2. These estimates are presented below in Figure 9. Applying the three financing scenarios (Best Case, Base Case and Worst Case) to all four of the delivery scenarios results in 12 total scenarios. As the table shows, the variability across the four delivery scenarios is not as great as the variability across the three financing scenarios – for example, the Base Case average cost/AF ranges from a low of $289 for the LOS delivery scenario to a high of $343 for the HOS scenario, while the finance scenarios applied to the LOS delivery scenario produce average cost/AF estimates that range from as low as $232 in the Best Case to as high as $504 in the Worst Case.

Figure 9: Peak Annual Cost/AF for Total Deliveries (SWP+CVP) by Scenario ($YOE)

Scenario		Values in $YOE									
		Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
Best Case	LOS	198	462	281	239	205	177	169	160	153	146
	ESO	221	495	317	257	237	215	204	189	167	152
	SprHOS	211	469	343	280	222	201	182	166	154	150
	HOS	236	500	370	299	266	237	216	198	172	152
Base Case	LOS	289	671	408	347	299	257	245	232	223	212
	ESO	322	720	461	374	345	312	296	275	243	221
	SprHOS	307	681	499	407	322	293	265	242	224	218
	HOS	343	727	538	435	386	345	314	288	251	222
Worst Case	LOS	458	1,065	648	551	474	409	390	368	354	337
	ESO	511	1,143	731	594	548	496	470	436	385	351
	SprHOS	487	1,081	791	646	512	465	420	384	356	346
	HOS	545	1,154	854	690	613	547	498	457	398	352

Similar estimates can be constructed for the SWP and CVP exports separately by applying the appropriate export estimates in Figure 4 above to the peak annual costs in Figure 8. These estimates are presented in Figure 10, which assumes a 50/50 split between the SWP and CVP, and Figure 12, which assumes a 60/40 split.

Figure 10: Peak Annual Cost/AF Assuming a 50/50 SWP/CVP Cost Allocation

Scenario		Values in $YOE									
		Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
SWP	LOS	170	456	250	206	170	148	138	134	130	125
Best	ESO	206	545	317	238	217	204	186	173	147	138
Case	SprHOS	184	507	362	243	190	161	146	140	132	127
	HOS	222	579	388	301	239	219	202	187	154	139
SWP	LOS	248	663	363	299	247	215	201	194	190	182
Base	ESO	300	792	461	346	315	296	270	251	214	200
Case	SprHOS	267	737	527	354	277	234	212	203	193	185
	HOS	322	842	565	438	348	318	294	272	224	202
SWP	LOS	393	1,052	576	475	392	341	319	308	301	288
Worst	ESO	476	1,257	731	550	500	471	429	399	339	318
Case	SprHOS	424	1,170	836	562	440	371	337	322	306	293
	HOS	512	1,337	897	696	552	505	466	431	355	321
CVP	LOS	237	441	326	295	260	225	209	197	184	169
Best	ESO	239	441	329	290	262	237	209	200	185	169
Case	SprHOS	248	441	363	310	272	250	225	201	185	170
	HOS	252	441	342	319	285	264	242	209	187	169
CVP	LOS	345	641	473	429	378	327	303	286	268	246
Base	ESO	348	641	479	421	380	345	305	290	269	245
Case	SprHOS	360	641	528	451	396	363	328	292	270	247
	HOS	367	641	497	464	415	384	352	304	272	246
CVP	LOS	548	1,017	751	681	600	519	481	454	425	390
Worst	ESO	552	1,017	760	668	604	548	483	461	426	389
Case	SprHOS	572	1,017	839	717	628	576	520	463	428	392
	HOS	582	1,017	789	736	658	610	559	483	431	391

As shown in Figure 10, there is a difference between the SWP and CVP total costs when compared across different exceedance levels. Using the Base Case/HOS scenario as an example, the cost/AF for the SWP contractors ranges from $202/AF at the 10% exceedance level to $842/AF at the 90% level, an increase of over 400%. The CVP costs, however, range from $246/AF to $641/AF, an increase of just over 260%. Because the peak annual costs are equal when the costs are split 50/50 between the CVP and SWP, this implies that the total SWP exports are more variable than the CVP total exports. Figure 11 below, which presents comparable estimates assuming a 60/40 allocation between the SWP and CVP, shows a similar pattern.

Figure 11: Peak Annual Cost/AF Assuming a 60/40 SWP/CVP Cost Allocation

Scenario		Values in $YOE									
		Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
SWP	LOS	205	547	300	247	204	177	166	160	157	150
Best	ESO	247	654	380	286	260	245	223	207	176	165
Case	SprHOS	221	608	435	292	229	193	175	168	159	153
	HOS	266	695	466	362	287	263	242	224	185	167
SWP	LOS	297	796	436	359	297	258	241	233	228	218
Base	ESO	360	950	553	415	378	356	324	301	256	240
Case	SprHOS	321	884	632	425	332	280	255	244	231	222
	HOS	387	1,011	678	526	417	382	352	326	269	243
SWP	LOS	472	1,263	692	570	471	410	382	370	361	346
Worst	ESO	571	1,508	878	659	600	565	515	478	407	381
Case	SprHOS	509	1,404	1,003	674	527	445	405	387	367	352
	HOS	614	1,604	1,076	835	663	606	559	517	427	385
CVP	LOS	190	353	260	236	208	180	167	157	147	135
Best	ESO	191	353	263	232	209	190	168	160	148	135
Case	SprHOS	198	353	291	248	218	200	180	161	148	136
	HOS	202	353	274	255	228	211	194	167	149	135
CVP	LOS	276	513	379	343	302	262	243	229	214	197
Base	ESO	278	513	383	337	304	276	244	232	215	196
Case	SprHOS	288	513	423	361	317	290	262	233	216	198
	HOS	293	513	398	371	332	307	282	243	217	197
CVP	LOS	438	814	601	545	480	415	385	363	340	312
Worst	ESO	442	814	608	535	483	438	387	369	341	312
Case	SprHOS	457	814	671	573	503	461	416	371	342	314
	HOS	466	814	631	589	526	488	447	386	345	312

Delivery and Cost Estimates for Specific Contractors

METHODOLOGY

To understand the issues that affect the affordability of the BDCP for specific contractors, we selected four contractors that represent some of the largest agricultural and M&I contractors from the SWP and CVP. Specifically, we examine the Metropolitan Water District (MWD), the Kern County Water Agency (Kern), the Westlands Water District (Westlands), and the Santa Clara Valley Water District (Santa Clara). As the largest water users, the four contractors selected may not be representative of the many smaller SWP and CVP contractors, most notably CVP agricultural water users; however, they do represent a substantial portion of total SWP and CVP south-of-Delta water deliveries and are used here to provide some insight into the issues all contractors share in common. A summary of the four selected contractors and their characteristics is provided in Figure 12.

Figure 12: Contractors Selected for Affordability Investigation

	MWD	Kern	Westlands	Santa Clara
SWP Table A Quantity (AF) (% Total SOD Table A)[33]	1,911,500 (46.3%)	982,730 (23.8%)	(n/a)	100,000 (2.4%)
CVP Max Contract Qty (AF)[34] (% Total SOD CVP)	(n/a)	(n/a)	1,186,688 (36.4%)	152,500 (4.7%)
M&I vs. Ag	95% M&I	90% Ag	99% Ag	90% M&I

MWD and Santa Clara primarily provide water to M&I users, while Kern and Westlands primarily supply agricultural users. MWD and Kern are the two largest SWP contractors, accounting for about 70% of the SOD total Table A values. Santa Clara receives water from both the SWP and CVP, accounting for 2.4% of the SWP SOD Table A and 4.7% of the CVP SOD Maximum Contract Quantity. Westlands is the single largest CVP water contractor and represents 36.4% of the CVP's SOD "maximum contract quantity" total.

As discussed above, the Delta water export data series produced by the CALSIM II model include estimates for each SWP contractor, so we have used the sum of the Normal, Article 56, and Article 21 deliveries for MWD, Kern, and the SWP portion of the Santa Clara deliveries. For the CVP contractors, however, the CALSIM II model output does not provide delivery estimates for individual contractors, but only for the total Ag and M&I deliveries via the San Felipe Division Project, the San Luis & Delta Mendota Water Authority (SLDMWA), and via the Cross Valley Canal. For the CVP portion of the Santa Clara deliveries, we have estimated their share of the San Felipe deliveries based on the Santa Clara share of the "Max Contract Quantity" and their allocation of agricultural and M&I water, since the CVP distinguishes between agricultural use and historical M&I use to allocate scarce water deliveries in dry years, providing a higher percent of the contract quantity for M&I use than for agricultural use. Similarly we have used Westlands' share of the SLDMWA deliveries, again following the current allocation process, to estimate M&I deliveries and agricultural deliveries in years when full contract quantities are not available.

The CVP delivery priority schedule in Figure 13 provides the level of "Historical Use" for M&I users that is first met before the corresponding percent of contracted agricultural water is provided. As the delivery schedule shows, the priority given to CVP M&I water users provides them with 50% of their historical use before any water is provided to agricultural users. After the 50% threshold for M&I users is met, both M&I and Ag users receive an increasing share of their contract quantity/historical use. At the high end, agricultural water deliveries are capped at 75% of their contract quantity until 100% of M&I deliveries are provided.

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33 The maximum Table A amount is the basis for apportioning water supply and costs to the 29 SWP contractors. The total South-of-Delta Table A totals 4,132,836 AF and does not include the 39,420 AF for the three Feather River contractors (Source: SWPAO (5/21/2012), http://www.water.ca.gov/swpao/docs/notices/12-09.pdf).

34 The CVP contractors have a "Maximum Contract Quantity" similar to the SWP's "Table A," though numerous additional considerations are used to give priority for deliveries in dry years. The CVP south-of-Delta contractors include the following, with the corresponding Maximum Contract Quantity annual amounts in AF: Refuges – Level 2 (271,001), Exchange Contractors (840,000), Settlement Contractors (35,023), and Service Contractors (2,110,648) for a total of 3,256,672 AF. Westlands and Santa Clara are both Service Contractors. (Source: "Central Valley Project (CVP) Water Contractors", Bureau of Reclamation, revised 2/22/2012).

Figure 13: CVP Water Delivery Priority and Contract Quantity Detail

CVP Delivery Priority			Max	M & I	Ag	
Ag	**M&I**	**San Felipe Divlsion ***	**Contract Qty**	**Historical Use**	**Contract Qty**	**% M&I**
100%	100%	When M&I Allocation is <100%:				
75%	100%	San Benito County Water District	43,800	8,250	35,550	18.8%
70%	95%	Santa Clara Valley Water District	152,500	130,000	33,100	79.7%
65%	90%	**San Felipe Total**	**196,300**	**138,250**	**68,650**	**66.8%**
60%	85%	**Santa Clara % of Total**	**77.7%**	**94.0%**	**48.2%**	
55%	80%	When M&I Allocation is 100%:				
50%	75%	San Benito County Water District	43,800	8,250	35,550	18.8%
25%	75%	Santa Clara Valley Water District	152,500	119,400	33,100	78.3%
20%	70%	**San Felipe Total**	**196,300**	**127,650**	**68,650**	**65.0%**
15%	65%	**Santa Clara % of Total**	**77.7%**	**93.5%**	**48.2%**	
10%	60%	**San Luis & Delta Mendota**	**Max**	**M & I**	**Ag**	
5%	55%	**Water Authority (SLDMWA)**	**Contract Qty**	**Historical Use**	**Contract Qty**	**% M&I**
0%	50%	Delta-Mendota Canal - All but Westlands	297,412	11,254	286,158	3.8%
		Mendota Pool	56,278	-	56,278	0.0%
		San Luis Unit - All but Westlands	245,670	11,147	234,523	4.5%
		Westlands	1,186,688	2,735	1,183,953	0.2%
		SLDMWA Total	**1,786,048**	**25,136**	**1,760,912**	**1.4%**
		Westlands % of Total	**66.4%**	**10.9%**	**67.2%**	

* The values for San Benito and Santa Clara were provided by those agencies and differ slightly from the values reported in the document "*Central Valley Project (CVP) Water Contractors*, Bureau of Reclamation, revised 2/22/2012" from which the rest of the data were taken.

Figure 13 also shows the share of the San Felipe Division water deliveries that go to Santa Clara, and the share of the SLDMWA deliveries that go to Westlands. As those tables show, Santa Clara accounts for about 78% of the total contract quantity for San Felipe, and 96% of the San Felipe M&I water quantities. Overall, M&I use accounts for about 59% of the San Felipe water. Similarly, Westlands accounts for just over 66% of the SLDMWA total water contracts, though only 11% of the M&I water. Historical M&I use accounts for only 1.4% of the SLDMWA water contracts.

The information presented in Figure 13 was used to estimate the CVP water deliveries to the individual CVP contractors, Santa Clara and Westlands. First, the total estimated annual water deliveries for San Felipe Division or the SLDMWA was compared against the CVP delivery priority schedule to determine the allocation to M&I and agricultural use. For example, if the San Felipe Division has a total of 150,000 AF in estimated deliveries for a given year, that amount will not provide 100% of the total maximum contract quantity of 196,300 AF for the Division. Comparing the total against the delivery schedule, 150,000 AF provides enough water to meet at least 80% of the M&I use and 55% of the Ag use (80% x 138,250 AF = 110,600 AF for M&I use and 55% x 68,650 AF = 37,758 AF for Ag use for a total of 148,358 AF). The remaining deliveries were then allocated proportionately to Ag and M&I use; in this example, 75% of the water is for M&I use and 25% for Ag use, so 75% of the remaining 1,643 AF also is allocated to M&I and 25% to Ag, resulting in a total of 111,824 AF to M&I and 38,176 AF to Ag. Thus, the final percentage allocations represent 81% of the "M&I Historical Use" and 56% of the "Ag Contract Quantity," which meets the requirements of the CVP delivery priority schedule. Finally, the CVP water deliveries to the individual contractor were estimated by applying the contractor's share of the agency's M&I and Ag water deliveries. For our example, Santa Clara represents 94% of the San Felipe M&I use and 48.2% of the San Felipe Ag water contracts when M&I water deliveries are less than 100% of the maximum allocation, so Santa Clara is assumed to receive 94% of the M&I water and 48.2% of the Ag water, for a total of 123,558 AF out of the full 150,000 AF in this example.

Figure 14 provides a summary of the annual delivery estimates for the four BDCP delivery scenarios for each of the four individual contractors.

Figure 14: Deliveries by BDCP Scenario (ELT) for Selected SWP and CVP Contractors (thousands of AF)

	Delivery		Driest Years		<-------	Exceedance Level		------->	Wettest Years		
Contractor	**Scenario**	**Avg**	**90%**	**80%**	**70%**	**60%**	**50%**	**40%**	**30%**	**20%**	**10%**
MWD	LOS	1,401	569	1,003	1,205	1,386	1,620	1,701	1,751	1,802	1,836
	ESO	1,294	495	760	1,092	1,303	1,447	1,579	1,685	1,737	1,798
	SprHOS	1,165	470	779	1,051	1,151	1,216	1,278	1,372	1,494	1,746
	HOS	1,081	426	657	816	1,030	1,124	1,186	1,301	1,447	1,738
Kern	LOS	833	265	489	577	807	952	983	1,061	1,193	1,271
	ESO	769	233	312	494	677	868	983	983	1,107	1,236
	SprHOS	686	225	371	514	619	656	725	881	983	1,137
	HOS	637	219	303	402	495	631	659	731	959	1,136
Santa Clara	LOS	198	106	133	165	191	213	229	246	255	260
	ESO	188	100	121	151	173	194	213	240	254	258
	SprHOS	182	91	127	156	170	180	200	219	237	256
	HOS	173	91	120	140	154	169	178	212	236	255
Westlands	LOS	624	79	244	344	507	676	788	875	987	1,144
	ESO	570	80	194	289	440	571	677	845	975	1,135
	SprHOS	614	1	233	365	532	617	779	852	982	1,148
	HOS	547	1	201	262	434	472	581	784	962	1,142

Data taken from CALSIM II output as received from DWR.

In addition to deliveries, we have also estimated the possible allocation of BDCP costs among the four individual contractors. As mentioned above, as a starting point we have allocated the BDCP contractor costs between the SWP and the CVP using both a 50/50 and a 60/40 split. It should be noted, however, that the final allocation of costs between the SWP and the CVP has not yet been determined, nor has the methodology for allocating these costs among the individual SWP and CVP contractors. Thus, these results should be viewed as preliminary and illustrative. While costs likely would be allocated based on an initial split, there may be a "true-up" at the end of each year based on the actual allocation of water deliveries.

To allocate the SWP costs to the individual SWP contractors, we have simply used each contractor's share of the total SOD Table A quantities. This provides a reasonable estimate of cost allocation, as the SWP currently allocates actual deliveries proportionately to each contractor's Table A value, and also allocates system-wide capital costs in the same way. Using this approach we estimated the peak annual costs for MWD, Kern, and the SWP portion of Santa Clara. These peak annual costs were then divided by the total annual deliveries, including the Article 21 and

Article 56 deliveries, to estimate the peak annual cost/AF. Note that the actual methodology for allocating costs among the SWP contractors has not yet been determined; thus, these results should be considered preliminary and illustrative.

The CVP, however, has a far more complex system for allocating both deliveries and costs.[35] In addition, there are many questions remaining as to how the BDCP costs assigned to the CVP overall would be allocated among the individual CVP contractors.[36] To construct a simplified estimate, we have assumed that all of the BDCP costs allocated to the CVP contractors would be considered conveyance costs and allocated equally among the SOD CVP contractors on a cost-per-acre-foot basis. In addition, we have assumed that the costs associated with the Exchange Contractors would be paid by the Friant contractors, as they currently pay for the Exchange Contractor costs.[37] We then assume that the associated costs for the Refuges' Level 2 water deliveries are divided equally by all CVP contractors system-wide by assuming that the SOD delivery estimates are proportionate to the overall CVP deliveries (i.e., if SOD CVP delivery estimates are 75% of maximum contract quantity amounts, we assume all system-wide CVP deliveries for that year are 75% of maximum contract quantity amounts). We divide the costs for the Refuges' Level 2 deliveries among all of the non-refuge CVP contractors and add this to the estimated cost/AF, and assume all SOD CVP contractors pay that same rate for their deliveries in that year.

RESULTS

We first present our cost estimates for the individual contractors in terms of cost/AF of delivered water. Figure 15 provides the peak annual cost/AF estimates for MWD across the various delivery and finance scenarios. For the 50/50 SWP/CVP cost allocation, the average costs to MWD range from $179 - $232/AF in the Best Case finance scenario, to $260 - 337 /AF in the Base Case, to as high as $413 - $535 /AF in the Worst Case. In terms of exceedance levels, the costs at the 90% level are as high as $$589 /AF in the Best Case, $856 /AF in the Base Case, and $1,358 /AF in the Worst Case.

[35] For a detailed description, see the "Mid-Pacific Region Central Valley Project (CVP) Water Contracts Fact Sheet" (http://www.usbr.gov/mp/PA/docs/fact_sheets/CVP_Water_Contracts.pdf).

[36] For example, it has not yet been determined whether some or all of the construction costs allocated to the CVP will be spread among all of the CVP contractors, or only among the SOD CVP contractors. For the purpose of this analysis we have taken the conservative approach that only the SOD CVP contractors will pay these costs.

[37] Note that the final determination of how the Exchange Contractor costs will be allocated has not yet been made, and the assumption that the Friant contractors will pay these costs is only one possible approach.

Figure 15: Peak Annual Cost/AF for MWD by Scenario

Scenario			Values in $YOE									
			Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
	Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
50/50 SWP/CVP Cost Allocation	Best Case	LOS	179	440	250	208	181	155	147	143	139	137
		ESO	215	533	322	239	218	206	196	183	168	144
		SprHOS	194	507	330	230	192	173	159	149	144	139
		HOS	232	589	382	307	243	223	211	193	173	144
	Base Case	LOS	260	640	363	303	263	225	214	208	202	199
		ESO	313	775	468	347	317	300	285	266	244	209
		SprHOS	282	737	480	334	280	252	231	216	210	203
		HOS	337	856	555	447	354	324	308	280	252	210
	Worst Case	LOS	413	1,016	577	480	417	357	340	330	321	315
		ESO	497	1,231	743	551	503	476	453	422	387	331
		SprHOS	447	1,169	762	530	444	400	366	344	333	322
		HOS	535	1,358	881	709	562	515	488	445	400	333
60/40 SWP/CVP Cost Allocation	Best Case	LOS	215	528	300	250	217	186	177	172	167	164
		ESO	258	640	386	286	261	247	236	219	201	172
		SprHOS	233	608	396	275	231	208	191	179	173	167
		HOS	278	706	458	369	292	268	254	231	208	173
	Base Case	LOS	312	768	436	363	316	270	257	250	243	238
		ESO	376	931	562	416	380	360	342	319	293	251
		SprHOS	338	884	576	401	336	302	277	260	252	243
		HOS	405	1,027	666	536	425	389	369	336	302	252
	Worst Case	LOS	496	1,219	692	576	501	429	408	397	385	378
		ESO	596	1,477	892	661	603	571	544	506	465	398
		SprHOS	537	1,403	914	636	533	480	440	412	400	386
		HOS	642	1,630	1,058	851	674	618	586	534	480	400

Figure 16 provides the peak annual cost/AF for Kern, Figure 17 provides the values for Santa Clara, and Figure 18 provides the values for Westlands. The average peak annual cost/AF assuming a 50/50 SWP/CVP split range from $150 to $260/AF in the Best Case, $225 to $380/AF in the base case, and up to $350 to $600/AF in the Worst Case. For the exceedance levels there is even more variation among the contractors, ranging from somewhere around $100 to $175/AF in the Best Case at the 10% exceedance level to as much as $1,000 to $1,400 /AF for the SWP contractors and $1,000 to $1,100/AF for the CVP contractors at the 90% exceedance level in the Worst Case financing scenario. This variation by exceedance level is important to note, for while the SWP contractors currently have “take-or-pay” contracts that require them to make annual payments proportional to their Table A amounts and their share of the transport capacity for the conveyance facilities used to deliver their Delta water supplies regardless of the amount of water actually delivered, the CVP contractors do not currently have such take-or-pay requirements. If the BDCP costs are not allocated under some type of take-or-pay arrangement, it is possible that some contractors could choose to simply decline water deliveries in dry years when the cost/AF is very high, and instead use alternative sources (e.g., groundwater) or curtail water use (e.g., by fallowing agricultural land). If contractors were able to opt out in a given year, this would result in total payments that are insufficient to meet that year’s BDCP debt obligations unless another contractor were to make up the shortfall. This topic is discussed in more detail in Section V below.

Figure 16: Peak Annual Cost/AF for Kern by Scenario

Scenario			Values in $YOE									
			Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
	Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
50/50 SWP/CVP Cost Allocation	Best Case	LOS	155	486	264	223	160	135	131	122	108	101
		ESO	188	574	348	251	208	196	178	146	131	113
		SprHOS	168	553	413	261	190	149	131	131	116	104
		HOS	203	589	425	321	261	204	196	176	134	113
	Base Case	LOS	225	706	383	325	232	197	191	177	157	147
		ESO	273	834	506	365	303	286	258	213	191	165
		SprHOS	244	805	601	379	277	216	191	191	169	152
		HOS	294	856	618	467	379	297	285	256	195	165
	Worst Case	LOS	357	1,121	608	516	369	313	303	280	249	234
		ESO	434	1,324	803	579	481	453	410	338	303	262
		SprHOS	387	1,277	954	602	439	343	303	303	269	241
		HOS	467	1,358	981	741	601	471	452	407	310	262
60/40 SWP/CVP Cost Allocation	Best Case	LOS	186	583	316	268	192	163	157	146	130	122
		ESO	225	688	418	301	250	236	213	176	157	136
		SprHOS	201	664	496	313	228	178	157	157	140	125
		HOS	243	706	510	385	313	245	235	212	161	136
	Base Case	LOS	270	847	460	390	279	236	229	212	189	177
		ESO	328	1,001	607	438	364	343	310	255	229	198
		SprHOS	292	965	721	455	332	259	229	229	203	182
		HOS	353	1,027	741	560	455	356	341	308	235	198
	Worst Case	LOS	429	1,345	730	619	442	375	363	337	299	281
		ESO	520	1,589	964	694	577	544	492	405	363	314
		SprHOS	464	1,532	1,145	722	527	411	363	363	323	289
		HOS	561	1,630	1,177	889	722	565	542	488	372	314

Figure 17: Peak Annual Cost/AF for Santa Clara by Scenario

Scenario			Values in $YOE									
			Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
	Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
50/50 SWP/CVP Cost Allocation	Best Case	LOS	216	442	340	274	224	198	187	174	163	155
		ESO	233	452	357	285	252	231	213	196	175	157
		SprHOS	227	467	387	299	252	217	196	179	164	155
		HOS	247	453	375	326	292	254	232	202	177	158
	Base Case	LOS	313	643	494	398	326	288	272	253	237	225
		ESO	339	657	519	415	366	335	310	285	255	229
		SprHOS	330	679	563	435	367	316	286	261	238	226
		HOS	359	659	545	474	424	370	338	293	257	229
	Worst Case	LOS	498	1,020	784	632	517	457	431	402	376	357
		ESO	538	1,043	824	659	580	532	492	452	405	363
		SprHOS	524	1,078	893	691	582	501	453	414	378	359
		HOS	570	1,045	865	753	674	587	536	466	408	364
60/40 SWP/CVP Cost Allocation	Best Case	LOS	199	403	311	251	207	183	172	161	151	144
		ESO	215	419	327	262	232	214	197	181	162	146
		SprHOS	210	426	353	274	232	201	182	165	152	145
		HOS	228	420	343	298	268	235	215	186	164	147
	Base Case	LOS	289	586	452	365	300	266	251	234	219	209
		ESO	313	610	475	381	337	311	286	263	236	213
		SprHOS	305	620	513	399	338	292	264	240	221	210
		HOS	332	611	499	434	389	341	313	271	238	213
	Worst Case	LOS	459	931	718	579	477	422	398	371	348	332
		ESO	497	968	755	604	536	493	454	417	375	338
		SprHOS	484	984	815	633	536	464	420	381	350	334
		HOS	526	970	793	689	618	542	497	430	378	338

Figure 18: Peak Annual Cost/AF for Westlands by Scenario

Scenario			Values in $YOE									
			Avg	Driest <---- $/AF by Exceedance Level ----> Wettest								
	Financing	Delivery	$/AF	90%	80%	70%	60%	50%	40%	30%	20%	10%
50/50 SWP/CVP Cost Allocation	Best Case	LOS	247	466	344	310	272	234	216	203	190	174
		ESO	249	466	348	304	273	247	217	207	191	174
		SprHOS	258	466	386	327	285	261	234	208	192	175
		HOS	263	466	362	337	299	276	252	217	193	175
	Base Case	LOS	359	678	500	451	395	340	314	296	276	253
		ESO	362	678	506	442	398	360	316	301	277	253
		SprHOS	375	678	562	476	415	379	341	302	278	255
		HOS	382	678	527	490	435	402	367	315	281	254
	Worst Case	LOS	570	1,076	794	716	627	540	499	470	439	402
		ESO	574	1,076	803	702	631	571	501	477	440	401
		SprHOS	595	1,076	892	755	658	601	541	479	442	404
		HOS	607	1,076	837	778	691	638	583	500	445	403
60/40 SWP/CVP Cost Allocation	Best Case	LOS	198	373	275	248	217	187	173	163	152	139
		ESO	199	373	278	243	219	198	174	165	153	139
		SprHOS	206	373	309	262	228	208	187	166	153	140
		HOS	210	373	290	270	239	221	202	173	154	140
	Base Case	LOS	287	542	400	361	316	272	251	237	221	203
		ESO	290	542	405	354	318	288	253	240	222	202
		SprHOS	300	542	450	381	332	303	273	242	223	204
		HOS	306	542	422	392	348	322	294	252	224	203
	Worst Case	LOS	456	861	635	573	501	432	399	376	351	322
		ESO	460	861	643	562	505	457	401	382	352	321
		SprHOS	476	861	714	604	526	481	433	384	354	323
		HOS	486	861	669	622	553	510	466	400	356	322

In addition to examining the individual water contractors' BDCP-related costs in terms of cost per acre-foot, we also estimated those costs in annual terms since, assuming that debt service payments are subject to take-or-pay contracts, many contractors likely will treat these costs as fixed, annual costs and, in some instances, collect them as property tax charges or assessments where possible. These estimates are presented in Figure 19 below, which provides the estimated annual costs assuming both a 50/50 and a 60/40 split between the SWP and CVP, and for each of the three financing scenarios (Best Case, Base Case and Worst Case) described above. For the SWP contractors, we simply allocated the SWP costs proportionately based on each contractor's Table A amount – thus, since MWD's Table A contract quantity represents 46.3% of the total Table A amount, MWD pays 46.3% of the SWP's costs. For the CVP contractors, the total CVP costs were allocated based on that contractor's share of the total average CVP SOD deliveries plus their share of the cost for the Refuges' Level 2 deliveries, using the average across all four delivery scenarios. Using this approach, Westlands share of CVP SOD deliveries plus their share of the Refuges' costs total on average 27.3% of the total CVP costs.[38] As Figure 19 also illustrates, the expected peak annual costs vary depending upon the financing scenario and cost allocation assumptions used. Under the Base Case, MWD's annual BDCP costs range from $365 million to about $438 million per year, though these annual costs are considerably lower under the Best Case scenario ($250

[38] Note that Westlands' share of costs (27.3%), which is based on estimated share of deliveries is less than their share of the "maximum contract quantity" for SOD CVP contractors (36.4%). This is because CVP deliveries are not strictly allocated by maximum contract quantity amounts, but rather some contractors have higher priority for deliveries in dry years when all contracted deliveries cannot be made.

million to $300 million) and much higher under the Worst Case scenario ($579 million to $694 million).

Figure 19: Peak Annual Cost Estimates for Individual Contractors ($YOE Millions)

	Best Case:		**Base Case:**		**Worst Case:**	
SWP/CVP Split:	**50/50**	**60/40**	**50/50**	**60/40**	**50/50**	**60/40**
Total Contractor Peak Annual Costs	$1,084.28	$1,084.28	$1,576.57	$1,576.57	$2,502.39	$2,502.39
All SWP - Peak Annual Costs	$542.14	$650.57	$788.28	$945.94	$1,251.19	$1,501.43
All CVP - Peak Annual Costs	$542.14	$433.71	$788.28	$630.63	$1,251.19	$1,000.95
MWD						
SWP Table A Share	46.3%					
Estimated Share of BDCP Costs	$250.75	$300.90	$364.59	$437.51	$578.70	$694.44
Kern						
SWP Table A Share	23.8%					
Estimated Share of BDCP Costs	$128.91	$154.70	$187.44	$224.93	$297.52	$357.02
Santa Clara						
SWP Table A Share	2.4%					
Estimated Share of SWP Costs	$13.12	$15.74	$19.07	$22.89	$30.27	$36.33
CVP Estimated Cost Share	5.4%					
Estimated Share of CVP Costs	$29.17	$23.33	$42.41	$33.93	$67.31	$53.85
Estimated Share of BDCP Costs	$42.28	$39.08	$61.48	$56.82	$97.59	$90.18
Westlands						
CVP Estimated Cost Share	27.3%					
Estimated Share of BDCP Costs	$147.81	$118.24	$214.91	$171.93	$341.12	$272.89

These annual costs would be in addition to whatever debt-related costs and other fixed annual costs contractors will have while the BDCP costs are financed. While it is difficult to estimate what the full extent of such future obligations will be, over the five-year period from 2008 through 2012 SWP contractors paid an average of just over $280 million annually for the debt service associated with the SWP capital costs and an additional $400 million annually for other fixed operating costs, such as minimum O&M and energy charges for a total of $680 million in annual fixed costs that SWP contractors must pay regardless of the level of Delta water deliveries.

For individual contractors, existing fixed costs associated with CVP and/or SWP deliveries, in addition to their own debt obligations, can vary widely. For example, MWD paid an average of around $123 million annually in SWP capital costs and around $230 million in other SWP fixed operating costs from 2008 through 2012. According to its financial statement, MWD also paid approximately $343 million in debt obligations in 2012.[39] In total, these obligations represent just under $700 million in current fixed annual costs, as compared to the estimated $365 million in BDCP costs under the Base Case (50/50 split). For Santa Clara, SWP capital costs over the same 2008-2012 period averaged over $6 million, and other SWP fixed operating costs totaled over $8

[39] See the "MWD Biennial FY 2012/13 and FY 2013/14 Budget Summary," p. 10. Estimates presented here are for FY 2012-13.

million. On the CVP Santa Clara pays approximately $15 million in direct debt service for the San Felipe Division Facilities. Santa Clara also pays fixed operating and in-basin capital CVP costs on a rate basis depending on water deliveries. However, if insufficient revenue is collected to cover Santa Clara's annually allocated share of fixed costs, Santa Clara provides an annual deficit payment to cover the balance owed. These fixed costs amount to roughly $5 million per year. Santa Clara's combined SWP and CVP fixed costs therefore amount to about $34 million per year. Santa Clara also pays about $13 million in debt service for its other water utility costs, for a total of approximately $47 million in fixed annual costs.[40] As such, the estimated $61 million in BDCP costs under the Base Case would represent a considerable increase in fixed annual costs.

For Kern and Westlands, the current debt service is considerably lower at just $11 million and $20 million, respectively.[41] For the SWP fixed costs, Kern and its member agencies also paid an additional $27 million in capital costs and $44 million in other fixed operating costs annually. Kern and Westlands, however, differ from MWD and Santa Clara in some important ways. While Kern has a more diverse set of ultimate water users through its various member agencies than Westlands does, both Kern and Westlands act primarily as coordinating agencies to facilitate the delivery of SWP and CVP water to a limited number of agricultural users, rather than developing additional water supplies and investing in delivery and storage infrastructure, as MWD and Santa Clara do. Thus, one would expect the debt service obligations of Kern and Westlands to be lower, and it is therefore not necessarily appropriate to assess the BDCP costs in terms of existing debt service for these water agencies. In the section that follows, we present what we believe to be a more appropriate analysis of the ultimate agricultural water users' capacity to pay for the BDCP costs for both Kern and Westlands.

Examining the Affordability of the BDCP Costs

There are several factors to consider when assessing the affordability of the BDCP. One key factor is how the average price for Delta water compares to the available alternatives. There are two dimensions to this comparison. First, to the extent that the Delta exports represent a small portion of a contractor's supply portfolio, any additional costs from the BDCP will result in a smaller impact to the price charged to their customers. For example, if a contractor on average receives 10% of its total water supplies from the Delta, the BDCP-related costs will have a much smaller impact on total costs and thus on the price charged to its customers than if it relies on the Delta for 100% of its supplies. Thus, a contractor with a diverse set of water supplies and a large number of water users can more likely afford the costs associated with implementing the BDCP.

Second, to the extent that its customers have alternative sources available, a contractor or water agency may have decreased demand for the Delta exports as the price of Delta exports increases. This could be especially true in the absence of any sort of "take-or-pay" obligation on the part of the water contractor's customers, whether they be agricultural water users or municipal water

[40] The cost figures for Santa Clara were provided by the Santa Clara Valley Water District.

[41] The Kern debt service values are taken from the KCWA Financial Statements 2011 and represent estimates for FY 2012. Westlands values were provided by the Westlands Water District and are estimates for FY 2012-13. Note that the current debt estimates for Santa Clara and Westlands exclude any capital fees owed to the Bureau of Reclamation for their share of the CVP capital costs.

agencies. The current draft BDCP shows costs for current water recycling projects in Southern California ranging from $955/AF to $1,672/AF, and costs for desalination projects ranging from $1,191/AF to $2,257/AF, indicating that the *average* costs associated with the BDCP will still result in competitive prices for Delta water at least compared to these alternatives.[42] However, during periods of severe drought, such as the state is currently experiencing, the effective cost of the BDCP could exceed the cost of alternatives, particularly if the cost of those alternatives declines significantly over time. Given the potential for some lower cost alternatives and the relatively low likelihood of take-or-pay contracts between contractors and their customers, treating debt service costs as annual fixed costs collected through the property tax or assessments where possible could mitigate the impact of reduced demand due to lower-cost alternatives. Nevertheless, it seems clear that particularly agricultural customers would face higher costs during dry years from a combination of fixed debt service costs and the cost of alternative supplies.

Another factor to consider is whether the variability in deliveries can be mitigated. One way to achieve this would be to store water in wet years for use in dry years. This storage could be in the form of surface storage (i.e., reservoirs) or groundwater reserves, which can also be actively replenished or recharged in wet years and drawn upon in dry years. For example, MWD has surface storage capacity of approximately 1.5 million AF under its control, plus an additional estimated 3.2 million AF of groundwater basins available for storage within the MWD service area.[43] Even accounting for the 570,000 AF currently set aside to meet emergency requirements, this provides over 4 million AF of potential storage that may be filled during wet years and drawn upon during dry years. With current deliveries to its member agencies of approximately 2 million AF, this storage provides MWD with an important resource during periods of decreased supplies.

An additional tool available to the water contractors is the use of water transfers or exchanges. Such exchanges would allow those contractors that have excess water supplies in wet years or those that create them through effective conservation activities or the development of additional supplies to transfer those excess supplies, either on a short-term or a long-term basis, to other water users who need them. While there are numerous legal and logistical obstacles remaining, the development of such water markets would allow many contractors to better optimize both their water deliveries over time and the costs associated with those water supplies.

Another way to smooth out this variability is through financial reserves, which could be used both to purchase additional supplies in dry years and thus reduce supply fluctuations, and to smooth out prices charged by drawing from the reserves to cover costs in years when revenues are low and adding to it when revenues are high. To the extent that the water contractors have or create

[42] Draft Bay Delta Conservation Plan, Appendix 9.A (May 2013), pp. 9A-36 and 9A-37. Note that these costs are current costs, and it is difficult to determine exactly what future costs will be. To the extent that the implementation of the BDCP results in more Delta water being exported, contractors may be able to spend less on future costs associated with securing alternative water supplies. Any such decrease in spending could mitigate some portion of the contractors' BDCP costs, though it is impossible to predict or quantify the extent to which this may occur.

[43] MWD Region Urban Water Management Plan, November 2010, pages 3-56 and A3-35.

financial reserves for this purpose, they could also help alleviate year-to-year price swings due to variations in Delta water supplies.

Finally, it is important to consider the affordability of the project to agricultural users. To do this, we have estimated the "Payment Capacity" for water for both Kern and Westlands. For both contractors, we analyzed the past five years of agricultural production from 2008 through 2012. For Kern, we used the annual Kern County Agricultural Crop Reports to calculate the average number of acres harvested for each of the major crops produced.[44] These reports also provided data on the units produced (tons, pounds, etc.) and the revenue generated. We used these figures to calculate the gross revenue for each crop in each year, converted them to 2012 dollars using the CPI, and calculated the gross revenue per acre.[45] We then used the most recently available cost studies from the University of California Cooperative Extension to estimate the cost per acre, again converting these values to 2012 dollars using the CPI.[46] The cost of water was excluded to estimate the cost per acre net of water. We subtracted this cost measure from the gross revenue to calculate the gross margin per acre. We then subtracted 10% to account for a 10% return to the owner/management.[47] Finally, we applied the consumptive water use in AF/acre as reported in the November 2011 version of the Kern Integrated Regional Water Management Plan to estimate the payment capacity for each crop.[48] Specifically, we divided the gross margin per acre net of the 10% return to calculate each crop's payment capacity for water – that is, the amount an average producer could afford to pay for an acre-foot of water and still make a 10% return. Finally, we estimated the average value by crop category, weighting by the number of acres harvested. The crops were categorized into permanent crops (fruit and nut trees, grapes, etc.), vegetable crops (lettuce, tomatoes, etc.) and field crops (alfalfa, corn, etc.). The results of this analysis are provided in Figure 20 below. As this table shows, the payment capacity in Kern for permanent and vegetable crops is estimated to be quite high, at over $500/AF. Field crops have a much lower payment capacity, at $13/AF. When we take the weighted average, again weighted by acres harvested, the overall capacity to pay over the 2008-2012 time period was around $277/AF.

Figure 20: Water Payment Capacity Estimates for Kern ($2012)

Crop Category	Acres Harvested	Gross Rev/ Acre ($)	Cost/Acre Net Water	Gross Margin/ Acre ($)	Return to Mgmt (10%)	Water Use (AF/Acre)	Payment Capacity ($/AF)
Permanent	343,519	$7,276	$5,337	$1,939	$194	3.32	$526
Vegetable	82,118	$8,529	$7,398	$1,132	$113	1.75	$583
Field	403,586	$1,097	$1,053	$44	$4	3.07	$13
OVERALL	**829,224**	**$4,393**	**$3,456**	**$937**	**$94**	**3.04**	**$277**

We conducted a similar analysis for Westlands, again starting with the agricultural production reports from 2008 through 2012. For Westlands, the annual crop reports used were the Westlands Water District Annual Crop Acreage Reports, which provide only the acreage planted.

[44] Available at http://www.kernag.com/caap/crop-reports/crop-reports.asp.
[45] CPI used was the June value for the California CPI as reported by the Department of Industrial Relations (DIR).
[46] Available at http://coststudies.ucdavis.edu/current.php.
[47] The 10% return to management follows the methodology of a similar 2010 study Entrix conducted for the Westlands Water District ("Farm Viability and Water Prices in the Westlands Water District," Entrix (January 8, 2010)).
[48] See specifically Table 2-20 of the Kern Integrated Regional Water Management Plan (November 2011).

To estimate the total production and revenue, we used the annual crop reports from the Fresno County Department of Agriculture.[49] These provided data on the average units produced (tons, pounds, etc.) and the revenue generated per acre for each crop. We used the same cost data from the UC Cooperative Extension to estimate the gross margin per acre for each crop, subtracted the 10% return to management, and applied the 2030 projected water use requirements as reported in the Westlands Water District 2012 Water Management Plan.[50] The crops again were categorized into permanent, vegetable, and field crops. The results of this analysis are provided in Figure 21. As this table shows, the payment capacity in Westlands is similar to that of Kern, with permanent and vegetable crops having much higher payment capacity values than field crops--here in the range of $400-$500/AF in 2012 dollars. Field crops were estimated to have an average payment capacity of $43/AF, much lower than the other types of crops, but higher than the $13/AF estimated for Kern. Overall, the weighted average results for Westlands were quite similar to those for Kern, at around $290/AF vs. Kern's $277/AF, again, all in 2012 dollars.

Figure 21: Water Payment Capacity Estimates for Westlands ($2012)

Crop Category	Acres Harvested	Gross Rev/ Acre ($)	Cost/Acre Net Water	Gross Margin/ Acre ($)	Return to Mgmt (10%)	Water Use (AF/Acre)	Payment Capacity ($/AF)
Permanent	103,058	$5,114	$3,468	$1,646	$165	3.54	$418
Vegetable	143,179	$5,319	$4,113	$1,206	$121	2.13	$510
Field	160,586	$1,170	$1,032	$137	$14	2.85	$43
OVERALL	**406,823**	**$3,629**	**$2,734**	**$896**	**$90**	**2.77**	**$291**

It should be noted that the payment capacity estimates for Kern and Westlands presented above represent the total cost for irrigation water; thus, additional water-related costs such as existing SWP or CVP debt, additional delivery charges, and other costs must be added to the expected BDCP costs before comparing them against these payment capacity estimates. As explained above, Kern's average peak annual BDCP costs are estimated to be somewhere in the range of $187 to $225 million under the Base Case financing scenario, or an effective cost of $225 to $350/AF in $YOE, depending upon the overall level of water exports and whether the costs are split 50/50 or 60/40 between the CVP and SWP. This range equals $113 to $178 in $2012 for additional BDCP-related costs. According to the DWR, Kern paid an average of $100/AF for SWP water between 2008 and 2012; thus, their total costs when BDCP-related costs are included are estimated to be between $213 and $278/AF. For Westlands, the estimated BDCP-related costs are $172 to $215 million per year, which translates into $290 to $380/AF on average in $YOE for the Base Case financing scenario. This corresponds to $144 to $192/AF in $2012. Agricultural customers in Westlands have paid on average around $109/AF for water in recent years based on the published "Cost of Service" water rates, indicating that the total cost for water when expected BDCP costs are added should range between $253 and $301/AF ($2012). These figures, along with the estimated payment capacity values discussed above, are presented in Figure 22.

[49] Fresno County Department of Agriculture Annual Agricultural and Crop Reports (2009-2012).

[50] See specifically: Westlands Water District, Water Management Plan, 2012 (Dated 4/19/2013), Table 26, p. 61.

Figure 22: Summary of Water Payment Capacity Estimates for Kern and Westlands ($2012)

Kern ($2012)				
Crop Category	2008-2012 Avg. SWP Water Costs ($/AF)*	Est. Avg. Base Case BDCP Costs ($/AF) Low High	Current SWP Costs + Est. Avg. BDCP Costs Low High	Payment Capacity ($/AF)
Permanent	$100	$113 - $178	$213 - $278	$526
Vegetable	$100	$113 - $178	$213 - $278	$583
Field	$100	$113 - $178	$213 - $278	$13
OVERALL	**$100**	**$113 - $178**	**$213 - $278**	**$277**
Westlands ($2012)				
Crop Category	**WY 2011-2013 Avg. "Cost of Service" Rate For Ag Users ($/AF)****	**Est. Avg. Base Case BDCP Costs ($/AF) Low High**	**Current Costs + Est. Avg. BDCP Costs Low High**	**Payment Capacity ($/AF)**
Permanent	$109	$144 - $192	$253 - $301	$418
Vegetable	$109	$144 - $192	$253 - $301	$510
Field	$109	$144 - $192	$253 - $301	$43
OVERALL	**$109**	**$144 - $192**	**$253 - $301**	**$291**

* SWP water charges for Kern provided by DWR for 2008-2012.

** Average agricultural "Cost of Service" rate for water years 2011, 2012, and 2013 taken from data contained in Westlands Water District 2012 Water Plan and from the presentation entited "Westlands Water District Annual Water User's Workshop" (March 19, 2013).

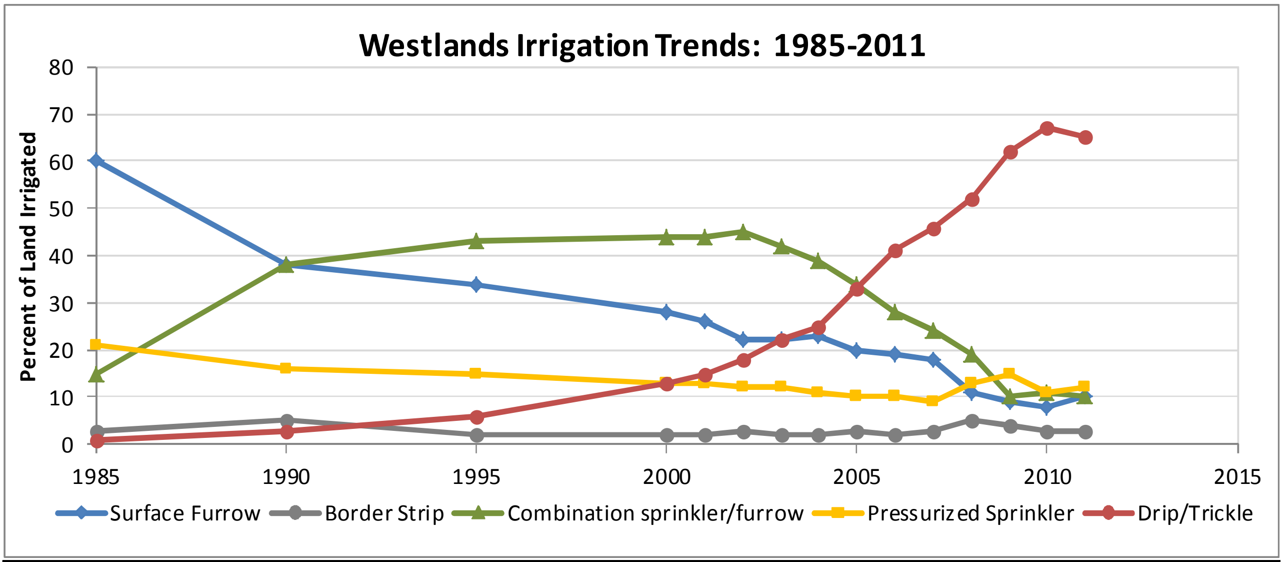
As shown in Figure 22, the current capacity to pay for water for both Kern and Westlands falls toward the high end of the range of expected costs when BDCP costs are added to current costs, indicating that their current crop mix may be capable of supporting these increased costs. In very dry years such as the current year, however, agricultural users may find it challenging to meet their fixed debt obligations for the BDCP if they must also pay for alternative water supplies or limit production because of a lack of available irrigation water. In addition, this analysis uses current estimates of the costs, yields, and crop prices to estimate the current capacity to pay for irrigation water for both Kern and Westlands. To the extent that non-water production costs, yields, and crop prices differ in the future, these estimates may not be representative of their future capacity to pay for water.

It should also be noted that many of the larger water users in Westlands and Kern are in fact vertically integrated agricultural concerns that not only grow the fruits and vegetables but also process and distribute them, which would indicate that some growers may be better equipped to absorb the increases in water prices associated with the BDCP. In general, the payment capacity analysis illustrates some potential strategies that agricultural users could employ to mitigate the BDCP cost increases. One strategy would be to change the mix of crops produced, planting more acres of permanent and vegetable crops and fewer acres of field crops. While this may be possible for some individual farmers, there are downsides to this strategy as well. Permanent crops require a substantial initial investment, both the high capital investments of purchasing and planting the trees or vines and setting up the appropriate irrigation infrastructure, and the lost revenue from the initial establishment period between the time it is planted and the time it begins producing a viable crop.[51] In addition, these permanent crops must be maintained continuously, and the land cannot be fallowed in dry years or irrigation curtailed if supplies become difficult or expensive to obtain. These increased risks may limit the potential for some producers to move large portions of their production into these types of crops.

Another strategy available to agricultural users is to improve the efficiency with which they irrigate. The type of irrigation used depends to some extent on the crop – some permanent and vegetable crops can be irrigated using highly efficient drip irrigation systems, while most field crops require sprinklers or furrow (gravity) irrigation. Also, the initial investment in purchasing and setting up these systems can be substantial. In general, there has already been a marked move to more efficient irrigation techniques throughout the state. DWR's 2010 Statewide Irrigation Survey reported that the drip/micro irrigation accounted for 43% of the total irrigated land in the San Joaquin River region in 2010, up from 35% in 2001, while the percent using gravity irrigation methods fell from 54% to 45% over the same period.[52] For any single water district, however, there may be even less capacity for migrating to more efficient irrigation techniques. In the Westlands district, for example, 65% of all irrigated land was already using drip/micro irrigation as of 2011, and 22% was using either pressurized sprinkler or a combination of sprinkler/furrow irrigation, which is often the most efficient system for irrigating certain types crops. Figure 23 shows the irrigation trends in Westlands from 1985 through 2011.

[51] For example, according to the UC Cooperative Extension, almond trees begin bearing after 3 years and reach full production at 7 years.
[52] See http://www.water.ca.gov/landwateruse/surveys.cfm.

Figure 23: Irrigation Trends in the Westlands Water Districts



Type of System	Percentage of Land Irrigated														
	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Surface Furrow	60	38	34	28	26	22	22	23	20	19	18	11	9	8	10
Border Strip	3	5	2	2	2	3	2	2	3	2	3	5	4	3	3
Combination sprinkler/furrow	15	38	43	44	44	45	42	39	34	28	24	19	10	11	10
Pressurized Sprinkler	21	16	15	13	13	12	12	11	10	10	9	13	15	11	12
Drip/Trickle	1	3	6	13	15	18	22	25	33	41	46	52	62	67	65
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Westlands Water District (http://www.westlandswater.org/wwd/waterconservation/default.asp?title=Overview)

V. Financing Considerations

As discussed Chapter 8 of the draft BDCP, it is anticipated that the SWP and CVP contractors (and their customers) – not taxpayers generally throughout the state – will pay for the costs of the new Delta conveyance facility, the cost of mitigation measures undertaken in connection with construction of the facility, the facility's operating costs, and a share of the cost of a number of the other BDCP conservation measures. The draft BDCP also anticipates that the costs of the conveyance facility and certain other capital costs will be funded from the proceeds of revenue bonds to be issued by DWR, a joint powers authority such as the State and Federal Contractors Water Agency (SFCWA) or by individual water contractors.

As described earlier in this report, the capital costs expected to be financed in the Base Case are estimated to be $14.7 billion in 2012 dollars. When factoring in construction cost inflation, costs to issue the bonds, and a six month debt service reserve, the amount of bonds that need to be issued increases to approximately $20.5 billion.[53] By any measure, this is an extraordinarily large amount of bonds to be issued for a single project and would be one of the most expensive infrastructure projects ever undertaken in California and the United States.

Below, we review a number of issues related to the financeability of the Delta conveyance facility. We have assumed that the SWP and CVP contractors will separately finance their respective costs of the conveyance facilities, which is the approach currently being pursued by the SWP and CVP contractors for pre-construction costs.

Credit Characteristics of the SWP Contractors and the Bonds Issued by the DWR for the State Water Project

Currently, 29 public agency SWP contractors[54] contract with the DWR to pay for the operation, maintenance, planning and capital costs, including interest, of the State Water Project under the terms of water supply contracts. The contractors are principally located in the San Francisco Bay Area, the Central Coast, the Central Valley and Southern California and their service areas encompass approximately 25 percent of the state's land area and approximately 71 percent of its population. According to DWR, of the 29 contractors, 24 provide water primarily for municipal and industrial purposes and five provide water primarily for agricultural purposes. Under the water supply contracts, the original forms of which were judicially validated, DWR imposes a fixed charge that includes amounts for operations, debt service and debt service coverage, and a variable charge that enables DWR to recover the net cost of energy used to deliver water to the contractors.

[53] The amount that would need to be issued for the Worst Case scenario is $26.4 billion and the amount that needs to be issued for the Best Case scenario is $15.4 billion.

[54] 26 of the contractors are districts formed for water related purposes, one is a city, and two are counties.

DWR has issued $7.9 billion of revenue bonds for the State Water Project (DWR Bonds), of which $2.4 billion are outstanding.[55] The bonds are rated AAA by S&P and Aa1 by Moody's. The rating agencies cite the following factors in their rationale for DWR's very strong credit ratings:

- **"Take or Pay" Contracts.** The water supply contracts require SWP contractors to pay DWR for its expenses regardless of the amount of water that is delivered. This is a particularly important feature. The contracts remain in effect through 2035 or until the repayment of all bonds, whichever is longer.
- **Essentiality.** The 29 SWP Contractors serve approximately 71% of the state's population.
- **Credit Strength of SWP contractors**. More than 55% of the combined contract revenue pledged to the outstanding bonds is derived from contractors rated Aa3 or higher by Moody's. MWD, which represents 46% of total contracted water entitlements, has over $4.2 billion of revenue bonds outstanding and is rated AAA/Aa1/AA+ by S&P, Moody's and Fitch, respectively. DWR reports that there have been no material payment defaults or delinquencies from the SWP contractors, even in severe drought conditions.
- **Debt Service Coverage.** DWR has covenanted to charge amounts under the water supply contracts sufficient to repay all projects costs and to produce net revenues at least equal to 1.25 times annual debt service on the bonds plus the amount needed for operation and maintenance costs. Excess amounts are held by DWR and are generally credited back to the contractors once a year.
- **"Step-Up" Provisions.** Under all but three bond amendments to the contracts, if a contractor defaults on a payment, DWR can increase amounts billed to the other contractors by up to 25% if needed. MWD's maximum step-up amount is larger than the next largest contractor's total DWR debt service obligation. This effectively provides coverage from MWD of any other individual contractor's payment delinquency.
- **Ability to Suspend Water Deliveries.** If a contractor defaults under its water supply contract, DWR may, upon six months' notice, suspend water deliveries to that contractor. During such period, the contractor remains obligated to make all payments required by the water supply contracts.
- **Property Tax Assessment.** If a contractor fails or is unable to raise sufficient funds by other means to make its payments to DWR, the contractor is required by the water supply contract to levy a tax assessment sufficient to make the payment. The ability to levy property taxes was determined in 1983 by the *Goodman v. Riverside* case to not be constrained by the state's constitutional 1% property tax rate limit. We also understand that most urban SWP contractors, except MWD, collect property tax revenue to cover their fixed charges from DWR.
- **Debt Service Reserve.** DWR is required to maintain a debt service reserve equal to at least one-half of the maximum annual debt service on the bonds that are outstanding under the general bond resolution.

[55] The original construction of the SWP was financed from the issuance of $1.5 billion of State of California general obligation bonds, which were authorized by the Burns-Porter Act of 1960 (the draft BDCP indicates that this amount is equivalent to $12.9 billion to $18.2 billion in 2011 dollars). These bonds, $229 million of which are outstanding, are paid by revenues from the SWP contractors - the State's General Fund would only be used if there were to be a shortfall. DWR has also issued $1.5 billion of revenue bonds for certain power facilities of the State Water Project, of which $57 million are outstanding.

- **DWR's Strong Cash Position.** As of June 30, 2013, DWR held $560 million of available cash, which equaled 68% of DWR's total operating expenditures less depreciation, including certain non-SWP expenditures. The rating agencies view this liquidity as important due to DWR's need to have sufficient cash to operate during an effective two-year lag in charge adjustments under its "true-up" billing adjustment process at the end of each year.

Credit Characteristics of the CVP Contractors and their Debt Obligations

USBR's Central Valley Project supplies water to more than 250 water contractors, with just over 50 receiving water from the Delta and presumably forming the core of the CVP contractors that would pay for the Delta tunnels. CVP contractors include large municipal users, irrigation districts and individual farmers in the Central Valley as well as major urban centers in the San Francisco Bay Area. The majority of the CVP's water is used for agricultural purposes. According to the USBR, the CVP provides water for six of the top 10 agricultural counties in the nation's leading farm state.

Generally, the costs of CVP construction efforts by USBR are first allocated into pools based on the benefits they provide (e.g., water conveyance, storage, pumping, etc.). The costs in these pools are further divided by purpose (e.g., flood control, irrigation, recreation, fish and wildlife, municipal and industrial (M&I) use, etc.).[56] These purposes are classified as either reimbursable or non-reimbursable. Reimbursable costs, such as irrigation and M&I, are paid at least in part, by project beneficiaries of, for example, a water conveyance. Non-reimbursable costs are borne by the federal and/or state government, as in the case of flood control or navigation. Reimbursable capital and O&M costs are totaled for each pool and by purpose. Capital costs are then divided by the historical and projected deliveries to derive a cost per acre-foot. A similar cost per acre-foot is calculated for O&M costs using just the historical five-year average of water deliveries. For each contractor, each year their total costs per acre-foot of water delivered are calculated by adding the cost per acre-foot for all of the cost pools to which they belong. In the case of water districts, these costs are passed along to the districts' customers through a variety of charges.

Water service contracts are used to recoup the cost of a CVP facility where multiple benefits accrue to contractors. For these projects, costs are allocated to contractors based on the amount of water they receive. Water rates for each contractor are calculated annually by USBR adjusting for changes in the cost of service. Charges are also adjusted to amortize capital costs so as to recover all project costs by 2030. In low water delivery years, capital charges paid to USBR by CVP contractors are less than the amount budgeted to be paid towards the outstanding capital balance because the CVP contractors do not have a "take or pay" obligation with USBR. To the extent that a CVP contractor does not pay the full charge for capital costs in a given year, these costs are included in a recalculated obligation for future years. Irrigation contractors also do not pay USBR interest charges on capital costs.

[56] The costs of the CVP are allocated among project purposes based on a 1975 cost allocation study. According to the USBR, a new cost allocation study is currently underway and is expected to be completed by 2014-2015.

Since USBR has provided the funding for the capital costs of the CVP, the CVP has not had a program of bond issuances backed by contractor revenues similar to DWR. However, the San Luis and Delta-Mendota Water Authority (SLDMWA), a joint powers authority which represents 27 CVP contractors, has issued $50 million of bonds on behalf of a subset of the contractors to finance Delta Habitat Conservation and Conveyance Program planning costs. These bonds are secured 100% by Westlands, which is in turn reimbursed by participating contractors for their allocable shares of debt service. These bonds have underlying ratings of A+/AA- by S&P and Fitch, respectively, based on Westlands' ratings. Three of the CVP contractors, which represent approximately 5% of the CVP contractors' assumed financial responsibility for the conveyance facility, have two AA/Aa category ratings.[57]

Financing Approach

SWP Contractors. As discussed above, the existing financing mechanism for the SWP contractors – the DWR Bonds – is highly rated and widely accepted among investors. Given the strong credit features of the DWR credit, we believe DWR should be able to issue additional bonds to finance the SWP contractors' share of the approximately $20.5 billion of revenue bonds that would need to be issued under the Base Case scenario. Based on discussions with various parties, we are not aware of any impediments under state law or within the existing bond covenants to financing the BDCP conveyance costs under the DWR Bonds credit. However, the water supply contracts would need to be formally extended through the final maturity of the bonds to be issued (the contracts are currently set to expire in 2035) and amended to address the funding of the conveyance facility and related costs.[58] If all of the SWP contractors do not agree to a BDCP funding amendment, the cost would increase for those that are willing to pay for the conveyance facility. It is not clear how contractors that do not agree to the BDCP funding amendment would be affected since they already have water supply contracts in place through 2035.

CVP Contractors. Since the CVP contractors do not have an existing credit similar to the DWR Bonds and since we do not believe it is feasible for Westlands to secure the full amount of the CVP contractors' share of the $20.5 billion of bonds that would need to be issued under the Base Case scenario (similar to the approach taken with the $50 million of SLDMWA bonds), the CVP contractors will need to develop a new credit to finance their share of the conveyance facilities. New contracts will need to be negotiated and agreed to by the contractors with a term that extends through the final maturity of the bonds. Developing such a credit to successfully finance the CVP contractors' $10.25 billion share of bonds under the Base Case (assuming 50/50 split

[57] Nine of the CVP Contractors, representing 49% of the assumed CVP financial responsibility, have at least one AA/Aa category rating. These figures include the Friant contractors, but do not include any CVP contractors that would have less than 0.1% of the assumed financial responsibility combined. Note that these percentages are based on the "maximum contract quantity" and not estimated deliveries for individual CVP contractors.

[58] According to DWR, an agreement in principle on an extension of the water supply contracts to 2085 has been negotiated and is about to undergo a full CEQA review. A separate contract amendment will be necessary to establish the terms on which SWP contractors will participate in the BDCP.

between SWP and CVP contractors) will be challenging for a variety of reasons, including, but not limited to the following.

- In order to issue bonds for their portion of the conveyance facility, CVP contractors will likely need to agree to "take-or-pay" contracts since debt service on bonds must be paid irrespective of hydrologic conditions or the amount of water delivered in a given year. However, fixed payments from contractors that don't vary as a function of the amount of water delivered are potentially problematic. As was described in Section IV, the effective cost of fixed debt service as a per acre-foot-of-delivered-water charge would vary significantly due to fluctuations in water deliveries. During a period of low water deliveries, at the same time contractors are securing alternative water supplies – potentially at high prices - they would be obligated to continue to make debt service payments. This could be problematic particularly for small agricultural contractors because their revenues will likely be constrained either simply as a function of crop prices or because they would fallow a portion of their acreage, resulting in lower crop yields to bring to market. Thus, even if CVP contractors are willing to accept a take-or-pay obligation for debt service, which would be a significant change, for some of the smaller agricultural contractors it may not be realistic to expect they would always be able to make fixed debt service payments. And even for larger water districts that might be willing to accept a take-or-pay obligation, the question arises as to whether their member contractors would be willing or able to enter into a take-or-pay arrangement.

  There are a few possible approaches that could be taken to help address this issue. First, as noted in Section IV, for many contractors the BDCP debt service obligation will be treated as a fixed annual cost potentially to be collected through property tax charges or assessments, to the extent these charges are legally permissible. While this does not eliminate the potential for higher costs during dry years from a combination of debt service costs and the cost of alternative supplies, it does create a more stable financing arrangement where debt service costs are predictable from one year to the next.

  Second, the creation of a large rate stabilization fund has been discussed as a way to mitigate large impacts of prospective rate adjustments and to make financing of the conveyance facility more economically viable for CVP contractors. Using this approach, the issue is how large of a reserve fund is needed to provide assurance that debt service can always be paid and how the reserve would be funded. In addition to funding such a reserve initially, it would need to be replenished through a surcharge or higher rates whenever it is utilized during dry periods. In addition, the contractors would still need to be obligated to pay debt service regardless of the amount of water they receive if the rate stabilization fund was exhausted.

  Finally, contracts could be structured to provide for lower-priced water deliveries for customers for whom contracts permit a limited reduction in supply during dry years in exchange for a lower price for that interruptible supply. Other contractors for whom having a more reliable supply is critical would pay a somewhat higher price for that guarantee.

- Bonds to be repaid by the CVP contractors will also likely need to include other credit features that are included in the DWR bonds such as “step-up” provisions, ability to suspend water deliveries for non-payment, excess debt service coverage requirements, ability to levy a tax assessment for non-payment (if permissible), etc. As with take or pay contracts, such features would be a significant change for the CVP contractors and may raise significant policy issues– especially regarding the impact on smaller agricultural contractors.

- The average credit profile of the CVP contractors is significantly different from those of the SWP contractors. While the largest SWP contractors are wholesale agencies, the majority of CVP contractors are agricultural districts. More than 63% of the SWP contractors assumed financial responsibility is from contractors rated AA- or Aa3 or higher by S&P or Moody’s, while approximately 48% of the CVP contractors’ assumed responsibility for the conveyance facility is from contractors that have at least one rating in the AA/Aa category. Westlands, which has the largest entitlement of the CVP contractors, accounts for approximately 36.44% of the “maximum contract quantity” amount of water under contract to be delivered to CVP contractors, and is rated A+/AA- by S&P and Fitch. Assuming a 50/50 split between SWP and CVP, Westlands’ share of the $10.25 billion of bonds for CVP contractors under the Base Case would be approximately $3.74 billion if the “maximum contract quantity” percentages were used to allocate CVP debt obligations. By contrast, Westlands currently has approximately $237 million of bonds outstanding.

- Rating agencies and investors will closely scrutinize the affordability of the financing for the conveyance facility as well as the willingness and ability of the CVP contractors to pay debt service during a sustained dry period.

Even if the CVP contractors develop a new credit with a take or pay obligation and similar credit features to the DWR bonds, it is not clear at this point whether $10.25 billion of bonds (assuming a 50/50 split) in the Base Case could reasonably be issued without a large rate stabilization fund or other credit enhancement or subsidy from the federal government, state government, or SWP contractors.

Other Financing Issues

Ownership of Conveyance Facility. In order to finance the conveyance facility with tax-exempt bonds, USBR is precluded from having an ownership share in the facility. Thus, a variety of ownership structures are being discussed, including one in which a joint powers authority would own the CVP contractors’ share of the project and DWR would own the SWP contractors’ share of the project. Other ownership structures involving public agencies are also possible.

Construction Management and Governance. Given the size and scope of the proposed project, construction management and the ongoing governance plan for operations, financial management and regulatory matters will be considerations in the assessment of credit worthiness by the rating agencies and investors.

Coordinated Plan of Finance. To the extent that the bonds for the conveyance facility would be issued by more than one entity, the plan of finance would need to be highly coordinated among the issuers.

"Wrapped Debt Service." Instead of just adding the new debt service for the conveyance facility on top of the existing debt service, principal for the new bonds could be "wrapped" around the existing DWR debt service. This could potentially provide some near-term debt service relief for the SWP contractors from 2020-2030, but would result in a longer average life of the new bonds and a higher all-in-TIC. However, because the extent of future debt service obligations from future non-BDCP-related capital projects is unknown, the extent of such near-term debt service relief is unclear.

VI. Project Risks

Construction Cost Risk

As described in Section III, the conveyance facility is estimated to cost $14.57 billion in 2012 dollars. As noted, this estimate has a range of minus 10 percent to plus 30 percent, based on the type of the estimate at this stage of the project planning process. If the cost of designing and constructing the facility ultimately comes in at the high end of the range, this would increase the cost of CM1 to $18.9 billion in 2012 dollars. At the low end of the range, the cost of the conveyance facility would decline to $13.1 billion. In addition, as previously noted, contractors will be responsible for other costs associated with the plan, including mitigation costs, operating costs and the cost for their share of other BDCP conservation measures.

It is possible that the cost of the project will significantly exceed the upper end of the current range of the cost estimate. In a 2003 study of risks associated with so-called “megaprojects,” the authors conclude that very large infrastructure projects – primarily transportation projects – commonly experience cost overruns of 50 to 100 percent or more due to their complexity and the failure to properly assess risks inherent in the projects.[59] More specifically, the study found that bridge and tunnel projects experienced cost overruns of 34 percent, on average.

One of the key points the authors make is that the incentives to recognize and control risks associated with these very large projects are often not strong or properly aligned. They argue that this occurs largely because the risk of cost overruns or project failure is borne by a governmental entity and, ultimately, taxpayers.

While the conveyance facility may be constructed by the DWR, water contractors will bear the cost of paying for the project. This at least partially aligns the incentive for cost control and risk assessment since the water contractors and their customers would bear the impact of cost overruns. However, making the contractors responsible for construction would likely strengthen the incentive. However, it might be argued that the incentive for cost control on the part of at least some of the water contractors is not as strong as it would be if private investors’ capital were at risk since, for a significant number of water contractors, they would pass higher costs through to their ratepayers. Arguably, having some private capital at risk would make the incentive for cost control even stronger.

However, even with ratepayers bearing the burden of any higher costs, significant cost overruns would result in higher debt loads for the water contractors, potentially raising concerns about their ability to absorb these costs, particularly for smaller agricultural contractors that are not in a position to pass these costs through to ratepayers.

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[59] Flyvbjerg, Bent, Nils Bruzelius, and Werner Rothengatter. *Megaprojects and Risk: An Anatomy of Ambition*. United Kingdom: Cambridge UP, 2003.

Construction Delay Risk

Given the scale of the project, construction of the conveyance facility is expected to take a considerable period. As currently envisioned, design work on the facility would begin soon after the Record of Decision (ROD)/Notice of Decision (NOD). While the timeframe for the ROD/NOD is uncertain, it is anticipated that that would occur sometime in 2015. This would be followed several years later by the commencement of construction, assuming that the appropriate permits have been secured by that point. Construction is estimated to be completed by 2028.

In light of the complexity of the project, it is reasonable to expect some deviation from this schedule. Some activities will likely take less time than anticipated; others will likely take more. In addition, some aspects of the project present risks that could result in delay, such as:

Geology of the Tunnel Alignment
The construction schedule anticipates a certain pace of progress with respect to drilling the tunnel alignment. However, since the number of tunnel borings performed to date is smaller than what will eventually be performed prior to construction due to access issues, the construction team may encounter geological conditions that differ from those currently anticipated. Whether this could affect the construction schedule depends on the type of unanticipated conditions encountered.

Legal Challenges
Given the controversy surrounding the BDCP, it is likely that potentially numerous lawsuits will be filed challenging the project. The project schedule anticipates that even if lawsuits are filed, the construction schedule will stay on track as the litigation is resolved, so long as the construction team is not enjoined from proceeding with land acquisition and collecting boring samples, for example. If a court stops the construction team from pursuing these efforts, however, the schedule would be affected to an unknown extent.

Another potential legal challenge could involve the application of Proposition 26 to the water charges imposed by water contractors on their member agencies and customers for the cost of the conveyance facility. This measure, which amended the California Constitution, was passed by the voters at the November 2010 General Election. Generally, the measure requires that governmental entities show that fees bear a reasonable relation to the cost of the service being provided and that the manner in which costs are apportioned bear a reasonable relationship to the fee payer's benefits. While these requirements generally predated the measure's adoption by the voters, the courts are at the initial stages of interpreting what additional requirements, if any, it imposes regarding the application and design of user charges.

Funding Sources for Habitat Conservation Efforts
The BDCP proposes undertaking significant habitat conservation efforts as a condition of receiving permits to pursue the construction of the conveyance facility. Of the total $24.75 billion ($2012) estimated cost of the BDCP, approximately $8.2 billion would be invested in habitat restoration

and efforts to reduce the impact of stressors on various covered species (including responses to changed circumstances and research and monitoring). Of this amount, $5.28 billion is for capital purposes. Funding for habitat conservation is proposed to come primarily from various state and federal sources, including future General Obligation bond measures approved by the voters. Specifically, $4.1 billion is identified as potentially coming from existing and new state water bonds and other state sources for this purpose. Approximately $3.3 billion is identified as potentially coming from existing and new federal funding authorizations for habitat restoration.[60] If sufficient funding for habitat conservation is not ultimately forthcoming, the ability to operate the conveyance facility could be jeopardized. In this report, we have not assessed the likelihood that the various potential habitat conservation funding sources identified in the BDCP documents will actually be available to finance the entire BDCP project.

Seismic Risk
The BDCP draft discusses the risk to Delta water exports from a seismic event that would damage or destroy some of the Delta's levees. Risk of seismic damage to Delta levees is also an issue with respect to two other timeframes: during construction of the conveyance facility and after construction is completed. A major seismic event during construction would pose the risk of delay to construction itself at the same time that water supplies from the existing south of Delta pumps might be disrupted. This could create a situation where water agencies are scrambling to secure water supplies to replace Delta water losses at the same time they are beginning to pay debt service on bonds to finance the construction of the new conveyance facility, depending on the timing of bond issuance. A major seismic event after construction is completed and the new facility is operational would, in theory, pose less of a challenge, since the facility is intended to make Delta water exports less susceptible to disruption from an earthquake. According to BDCP staff, the tunnels are being designed to withstand the maximum seismic event that would occur every roughly 2,400 years.

Regulatory Risk

This section discusses the potential for environmental regulators to reduce allowable Delta water exports in the future.

Under the No Action Alternative, some steps would continue to be taken to improve the ecology of the Delta, but not on the scale that would occur under implementation of the BDCP. As a result, risks to the health of the Delta due to a combination of climate change and sea level rise, seismic risks, and flood risks would be mitigated to a lesser extent than under implementation of the BDCP. Without the BDCP's conservation measures, further restrictions on consumptive water use become more likely as a means to improve the ecological health of the Delta. It is not possible to determine the probability of future additional restrictions on Delta water extraction. However, the probability is greater under the No Action Alternative than under implementation of the BDCP.

[60] The balance of the cost of habitat restoration costs is anticipated to come from the SWP and CVP contractors.

In exchange for agreeing to fund the debt service on a new water conveyance facility, SWP and CVP contractors and consumers would prefer to have a guarantee regarding the minimum amount of water that can be extracted from the Delta each year for consumptive use. Based on our discussions with various regulatory agencies and outside experts, such a guarantee is unlikely to materialize.

The Federal Endangered Species Act (ESA) and the California Natural Community Conservation Planning Act (NCCPA) set out conditions under which resource agencies can provide regulatory assurances to permittees concerning their mitigation obligations. The ESA includes a "no surprises" policy, which states that once a Habitat Conservation Plan is approved and implemented, "the federal government will not require additional conservation or mitigation measures, including land, water (including quantity, timing, and delivery), money, or restrictions on the use of those resources.[61]

Under the NCCPA, the California Department of Fish and Wildlife can also provide some assurance to permittees. "The assurances provided to the entities receiving permits under the NCCPA will ensure that if there are unforeseen circumstances, no additional financial obligations or restrictions on the use of resources will be required of the Permittees without their consent."[62]

Nevertheless, even when these assurances are granted, both federal and state regulators have the right to revoke a permit if continuing the permitted activity would jeopardize the continued existence of a protected species.

Notwithstanding the fact that federal and state law provide the opportunity for some level of regulatory assurance, several factors make a blanket assurance regarding minimum water exports from the Delta very unlikely in the case of the BDCP. The BDCP is a huge project covering a large, complex ecosystem. It includes many moving parts and the science of the Delta is uncertain and evolving, particularly as it relates to the impact of climate change and sea level rise. Given these circumstances, regulators expect to take an adaptive management approach to the Delta under which policies evolve in response to new information. The operating criteria of the new facility will have to meet the regulatory requirements of the Endangered Species Act and other relevant state and federal statutes.

The BDCP includes a number of measures intended to help protected Delta species thrive. These include predator control, the Yolo Bypass fishery enhancement, and tens of thousands of acres of habitat restoration. In addition, the new conveyance itself has the potential to improve the ecological health of the Delta by conveying water around the Delta rather than through it, which sometimes results in "reverse" flows under certain conditions.[63] As currently envisioned, under

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[61] BDCP Chapter 6, Plan Implementation, p. 6-28, (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Chapter_6_-_Plan_Implementation.sflb.ashx).

[62] Ibid., p. 6-30.

[63] Reverse flows can occur on the Old and Middle Rivers in the Delta when water deliveries through the south Delta pumps result in currents moving in the opposite direction from the natural flow. This can confuse fish and result in greater numbers of fish being trapped in the pumps fish screens.

the so-called Decision Tree process, prior to operation of the facility, hypotheses guided by biological goals and objectives regarding the impact of habitat restoration on recovering species would be tested. Based on that experience, operations criteria may be adjusted, and the amount of water needed for outflows and the amount available for export could go up or down. Ultimately, various regulatory agencies will retain authority to determine how the facility is operated.

Although the conservation measures are expected to improve species health in the Delta, significant uncertainties remain over the extent to which they will achieve their objectives. As a result, regulators are unlikely to limit the extent to which water operations can be changed in response to new information or changes in future circumstances. Instead, through adaptive management, regulators and Delta managers will update Delta policy, including water management, as new research becomes available and as researchers see how the Delta responds after the new conservation measures are implemented. If the Delta's health does not improve sufficiently, environmental regulators could, in the future, require additional protective measures, including reductions in the amount of water than can be extracted for consumptive use. By the same token, if these protective measures significantly improve the health of the Delta, it is possible that the amount of water exported from the Delta could increase by an unknown amount. Ultimately, a better understanding of the impact of habitat restoration on future conditions in the Delta is needed before long-term operations criteria can be developed.

To the extent that deliveries increase under potential new operating criteria, that would reduce the effective cost of water delivered to SWP and CVP contractors given fixed debt service requirements to pay for construction of the conveyance facility. Conversely, if deliveries are lower on average, the effective cost of debt service on a per acre foot basis would be higher.

Risk of Climate Change and Sea Level Rise

As described earlier, the modeling presented in this report builds on modeling work done as part of the preparation of the draft BDCP. The modeling undertaken in connection with the draft BDCP makes certain assumptions regarding the future conditions with respect to sea level rise and climate change. In addition, as discussed, that modeling uses the 81-year hydrologic period used by the CALSIM II model to simulate SWP and CVP operations. Thus, this information provides an illustration of the impact of sea level rise and climate change on the historical pattern of precipitation.

Climate Change

Global climate change is projected to result in increased surface and water temperatures in California. However, projecting future changes in precipitation is more difficult. Since the 1930s, while precipitation has increased in the Sacramento River basin, this has not been the case in the

San Joaquin River basin.[64] Overall, studies forecast changes in precipitation in California as a whole, with declines in precipitation particularly in Southern California through 2100. While the mean-annual amount of precipitation is forecast to decrease only slightly in the Sacramento and San Joaquin River basins, more precipitation is forecast to come in the form of rainfall rather than snow, resulting in earlier runoff.[65]

For purposes of projecting the impact of climate change in the development of the BDCP, an approach has been used that combines forecasts from 112 future climate projections used in the development of the 2007 International Panel on Climate Change Fourth Assessment Report. The methodology was further refined in an effort to reflect the impact that climate change will have not only in terms of higher average temperatures and lower average precipitation, but also the expected increase in variability around those averages in the form of weather extremes.[66]

Unlike sea level rise, where the impact of climate change can be characterized by a single figure denoting the extent of the projected rise, the impact of climate change on temperature and precipitation is more complex. In general, climate change is expected to result in higher average temperatures and lower average precipitation. However, there will be significant monthly and, even daily, variation around those averages. And, as noted, more of the region's precipitation is expected to come in the form of rainfall. Thus, the monthly pattern of runoff in the SWP and CVP watersheds is likely to change significantly from the historical pattern.

The results of the 112 projections used to develop the BDCP climate change forecast exhibit some variability regarding the projected annual average temperature and precipitation. In other words, some projections forecast drier and warmer conditions compared to the mid-range climate change scenario, while others forecast wetter and less warm conditions. Similarly, some projections forecast drier and less warm conditions and still others forecast wetter and warmer conditions.

These variations among climate change scenarios could potentially affect annual average exports from the Delta. There is a risk that precipitation patterns evolve in a direction that differs significantly from the pattern currently anticipated under the BDCP planning process such that exports from the Delta are substantially below the anticipated level, again potentially jeopardizing the willingness or ability of water contractors to pay debt service. Because the risk of a significant deviation – should one occur – is likely greater further out in time when the balance of financing costs remaining to be paid is diminishing, this mitigates the risk associated with this issue.

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[64] BDCP, Appendix 2.C Climate Change Implications and Assumptions, p. 2.C-7, (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_2C_-_Climate_Change_Implications_and_Assumptions.sflb.ashx).

[65] BDCP EIR/EIS, Chapter 29, Climate Change, p. 29-11 (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_EIR-EIS_Chapter_29_-_Climate_Change.sflb.ashx)

[66]BDCP, Appendix 5.A.2 Climate Change Approach And Implications For Aquatic Species**,** p. 5.A.2-8, (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_5A_-_2_-_Climate_Change_Approach_and_Implications_for_Aquatic_Species.sflb.ashx).

Sea Level Rise

Global climate change is projected to result in an increase in sea level. For BDCP planning purposes, sea level rise is projected to be approximately 12 - 18 cm (5 - 7 inches) at year 2025, and approximately 30 – 60 cm (12 – 24 inches) at year 2060. For the BDCP alternatives, given the uncertainty in sea level rise projections, the mid-point of the estimates was used, resulting in sea level rise of 15 cm (6 inches) by 2025 and 45 cm (18 inches) at 2060.[67]

If sea level rise is greater than anticipated under these assumptions, salinity would increase in the western and central Delta. Delta operations criteria are designed to maintain freshwater in the western Delta in the Spring (Spring X2), and, in the case of the conveyance facility alternative currently under consideration, in the fall (Fall X2) under certain operating conditions. As sea level rise occurs, more water would need to be released from the SWP and CVP reservoirs north of the Delta to avoid saltwater intrusion into the Delta, therefore, less water would remain in storage at the end of September and less water would be available for SWP and CVP water supplies both upstream and downstream of the Delta.[68]

Greater than anticipated sea level rise resulting in increased salinity in the west Delta could also affect the ability to take water from the south Delta in the fall months. As a result, less water would be available for SWP and CVP deliveries south of the Delta.

Alternatively, to the extent that sea level rise is less than that assumed in the BDCP modeling, this would likely result in more water being available for SWP and CVP deliveries south of the Delta.

To the extent that the impact on water deliveries is significantly different from the assumptions employed in the BDCP planning process, this could affect the effective cost of water delivered to SWP and CVP contractors and may affect their ability to pay debt service for the facility. Again, because the risk of a significant deviation – should one occur – is likely greater further out in time when the balance of financing costs remaining to be paid is diminishing, this mitigates the risk associated with this issue.

[67] BDCP, Appendix 5.A.2 Climate Change Approach And Implications For Aquatic Species**,** p. 5.A.2-10, (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_Appendix_5A_-_2_-_Climate_Change_Approach_and_Implications_for_Aquatic_Species.sflb.ashx).

[68] BDCP EIR/EIS, Chapter 5, Water Supply, p. 5-47, (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Public_Draft_BDCP_EIR-EIS_Chapter_5_-_Water_Supply.sflb.ashx)

Appendix A: Supporting Detailed Data: Annual Estimates of Water Contractors' BDCP-related Costs

The table below provides the annual BDCP-related costs expected to be paid by the water contractors both in 2012 dollars and in year-of-expenditure dollars.

Figure 24: Annual Contractor BDCP-related Costs

	($2012 millions)[1]						($YOE millions)[2]					
	Debt-Financed Capital Costs		Total Debt-Financed Costs	PAYGO Capital Costs	O&M Costs	TOTAL	Debt-Financed Capital Costs		Total Debt-Financed Costs	PAYGO Capital Costs	O&M Costs	TOTAL
Calendar Year	CM1	CM4					CM1	CM4				
2015	315.7	6.0	321.7	4.7	17.4	343.8	344.9	6.6	351.5	5.1	19.0	375.7
2016	434.7	6.0	440.8	4.7	17.4	462.9	489.3	6.8	496.1	5.3	19.6	521.0
2017	448.6	6.0	454.6	4.7	17.4	476.7	520.0	7.0	527.0	5.4	20.2	552.7
2018	547.0	6.0	553.0	4.7	17.4	575.2	653.2	7.2	660.4	5.6	20.8	686.8
2019	1,198.9	6.0	1,205.0	4.7	17.4	1,227.1	1,474.5	7.4	1,481.9	5.8	21.4	1,509.1
2020	1,739.6	6.0	1,745.7	6.9	18.7	1,771.2	2,203.7	7.6	2,211.3	8.7	23.6	2,243.7
2021	1,826.1	6.0	1,832.1	6.9	18.7	1,857.6	2,382.6	7.9	2,390.5	8.9	24.4	2,423.8
2022	1,818.8	6.0	1,824.8	6.9	18.7	1,850.3	2,444.3	8.1	2,452.4	9.2	25.1	2,486.7
2023	1,745.3	6.0	1,751.3	6.9	18.7	1,776.8	2,415.9	8.3	2,424.2	9.5	25.8	2,459.6
2024	1,621.1	6.0	1,627.1	6.9	18.7	1,652.6	2,311.2	8.6	2,319.8	9.8	26.6	2,356.2
2025	1,239.9	7.2	1,247.1	7.1	30.1	1,284.3	1,820.9	10.5	1,831.4	10.4	44.1	1,886.0
2026	1,020.5	7.2	1,027.7	7.1	30.1	1,064.9	1,543.7	10.8	1,554.5	10.8	45.5	1,610.7
2027	563.8	7.2	570.9	7.1	30.1	608.1	878.3	11.1	889.5	11.1	46.8	947.4
2028	50.8	7.2	58.0	7.1	30.1	95.2	81.6	11.5	93.1	11.4	48.2	152.7
2029	-	-	-	14.3	30.1	44.3	-	-	-	23.6	49.7	73.2
2030	-	-	-	12.1	31.1	43.2	-	-	-	20.6	53.0	73.6
2031	-	-	-	12.1	31.1	43.2	-	-	-	21.3	54.6	75.8
2032	-	-	-	12.1	31.1	43.2	-	-	-	21.9	56.2	78.1
2033	-	-	-	12.1	31.1	43.2	-	-	-	22.6	57.9	80.4
2034	-	-	-	12.1	31.1	43.2	-	-	-	23.2	59.6	82.9
2035	-	-	-	12.1	46.3	58.3	-	-	-	23.8	91.3	115.1
2036	-	-	-	12.1	46.3	58.3	-	-	-	24.5	94.1	118.6
2037	-	-	-	12.1	46.3	58.3	-	-	-	25.3	96.9	122.2
2038	-	-	-	12.1	46.3	58.3	-	-	-	26.0	99.8	125.8
2039	-	-	-	12.1	46.3	58.3	-	-	-	26.8	102.8	129.6
2040	-	-	-	12.0	46.4	58.5	-	-	-	27.5	106.3	133.8
2041	-	-	-	12.0	46.4	58.5	-	-	-	28.4	109.4	137.8
2042	-	-	-	12.0	46.4	58.5	-	-	-	29.2	112.7	141.9
2043	-	-	-	12.0	46.4	58.5	-	-	-	30.1	116.1	146.2
2044	-	-	-	12.0	46.4	58.5	-	-	-	31.0	119.6	150.6
2045	-	-	-	11.8	46.6	58.5	-	-	-	31.4	123.7	155.0
2046	-	-	-	11.8	46.6	58.5	-	-	-	32.3	127.4	159.7
2047	-	-	-	11.8	46.6	58.5	-	-	-	33.3	131.2	164.5
2048	-	-	-	11.8	46.6	58.5	-	-	-	34.3	135.1	169.4
2049	-	-	-	11.8	46.6	58.5	-	-	-	35.3	139.2	174.5
2050	-	-	-	11.8	46.8	58.6	-	-	-	36.3	143.9	180.2
2051	-	-	-	11.8	46.8	58.6	-	-	-	37.4	148.2	185.6
2052	-	-	-	11.8	46.8	58.6	-	-	-	38.5	152.7	191.2
2053	-	-	-	11.8	46.8	58.6	-	-	-	39.7	157.3	196.9
2054	-	-	-	11.8	46.8	58.6	-	-	-	40.8	162.0	202.8
2055	-	-	-	4.0	47.0	50.9	-	-	-	14.1	167.5	181.5
2056	-	-	-	4.0	47.0	50.9	-	-	-	14.5	172.5	187.0
2057	-	-	-	4.0	47.0	50.9	-	-	-	14.9	177.7	192.6
2058	-	-	-	4.0	47.0	50.9	-	-	-	15.4	183.0	198.4
2059	-	-	-	4.0	47.0	50.9	-	-	-	15.8	188.5	204.3
2060	-	-	-	4.0	47.0	50.9	-	-	-	16.3	194.1	210.5
2061	-	-	-	4.0	47.0	50.9	-	-	-	16.8	200.0	216.8
2062	-	-	-	4.0	47.0	50.9	-	-	-	17.3	206.0	223.3
2063	-	-	-	4.0	47.0	50.9	-	-	-	17.8	212.1	230.0
2064	-	-	-	4.0	47.0	50.9	-	-	-	18.4	218.5	236.9
TOTAL	**14,570.9**	**88.8**	**14,659.8**	**439.2**	**1,886.8**	**16,985.8**	**19,564.3**	**119.4**	**19,683.7**	**1,043.4**	**5,131.5**	**25,858.6**

[1] The water contractors' share of BDCP costs in 2012 dollars as reported in the 2013 draft BDCP documents (Chapter 8 and Appendix 8A).

[2] The Year of Expenditure (YOE) dollars are estimated by applying a 3% annual construction and general inflation rate to the $2012 figures.

Summary of Financing Scenarios

The table below provides a summary of the financing scenarios prepared by the State Treasurer's Office to illustrate the impact of changing various assumptions such as an increase or decrease in construction costs, delays, higher or lower interest rates, and other factors.

Figure 25: Summary of Financing Scenarios Prepared by the State Treasurer's Office

Scenarios*	Project Funds	Par Amount	Total Interest	Total Debt Service	Maximum Annual Debt Service	Final Debt Service Year	All-In TIC	Total Debt Service Reserve Deposits	Capitalized Interest
Base Case (First 5 years interest only)	$19,683,652,391	$20,503,670,000	$34,862,923,874	$55,366,593,874	$1,392,899,921	2068	5.964485%	$696,464,274	
Best Case (Base Case with decrease of 10% in construction costs; less 1% interest)	$14,810,461,835	$15,369,620,000	$21,009,278,614	$36,378,898,614	$922,527,211	2068	4.948723%	$461,274,774	
Worst Case (Base Case plus 30% increase in construction costs, increase of 2% in interest; 3 year delay)	$25,168,828,982	$26,444,420,000	$63,627,053,427	$90,071,473,427	$2,244,643,240	2071	7.998919%	$1,122,332,156	
Base + 30 % increase in construction costs	$23,033,043,919	$23,988,870,000	$40,788,881,587	$64,777,751,587	$1,629,670,106	2068	5.963292%	$814,844,782	
Base - 10% decrease in construction costs	$14,810,461,835	$15,432,885,000	$26,240,915,986	$41,673,800,986	$1,048,427,716	2068	5.967184%	$524,224,573	
Base + 1% interest	$19,683,652,391	$20,592,635,000	$42,159,874,605	$62,752,509,605	$1,569,952,194	2068	6.982808%	$784,988,416	
Base + 2% interest	$19,683,652,391	$20,686,065,000	$49,772,093,729	$70,458,158,729	$1,755,868,970	2068	8.001086%	$877,944,457	
Base less 1% interest	$19,683,652,391	$20,419,610,000	$27,912,263,568	$48,331,873,568	$1,225,637,891	2068	4.946278%	$612,829,314	
Base less 2% interest	$19,683,652,391	$20,340,920,000	$21,337,990,707	$41,678,910,707	$1,069,039,078	2068	3.928358%	$534,529,888	
Base - first 10 years interest only	$19,683,652,391	$20,543,990,000	$36,408,102,048	$56,952,092,048	$1,473,163,409	2068	5.986771%	$736,593,960	
Base - 12 month debt service reserve	$19,683,652,391	$21,254,920,000	$36,140,305,313	$57,395,225,313	$1,443,944,728	2068	5.964195%	$1,443,964,682	
1 year delay	$20,274,161,963	$21,118,130,000	$35,907,661,452	$57,025,791,452	$1,434,646,173	2069	5.964245%	$717,334,189	
1 year delay + 30% increase in construction costs	$23,724,035,236	$24,707,875,000	$42,011,433,208	$66,719,308,208	$1,678,512,638	2069	5.963087%	$839,267,805	
1 year delay - 10% decrease in construction costs	$15,254,775,690	$15,895,215,000	$27,027,061,209	$42,922,276,209	$1,079,832,988	2069	5.966867%	$539,929,150	
2 year delay	$20,882,386,822	$21,751,005,000	$36,983,756,879	$58,734,761,879	$1,477,642,569	2070	5.964013%	$738,831,519	
2 year delay + 30% increase in construction costs	$24,435,756,293	$25,448,455,000	$43,270,616,560	$68,719,071,560	$1,728,818,514	2070	5.962889%	$864,422,674	
2 year delay - 10% decrease in construction costs	$15,712,418,960	$16,371,415,000	$27,836,747,915	$44,208,162,915	$1,112,183,455	2070	5.966559%	$556,104,042	
3 year delay	$21,508,858,427	$22,402,875,000	$38,092,205,657	$60,495,080,656	$1,521,922,749	2071	5.963789%	$760,974,428	
3 year delay + 30% increase in construction costs	$25,168,828,982	$26,211,255,000	$44,567,657,778	$70,778,912,778	$1,780,645,372	2071	5.962696%	$890,333,017	
3 year delay - 10% decrease in construction costs	$16,183,791,529	$16,861,900,000	$28,670,682,295	$45,532,582,295	$1,145,502,636	2071	5.966258%	$572,764,137	
1 year capitalized interest	$19,683,652,391	$21,836,575,000	$37,129,290,589	$58,965,865,589	$1,483,451,853	2068	5.963984%	$741,738,432	$1,280,976,165
2 years capitalized interest	$19,683,652,391	$23,354,850,000	$39,710,813,130	$63,065,663,129	$1,586,595,396	2068	5.963482%	$793,309,674	$2,740,081,899
3 years capitalized interest	$19,683,652,391	$25,100,015,000	$42,678,183,795	$67,778,198,795	$1,705,149,023	2068	5.962981%	$852,587,128	$4,417,247,201
CM1 Construction Costs Inflated	$19,564,254,264	$20,379,430,000	$34,651,627,431	$55,031,057,431	$1,384,459,036	2068	5.964534%	$692,242,621	
CM1 Construction Costs 2012	$14,570,914,565	$15,183,615,000	$25,817,118,928	$41,000,733,928	$1,031,494,016	2068	5.967203%	$515,758,558	
2012 CM1 & CM4 Construction Costs	$14,659,755,809	$15,276,065,000	$25,974,256,453	$41,250,321,453	$1,037,770,474	2068	5.967134%	$518,898,106	
2012 CM1 & CM4 Construction Costs 30% Higher	$17,154,268,286	$17,871,725,000	$30,387,724,777	$48,259,449,777	$1,214,106,863	2068	5.965556%	$607,063,913	
2012 CM1 & CM4 Construction Costs 10% Lower	$11,030,355,210	$11,499,500,000	$19,552,884,661	$31,052,384,661	$781,216,665	2068	5.970706%	$390,620,362	

** Note that the 10% decrease and 30% increase in construction costs refers to the change in pre-contingency construction costs, as explained in the report.*

Construction Cost Inflation Measures

For our analysis we have used an annual construction cost inflation rate of 3% based on a review of a number of construction cost index series from the U.S. Bureau of Reclamation, the United States Army Corps of Engineers (USACE), and the California Department of Transportation (Caltrans). We looked specifically at those large infrastructure projects most comparable to the proposed BDCP tunnels, such as tunnels, dams, pumping plants, and in the case of the Caltrans, bridges. We estimated the annual inflation over a 10-year, 20-year, and 28-year period (28 years being the longest period available from all three sources). In addition, the construction cost data from the Army Corps of Engineers included forecasts through 2037. A summary of these inflation estimates is provided in Figure 26 below. As the table shows, the average construction cost inflation rate from the three sources for the past 28 years are all very close to 3%, varying from 2.8% to 3.1%. The more recent 20-year period has seen a somewhat higher inflation rate (from 3.0% to 4.6%), and the past 10 years even higher (3.6% to 4.9%). The Army Corps of Engineers was the only source that also included a forecast, forecasting annual inflation rates of around 2% over both the next 10 years and the next 25 years. Because of the extended time period involved and the fact that the 2% forecast inflation rate from the ACE is considerably lower than the historical average, we have used the historical 3% annual inflation rate as a conservative estimate of the expected inflation rate over the course of the BDCP tunnel construction period.

Figure 26: Construction Cost Inflation Estimates

		Historical Index Values and Annual Growth Rate									Forecast Values and Annual Growth Rate					
		Past 10 yrs			Past 20 yrs			Past 28 yrs			10 Yr Forecast			25 Yr Forecast		
Source	**Detail**	**2002**	**to 2012**	**CAGR**	**1992**	**to 2012**	**CAGR**	**1984**	**to 2012**	**CAGR**	**2012**	**to 2022**	**CAGR**	**2012**	**to 2037**	**CAGR**
US Bureau of Reclamation	Tunnels	261	377	3.7%	198	377	3.3%	163	377	3.0%						
(Historical: 1984Q1 thru 2013Q2)	Dam structure	188	304	4.9%	148	304	3.7%	129	304	3.1%						
(Forecast: none)	Pumping plants	241	349	3.8%	188	349	3.1%	157	349	2.9%						
	Composite Trend	242	368	4.3%	188	368	3.4%	155	368	3.1%						
Army Corps of Engineers	CHANNELS & CANALS	553	789	3.6%	438	789	3.0%	354	789	2.9%	789	964	2.0%	789	1279	2.0%
(Historical: 1968 thru 2012)	PUMPING PLANT	486	769	4.7%	399	769	3.3%	341	769	2.9%	769	923	1.8%	769	1224	1.9%
(Forecast: 2013 thru2037)	DAMS	519	763	3.9%	410	763	3.2%	344	763	2.9%	763	923	1.9%	763	1224	1.9%
	COMPOSITE INDEX (WTD AVG)	517	774	4.1%	415	774	3.2%	350	774	2.9%	774	935	1.9%	774	1239	1.9%
CA DOT - Bridge Construction Index	Quarterly Index (Q4)	286	406	3.6%	166	406	4.6%	172	406	3.1%						
(Historical: 1984Q1 thru 2013Q1)	Annual Avg of Quarterly Data	258	400	4.5%	198	400	3.6%	179	400	2.9%						
(Forecast: none)	4-Qtr Moving Avg (Q4)	259	384	4.0%	201	384	3.3%	179	384	2.8%						

Sources for Construction Cost Index Data

Cost Indices	Source
USACE Civil Works Construction Cost Index System	http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-1304/entire.pdf
USBR Construction Cost Indices	http://www.usbr.gov/pmts/estimate/cost_trend.html
California DOT Construction Cost Indices and Forecast	http://www.dot.ca.gov/hq/oppd/costest/Construction-Cost-Indices-and-Forecast-04-2013.pdf

General Inflation Measures

We have also used a general annual inflation rate of 3% based on the historic inflation rate as estimated using the Consumer Price Index (CPI) for the US and for California. As shown in Figure 27, the average annual inflation rate as measured by the CPI has been approximately 2.4% for both California and the nation as a whole for the most recent 10 and 20 year period, while the average annual inflation over the past 30 years was approximately 2.9% for the entire US and 3.0% for the state. The Department of Finance has also forecast an annual inflation rate of 2.0% for the nation and 2.1% for California over the next four years. However, because of the extended time period analyzed here, we have used the 30-year historical California annual inflation rate 3.0% as a conservative estimate of the expected average general inflation rate for our analysis.

Figure 27: General Inflation Rate Estimates

		Historical Index Values and Annual Growth Rate									Forecast Values		
		Past 10 yrs			Past 20 yrs			Past 30 yrs			4 Yr Forecast		
Data Description	**Data Series**	**2003**	**to 2013**	**CAGR**	**1993**	**to 2013**	**CAGR**	**1983**	**to 2013**	**CAGR**	**2014**	**to 2017**	**CAGR**
California Department of Finance	CPI - US	184	233	2.4%	145	233	2.4%	100	233	2.9%	237	252	2.0%
(Historical: 1970 thru 2013)	CPI - California	190	242	2.4%	149	242	2.4%	99	242	3.0%	246	262	2.1%
(Forecast: 2014 thru2017)													
Source: California Department of Finance, Consumer Price Index (http://www.dof.ca.gov/html/fs_data/latestecondata/documents/BBCYCPI.xls)													

Glossary

Term	Definition
acre-foot (AF)	The volume of water that would cover 1 acre of land to a depth of 1 foot. Equal to 1,233.5 cubic meters (43,560 cubic feet) or 325,851 gallons.
Bay Delta Conservation Plan (BDCP or the Plan)	The joint habitat conservation plan and natural community conservation plan prepared in accordance with the Planning Agreement and approved by the fish and wildlife agencies under Section 10 of the ESA and Section 2835 of the Fish & Game Code. The BDCP supports the Section 7 consultation and the integrated biological opinion and related incidental take statements issued concurrently.[69]
California Department of Transportation (Caltrans)	The State of California, Department of Transportation (Caltrans) is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries. Alone and in partnership with Amtrak, Caltrans is also involved in the support of intercity passenger rail service in California, and is a leader in promoting the use of alternative modes of transportation.[70]
California Natural Community Conservation Planning Act (NCCPA)	A California state Act authorizing the Natural Community Conservation Plan program designed to use an ecosystem approach to conserve natural communities at the ecosystem scale while accommodating compatible land use.[71]

[69] Source: BDCP Chapter 12 (Glossary), 12/06/2013 (http://baydeltaconservationplan.com/PublicReview/PublicReviewDraftBDCP.aspx)
[70] Source: http://www.dot.ca.gov/hq/paffairs/faq/faq53.htm.
[71] Source: http://www.fws.gov/stockton/afrp/acronym_template.cfm?code=101

Glossary

Term	Definition
CALSIM II	CALSIM II is a peer-reviewed generalized water resources simulation model for evaluating operational alternatives of large, complex river basins. It currently uses historical hydrologic conditions from 1922 through 2002 to simulate SWP/CVP operations under various scenarios. The model is a product of joint development between DWR and Bureau of Reclamation.[72]
Central Valley Project (CVP)	The federally authorized water management and conveyance system, operated by the Bureau of Reclamation, provides water to agriculture, urban, and industrial users in California. [69]
Conservation Measure 1 (CM1)	Each action detailed in the BDCP's conservation strategy is currently grouped into one of 22 "conservation measures." Conservation Measure 1 (CM1), "Water Facilities and Operation," includes the new water intakes, fish screens, a new 40 acre forebay, and two 30-mile tunnels to transport the water to the existing pumping facilities in the south Delta.[73]

[72] Source: http://modeling.water.ca.gov/hydro/model/index.html.
[73] Source: http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Draft_BDCP_Highlights_12-9-13.sflb.ashx.

Glossary

Term	Definition
Department of Water Resources (DWR)	DWR was established in 1956 by the California Legislature, and currently operates and maintains the California State Water Project (SWP), which provides water for 25 million residents, farms, and businesses. Other programs work to preserve the natural environment and wildlife, monitor dam safety, manage floodwaters, conserve water use, and provide technical assistance and funding for projects for local water needs. DWR's major responsibilities include overseeing the statewide process of developing and updating the California Water Plan (Bulletin160 series); protecting and restoring the Sacramento-San Joaquin Delta; regulating dams, providing flood protection, and assisting in emergency management; educating the public about the importance of water and its proper use; providing technical assistance to service local water needs; and planning, designing, constructing, operating and maintaining California's State Water Project.[74]
early long-term (ELT)	The BDCP implementation period that extends 11 to 15 years after the BDCP permit term is initiated. [69]
evaluated starting operations (ESO)	As part of the BDCP planning process, various scenarios were modeled to analyze the impact on the Delta ecosystem of higher and lower flows of water through the Delta in the Spring and the Fall. The ESO scenario assumes low outflow in the Spring but high outflow in the Fall.[75]
Exceedance level	The exceedance level represents the percent of years in which the amount of water exports is equaled or exceeded, and is often used to illustrate the probability of water deliveries meeting or exceeding a specific level. For example, if a value of 4 million AF is associated with an exceedance level of 70%, that indicates that 70% of the time annual water exports will be at or above 4 million AF.

[74] Source: http://www.water.ca.gov.

[75] For more detail see the Draft BDCP Chapter 5 available at http://baydeltaconservationplan.com/PublicReview/PublicReviewDraftBDCP.aspx.

Glossary

Term	Definition
Federal Endangered Species Act (ESA)	The Endangered Species Act of 1973 was designed to protect critically imperiled species from extinction as a "consequence of economic growth and development untempered by adequate concern and conservation." The Act is administered by two federal agencies, the United States Fish and Wildlife Service (FWS) and the National Oceanic and Atmospheric Administration (NOAA).
High Outflow Scenario (HOS)	As part of the BDCP planning process, various scenarios were modeled to analyze the impact on the Delta ecosystem of higher and lower flows of water through the Delta in the Spring and the Fall. The High Outflow Scenario (HOS) assumes higher outflows in both the Spring and Fall, resulting in the lowest expected water for export to water users via the SWP and CVP.[75]
late long-term (LLT)	Refers to the BDCP implementation period that extends 16 to 50 years after the BDCP permit term is initiated.[69]
Low Outflow Scenario (LOS)	As part of the BDCP planning process, various scenarios were modeled to analyze the impact on the Delta ecosystem of higher and lower flows of water through the Delta in the Spring and the Fall. The Low Outflow Scenario assumes low outflows in both the Spring and Fall, resulting in the highest expected level of water for export to water users via the SWP and CVP.[75]
Metropolitan Water District (MWD)	The Metropolitan Water District of Southern California (MWD) is a consortium of 14 cities and 12 municipal water districts. It was created by an act of the California Legislature in 1928, primarily to build and operate the Colorado River Aqueduct, and in 1960 became the first (and largest) contractor to the State Water Project. MWD currently provides drinking water to nearly 19 million people, delivering an average of 1.7 billion gallons of water per day to a 5,200-square-mile service area that includes parts of Los Angeles, Orange, San Diego, Riverside, San Bernardino and Ventura counties.

Glossary

Term	Definition
municipal and industrial (M&I)	Municipal and industrial (M&I) water users include residential, commercial, industrial and government water users. Such water users typically require potable water that has been treated to a level appropriate for human consumption, as distinguished from agricultural water users who primarily use untreated water for irrigation purposes.
Municipal Market Data (MMD)	The Municipal Market Data is a Thomson-Reuters proprietary database that tracks municipal bond offerings nationwide. This database is used to generate numerous municipal bond indexes published by Thomson-Reuters. For this report, the MMD index for AA-rated general revenue bonds was used to estimate the expected interest rate for the general revenue bonds that will be issued to fund the water contractors' share of the BDCP costs.
No Action Alternative (NAA)	One of the BDCP's water export scenarios. This scenario assumes that no BDCP would be adopted and implemented.
operating and maintenance (O&M) costs	Costs associated with the operation and maintenance of water supply and conveyance facilities, as opposed to the cost of constructing the facilities themselves.
Peak Annual Costs	The average annual estimated costs across the ten years of the BDCP construction and financing period with the highest estimated annual costs.

Glossary

Term	Definition
San Luis & Delta Mendota Water Authority (SLDMWA)	The San Luis & Delta-Mendota Water Authority was established in January of 1992 and consists of water agencies representing approximately 2,100,000 acres of 29 federal and exchange water service contractors within the western San Joaquin Valley, San Benito and Santa Clara counties. One of the primary purposes of establishing the Authority was to assume the operation and maintenance (O&M) responsibilities of certain United States Bureau of Reclamation (USBR) Central Valley Project (CVP) facilities, and do so at an optimum level and at a lower cost than the USBR. The governing body of the Authority consists of a 19-member Board of Directors classified into five divisions with directors selected from within each division. Each Director, and respective Alternate Director, is a member of the governing body or an appointed staff member of his or her agency.[76]
Spring High Outflow (SprHOS)	As part of the BDCP planning process, various scenarios were modeled to analyze the impact on the Delta ecosystem of higher and lower flows of water through the Delta in the Spring and the Fall. The Spring High Outflow Scenario assumes high outflow in the Spring but lower outflow in the Fall.
State and Federal Contractors Water Agency (SFCWA)	The State and Federal Contractors Water Agency was formed in August of 2009 as a Joint Powers Authority under California law by various water agencies that receive water transported across the Sacramento-San Joaquin River Delta by the State Water Project (SWP) and Central Valley Project (CVP). The organization's mission is to assist its member agencies in assuring a sufficient and reliable high-quality water supply for their customers from the State Water Project and federal Central Valley Project. The core focus of activities in pursuing this mission is centered on facilitating habitat conservation measures and research related to the restoration of the Delta ecosystem while assuring sufficient and reliable export water supplies.[77]

[76] Source: http://www.sldmwa.org/learn-more/about-us/.
[77] Source: http://www.sfcwa.org/about/.

Glossary

Term	Definition
State Water Project (SWP)	The state-authorized and operated water storage and delivery system of reservoirs, aqueducts, power plants and pumping plants that provides and distributes water and urban and agricultural water suppliers in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and southern California.
United States Army Corps of Engineers (USACE)	The United States Army Corps of is a U.S. federal agency under the Department of Defense with approximately 36,500 civilian and military personnel, making it one of the world's largest public engineering, design, and construction management agencies. Although generally associated with dams, canals and flood protection in the United States, USACE is involved in a wide range of public works throughout the world. The Corps' mission is to "Deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters."[78]
year-of-expenditure dollars ($YOE)	Year of expenditure dollars ($YOE) are dollars that are adjusted for inflation from the present time to the year in which the money is expected to be spent.

[78] Source: http://en.wikipedia.org/wiki/United_States_Army_Corps_of_Engineers.