San Diego County Water Authority

SPECIAL MEETING
IMPORTED WATER COMMITTEE

Board Room

SEPTEMBER 12, 2013

10:30 a.m.

Elsa Saxod – Chair
Mark Muir – Vice Chair
Ken Williams – Vice Chair
Gary Arant
Gary Croucher
Betty Evans
Michael Hogan
Keith Lewinger
John Linden
Ken Olson
Bud Pocklington
Fern Steiner
Ronald Watkins
Doug Wilson
Tom Wornham

1. Call to order.

2. Roll call – determination of quorum.

3. Public comment – opportunities for members of the public to address the Committee on matters within the Committee's jurisdiction.

4. Chair's report.

I. CONSENT CALENDAR

II. ACTION/DISCUSSION

1. Bay Delta.

1-A Bay-Delta Conservation Plan Costs, Financing, and Economic Benefits. (Information/Discussion) — Dennis Cushman

1-B Bay Delta presentations by:

- Dr. Jerry Meral, Deputy Secretary of the California Natural Resources Agency
- Dr. David Sunding, Lead Economist with the BDCP Program
- Dr. Jeffrey Michael, Economist, University of the Pacific

San Diego County Water Authority

- Dr. Rodney Smith, Economist, President of Stratecon, Inc.

III. INFORMATION

IV. CLOSED SESSION

V. ADJOURNMENT

Doria F. Lore
Clerk of the Board

NOTE: This meeting is also called and noticed as a meeting of the Board, but will be conducted as a meeting of the Imported Water Committee. Members of the Board who are not members of the Committee may participate in the meeting pursuant to Section 2.00.060(g) of the Water Authority Administrative Code. All items on the agenda, including information items, may be deliberated and become subject to Committee action. All public documents provided to the committee or Board for this meeting including materials related to an item on this agenda and submitted to the Board of Directors within 72 hours prior to this meeting may be reviewed at the San Diego County Water Authority headquarters located at 4677 Overland Avenue, San Diego, CA 92123 at the reception desk during normal business hours.

San Diego County Water Authority

September 5, 2013

Attention: Imported Water Committee

Bay-Delta Conservation Plan Costs, Financing, and Economic Benefits. (Information/Discussion)

Background

The Sacramento-San Joaquin Bay-Delta (Delta) is an important water supply source for Southern California. Over the past five years, approximately 20 percent of San Diego County's annual water supply came from the Delta. The Water Authority has been a strong advocate for a sustainable Delta solution – one that is "right-sized," affordable, backed up by enforceable financial commitments, and supported by a broad range of stakeholders to reduce implementation challenges.

The Water Authority has been actively engaging in Delta issues at the Metropolitan Water District (MWD), the Delta Stewardship Council, within the Bay-Delta Conservation Plan (BDCP) process, and in the Legislature. The Water Authority was among the stakeholders involved in advocating for the successful passage of the 2009 comprehensive Bay-Delta bill package. The Water Authority staff has consistently pursued opportunities to bring the most contemporaneous and emerging information to the Board to ensure that the Board is well informed on the many significant issues that arise during the BDCP process.

For several years, the Water Authority has communicated its concerns over how potential Bay-Delta fix options would be financed and paid for by stakeholders. In August 2012, Water Authority General Manager Maureen Stapleton sent a letter to Natural Resources Agency Deputy Secretary Dr. Jerry Meral summarizing these concerns. Despite assurances that the next revision to Chapter 8 of the BDCP administrative draft would address the Water Authority's concerns, the Chapter 8 released in late May failed to do so. On July 30, the General Manager sent correspondence to Deputy Secretary Meral, again, asking that the BDCP address the Water Authority's concerns (Attachment 1). At this time, the Water Authority's concerns have not been addressed.

This memo is the fourth in a series of memos to be presented to the Board, reporting on staff's progress in assessing the four Delta fix alternatives for the ultimate goal of submitting a comment letter through the BDCP environmental review process. This memo is focused on issues relating to BDCP costs, financing, and economic benefits and is intended to provide the foundational background for a panel discussion on those issues at the September 12 special meeting of the Imported Water Committee. During that meeting, BDCP representatives and economists who have been closely monitoring and examining the BDCP will participate including:

- Dr. Jerry Meral, Deputy Secretary of the California Natural Resources Agency;
- Dr. David Sunding, Lead Economist with the BDCP Program;
- Dr. Jeffrey Michael, Economist, University of the Pacific; and
- Dr. Rodney Smith, Economist, President of Stratecon, Inc.

Each of these economists previously prepared written material examining costs, financing, and cost-benefit analysis of the BDCP, as the process has advanced over the past months and years.

Some of the more recent written material is attached (Attachments 2, 3, 4, and 5). Additionally, Water Authority General Manager Maureen Stapleton corresponded with Dr. Meral in an September 4, 2013 letter (Attachment 6) to provide a review of the questions and issues previously raised by Water Authority directors during Dr. Meral's May 2013 visit with the Water Authority Board.

Discussion

BDCP Costs

Chapter 8 of the BDCP administrative draft – *Implementation Costs and Funding Sources* – presents cost estimates and identifies potential funding sources for BDCP. Additionally, a separate, stand-alone document – *Statewide Economic Impact Study* – presents a cost-benefit analysis for the BDCP preferred alternative.

BDCP documents indicate that total capital costs to implement the BDCP preferred alternative over the 50-year period of the permit term are estimated to be $19.9 billion. The majority of these capital costs (approximately 75 percent) is associated with construction of water intake and conveyance facilities and expected to be incurred during the first 10 years of the BDCP implementation. Operations and maintenance costs for that same 50-year period are estimated to be $4.8 billion, for a total cost of $24.7 billion.

Table 1. BDCP Costs by Type and Component (in millions of 2012 dollars)

BDCP Component	Type of Cost		
	Capital	O&M	Total
Water Facilities & Operation	$14,510	$1,492	$16,000
Natural Community Protection & Mgt.	$603	$429	$1,032
Natural Community Restoration	$3,549	$0	$3,549
Other Stressors Conservation	$931	$1,603	$2,534
Monitoring, Research, Adaptive Mgt, & Remedial Measures	$178	$913	$1,091
Program Admin.	$0	$337	$337
Subtotal	$19,771	$4,774	$24,544
EIR/EIS mitigation measures not counted elsewhere*	$142	$0	$142
Total**	**$19,913**	**$4,774**	**$24,687**

*Included in BDCP's cost estimate tables, not in BDCP's funding estimate tables
**Detail may not add due to independent rounding
Source: Bay Delta Conservation Plan, Revised Administrative Draft, Chapter 8, May 2013 Tables 8-37 and 8-38 as presented at the Senate Governance & Finance and Senate Natural Resources & Water Committees on 8/13/13.

A number of assumptions are utilized by the BDCP in generating cost estimates. Assumptions related to the inclusion of appropriate contingencies are important to the development of realistic cost estimates. The BDCP administrative draft indicates that cost estimates for major BDCP elements, such as water facilities, tidal natural community restoration, and Yolo Bypass improvements, include contingency costs as specific cost line items. Where cost contingency has not been explicitly factored into a cost estimate, a 20 percent contingency is added. Some criticisms of the cost assumptions assert that the cost estimates do not include the costs to finance the project, such as revenue bond issuance fees, interest payments, or other financing charges.

BDCP Financing

Federal habitat conservation plans and the state Natural Communities Conservation Planning Act require the assurance of adequate funding to implement the elements of a conservation plan by the applicant. Chapter 8 of the BDCP is intended to identify funding amounts that are expected to be sufficient to meet the anticipated costs of the BDCP and to satisfy the "adequate funding" requirements in law.

However, rather than outlining assurances that adequate funding will be available, this Chapter 8 draft simply provides an accounting of funding sources that the BDCP proponents believe would likely be available. It is expressly noted in Chapter 8 of the administrative draft (8-73):

> *"It is important to note that this chapter is not a financing plan for the state or federal water contractors or any other party. Separate financing plans, funding agreements, legislative authority, and other documents will be needed to enable the use of certain funding sources. This chapter provides an overview of potential funding sources that are likely to be available to support the implementation of the BDCP."*

In addition, Chapter 8 includes another important "note to reader" (8-80):

> *"Details of the financing and repayment described in this section from the Authorized Entities and other sources are still being determined through on-going discussion between the state and federal governments and between the government, the state and federal water contractors, and other interests. Issues still under discussion include aligning the financing and repayment responsibilities with the 'beneficiary pays' principle, among other related issues."*

Chapter 8 of the BDCP administrative draft identifies potential funding for BDCP according to the Table 2 below.

Table 2. Potential BDCP Funding Sources (in millions of 2012 dollars)

Funding Source	Water Facilities & Operations	Nat.Com. Protect. & Mgt.	Nat. Com. Restoration	Other Stressors	Monitoring Research Etc.	Program Admin.	Total
Contractors	$15,974	$246	$256	$198	$104	$30	$16,808
USBR	$0	$310	$562	$1,142	$680	$100	$2,794
Other Fed Funds	$0	$351	$477	$10	$265	$65	$1,167
Props 1E & 84	$0	$0	$108	$21	$0	$0	$129
2014 Water Bond	$0	$184	$805	$525	$0	$0	$1,514
Future Water Bond	$0	$0	$1,300	$600	$0	$0	$1,900
Other State Funds	$0	$40	$20	$15	$90	$0	$165
Interest Income	$17	$0	$0	$64	$0	$143	$224
Total Funding	$15,990	$1,126	$3,567	$2,576	$1,139	$338	$24,737
Total Cost	$16,001	$1,032	$3,549	$2,534	$1,091	$337	$24,544
Difference	($11)	$94	$19	$42	$48	$1	$192

Source: Bay Delta Conservation Plan, Revised Administrative Draft, Chapter 8, May 2013, Table 8-41 as presented at the Senate Governance & Finance and Senate Natural Resources & Water Committees on 8/13/13.

According to the BDCP, State Water Project (SWP) and Central Valley Project (CVP) contractors would provide $16.8 billion, or approximately 68 percent of total funding. Federal government sources would cover approximately $4 billion, or about 16 percent of the total funding. The state is anticipated to provide another $3.7 billion, or approximately 15 percent of the total funding, including $1.5 billion from the 2014 water bond and another $1.9 billion from future water bonds.

There are substantial uncertainties related to the proposed funding of the BDCP outlined in Chapter 8 of the BDCP administrative draft. There are no assurances the federal government will provide nearly 16 percent of the total funding for the BDCP in an era of shrinking budgets. Additionally, the BDCP funding proposal relies on the passage of at least two separate water bonds by voters to provide a substantial amount of funding. Chapter 8 indicates the following:

> *"Based on past performance, both water bonds are expected to be approved by the voters. However, if one or both of the water bonds fail, they can be put on the ballot again 2 years later. If the water bonds do not pass in 2014, 2016, or thereafter, then additional funding sources will need to be found for the BDCP in order to maintain compliance with permit terms."*

In the absence of a federal and/or state funding contribution, there is concern that water users would be identified as the source for covering these unmet public funding needs.

There are many additional uncertainties and financing risks associated with the ambiguities and lack of detailed commitments within Chapter 8 of the BDCP administrative draft. Despite MWD staff representing to its Board of Directors that the costs of BDCP would be allocated roughly the same as the current cost allocation, the text of Chapter 8 makes it clear that cost-sharing allocations have not yet been determined and finalized. There is uncertainty regarding the cost allocation for the BDCP preferred alternative between the SWP and CVP contractors. Among the contractors, there is uncertainty regarding the cost allocations between urban and agricultural water users. Complicating this analysis and exacerbating these fiscal risks are the following:

- An August 12, 2013 BDCP presentation by a representative of the BDCP included a slide that identifies the agricultural community as a "*$1.5 billion project partner.*" Agricultural contractors represent roughly 70 percent of the combined allocations from the SWP and CVP, and a $1.5 billion partnership would represent less than 10 percent of the total capital costs of the BDCP preferred alternative.

- In a July 2013 presentation before the Water Association of Kern County, Dr. Jerry Meral was quoted as saying the following:

  > *"But nevertheless, in the end as this project is discussed between the state and federal and between the ag and urban contractors I think that there'll, perhaps, be at least some discussion, if not recognition, of the fact that the urban agencies are receiving most of the benefits of the project...*
  >
  > *We're not worried, frankly, that the urban agencies, Metropolitan, Santa Clara, certain so on, they can afford this. It's not in the range where people would even notice it compared to their cell phone bill. Ok? The cell phone bill would be many times more expensive than this is going to cost them per month. That's not the problem.*

> *But most of this water coming out of the Delta, the majority of it, goes to agriculture and agriculture has to continue getting it; we certainly want to keep the agricultural economy in the San Joaquin Valley going. So that's our challenge for you and for ourselves, make this project work for you financially, get you the level of assurance that you need…."*

To the extent agricultural contractors do not pay their share of project costs, those costs may be shifted to urban water users or other sources, further exacerbating the challenges with making a business case for participating in BDCP. These cost and funding dynamics are particularly challenging given the variability of MWD's water sales and the fact that MWD depends on water sales revenues to pay more than 80 percent of its own financial obligations. Water sales volatility – and thus the variability of revenue – coupled with Southern California water agencies' implementation of the State's policy to reduce reliance on water supplies imported from the Delta, creates uncertainties regarding financing of MWD's BDCP obligations. MWD's member agencies have no obligation to purchase water from MWD. As MWD water rates continue to increase, and as member agencies continue to implement water use efficiency programs to meet state mandates and develop their own local water supplies that may be more cost-competitive with imported water, MWD member agency purchases could drop even further. These dynamics raise questions as to what is the certainty that MWD member agencies will pay their fair share of the BDCP fixed costs committed by MWD.

The Water Authority Board's Bay-Delta policy principles state that water contractors that are wholesale water agencies, at a minimum, must demonstrate that their customers have take-or-pay contracts or other enforceable financial commitments to pay the fixed costs of the BDCP project that commensurate with the term of the BDCP obligation. These principles recognize that the willingness to make a firm financial commitment to a Delta solution will drive the demand for water supply, and therefore help inform the best sizing for the conveyance facility being contemplated.

<u>BDCP Economic Benefits</u>

On August 5, the BDCP released a draft "Statewide Economic Impact Study" prepared by The Brattle Group, led by Dr. David Sunding (Attachment 2). The economic impact study evaluates the economic impacts of the BDCP on various interest groups, and looks at whether the BDCP preferred alternative is a worthwhile investment for the State as a whole. The study concludes that "*the BDCP would result in a significant net economic benefit to the State of California."* Adding together the impacts to which dollar values could be assigned, the economic impact study concludes that *"…the BDCP would result in a net improvement in the economic welfare of California residents of $4.8 billion to $5.4 billion over the 50-year permit term. BDCP will also generate over $84 billion in additional business output in California and almost 1.1 million jobs over the 50-year life of the plan."*

The economic impact study evaluated and developed the quantitative benefits of the BDCP preferred alternative through four factors:

- Urban water supply reliability;
- Agricultural water supply reliability;
- Water quality impacts; and
- Reduction in seismic risk.

In terms of developing the benefits analysis for the BDCP preferred alternative on urban water supply reliability, the economic impact study analyzed the value of avoiding future water shortages as well as investments in alternative water supplies to make up that shortage. The study evaluated potential water supply shortages for 36 urban water utilities receiving SWP supplies, including all of MWD's member agencies and 10 other water agencies in the state. The economic impact model employed in the study considered a range of factors, including water demand growth, water supply alternatives, and operation of storage facilities.

For the agricultural water supply reliability benefits analysis, the economic impact study estimated benefits using the Statewide Agricultural Production model, which simulates the profit-maximizing decisions of agricultural producers given the inputs of land, labor, and availability and cost of water.

Table 3 below represents the combined total water supply benefits for urban and agricultural water users calculated by BDCP and included in the BDCP administrative draft.

Table 3. Expected Present Value Benefits of Water Supply Reliability (dollars in millions)

Take Alternative [a]	Facility Size cubic feet per second (cfs)	Deliveries million acre-feet (MAF)	Total Water Supply Benefits [b, c]
BDCP Proposed Action High-Outflow Scenario	9,000	4.705	$15,722
BDCP Proposed Action Low-Outflow Scenario [d]	9,000	5.591	$16,642
A: W Canal 15,000 cfs	15,000	5.009	$21,305
B: Tunnels 6,000 cfs	6,000	4.487	$13,130
C: Tunnels 15,000 cfs	15,000	5.009	$21,305
D: Tunnels: 3,000 cfs	3,000	4.188	$7,799
E: Isolated 15,000 cfs	15,000	3.399	-$11,937
F: Through Delta	N/A	4.172	$9,363
G: Less Tidal Restoration	9,000	4.705	$15,722
H: More Restoration	9,000	4.705	$15,722
I: More Spring Outflow	9,000	4.338	$11,128

Notes:
[a] Construction is assumed to begin in 2015. BDCP operations are assumed to begin in 2025.
[b] All values are in millions of 2012 dollars and all values are discounted to present value using 3% real discount rate.
[c] Benefits are calculated out to year 2075.
[d] Benefits for BDCP Proposed Action Low-Outflow Scenario are calculated relative to the Existing Conveyance Low-Outflow Scenario, which assumes Scenario 6 operations, no Fall X2, no north Delta diversions.
Source: Bay Delta Conservation Plan, Revised Administrative Draft, Chapter 9.A, May 2013, Table 9.A-7

In terms of developing the benefits analysis for the BDCP preferred alternative on water quality, the economic impact study evaluated reduced salinity impacts on the useful life of appliances, specific crop yields, costs to industrial and commercial customers, and amount of irrigation water needed. The study utilized two models to estimate salinity-related benefits – the Lower Colorado River Basin Water Quality Model and the South Bay Water Quality Model. Table 4 below represents the total water quality benefits for urban and agricultural water users calculated by BDCP and included in the BDCP administrative draft.

Table 4. Present Value Benefits of Water Quality Improvements (dollars in millions)

Take Alternative [a]	Facility Size (cfs)	Deliveries (MAF)	Total Water Quality Benefits [b, c]
BDCP Proposed Action High-Outflow Scenario	9,000	4.705	$1,819
BDCP Proposed Action Low-Outflow Scenario[d]	9,000	5.591	$1,789
A: W Canal 15,000 cfs	15,000	5.009	$1,952
B: Tunnels 6,000 cfs	6,000	4.487	$1,524
C: Tunnels 15,000 cfs	15,000	5.009	$1,952
D: Tunnels: 3,000 cfs	3,000	4.188	$1,063
E: Isolated 15,000 cfs	15,000	3.399	$3,741
F: Through Delta	N/A	4.172	$0
G: Less Tidal Restoration	9,000	4.705	$1,819
H: More Restoration	9,000	4.705	$1,819
I: More Spring Outflow	9,000	4.338	$1,910

Notes:
[a] Construction is assumed to begin in 2015. BDCP operations are assumed to begin in 2025.
[b] All values are in 2012$ (millions) and all values are discounted to present value using 3% real discount rate.
[c] Benefits are calculated out to year 2075.
[d] Benefits for BDCP Proposed Action Low-Outflow Scenario are calculated relative to the Existing Conveyance Low-Outflow Scenario, which assumes Scenario 6 operations, no Fall X2, no north Delta diversions.
Source: Bay Delta Conservation Plan, Revised Administrative Draft, Chapter 9.A, May 2013, Table 9.A-8

In terms of developing the benefits analysis for the BDCP preferred alternative on seismic risk reduction, the economic impact study calculated the seismic risk benefits based on a one year outage of the south-of-Delta pumps, and assumed a two percent probability of occurrence each year. The evaluation took into consideration the direct benefits to water consumers in those water agencies that would be affected by an outage, and also considered indirect analysis of changes in statewide economic output and employment associated with a significant seismic event.

The BDCP reports that the preferred alternative has the capability of delivering up to 80 percent of pre-earthquake water supplies, as compared to approximately 20 percent under the existing infrastructure. Table 5 represents the total seismic risk reduction benefits for urban and agricultural water users calculated by BDCP and included in the BDCP administrative draft.

Table 5. Present Value Benefits of Reduced Seismic Risk (dollars in millions)

Take Alternative [a]	Facility Size (cfs)	Deliveries (MAF)	Earthquake Supply (MAF)	Total Seismic Benefits [b, c]
BDCP Proposed Action High-Outflow Scenario	9,000	4.705	3.800	$470
BDCP Proposed Action Low-Outflow Scenario [d]	9,000	5.591	3.800	$364
A: W Canal 15,000 cfs	15,000	5.009	4.500	$563
B: Tunnels 6,000 cfs	6,000	4.487	2.900	$313
C: Tunnels 15,000 cfs	15,000	5.009	4.500	$563
D: Tunnels: 3,000 cfs	3,000	4.188	1.600	$55
E: Isolated 15,000 cfs	15,000	3.399	3.399	$665
F: Through Delta	N/A	4.172	1.000	-$62
G: Less Tidal Restoration	9,000	4.705	3.800	$470
H: More Restoration	9,000	4.705	3.800	$470
I: More Spring Outflow	9,000	4.338	3.800	$470

Notes:
[a] Construction is assumed to begin in 2015. BDCP operations are assumed to begin in 2025.
[b] All values are in 2012$ (millions) and all values are discounted to present value using 3% real discount rate.
[c] Benefits are calculated out to year 2075.
[d] Benefits for BDCP Proposed Action Low-Outflow Scenario are calculated relative to the Existing Conveyance Low-Outflow Scenario, which assumes Scenario 6 operations, no Fall X2, no north Delta diversions.
Source: Bay Delta Conservation Plan, Revised Administrative Draft, Chapter 9.A, May 2013, Table 9.A-9

Third-Party Viewpoints and Outstanding Issues/Questions

A number of stakeholders involved in the BDCP analysis have raised questions and concerns related to the financial components of the BDCP. Proponents of the BDCP have largely deferred discussions and decisions on finance-related issues by indicating that those topics are still in the preliminary stages and are subject to ongoing negotiations that have not concluded. Among the questions and concerns raised by stakeholders:

- What is the back-up plan for funding the BDCP if voters do not approve new bond funding, the Legislature decides not to appropriate funding, and/or the federal funding component does not materialize? Will the SWP/CVP contractors be required to back-stop those funds?

- What is the marginal cost of water produced by BDCP under a range of possible BDCP alternatives?

- Will agricultural water users be able and willing to afford water produced by BDCP, or will their cost-share be substantially reduced to improve their willingness to pay?

- If agricultural water users cannot afford the water produced by the BDCP, but cannot sustain their industry without the water, who has the responsibility to subsidize their share of the cost?

- How do the benefit-cost ratios for agricultural water users compare with the urban water users? The water supply benefits were calculated separately for each sector, but not reported separately.

- How would the cost-benefit analysis change if only some of the contractors decided to receive water from BDCP?

- Will state water contractors that are wholesale water agencies be required to demonstrate that their customers – the member agencies or units that purchase their water and provide their revenue – have take-or-pay contracts or other enforceable commitments to pay the fixed costs of the project commensurate with the term of the BDCP obligation?

- Will "step up" provisions – those bond pledges that may require other BDCP participants to assume the obligations of defaulting participants – be imposed upon MWD and other participants in the BDCP?

- Will a careful legal analysis be undertaken of contractors' taxing authority (including MWD) within the BDCP due diligence process, to examine the feasibility and appropriateness of using property taxes as additional back-up security for project debt?

- What effect does the baseline or no-action scenario have on the economic assessment of proposed major infrastructure?

- How does the "decision tree" and its associated water supply implications affect the allocation of costs in the near-term?

- What is meant by the Chapter 8 "note to reader" that provides: "*Because each branch of the decision tree has different water supply implications, there is uncertainty in the water supply provided by BDCP. To offset this uncertainty, the state and federal governments may consider additional investments in BDCP…If adopted, these additional investments will be incorporated into the public draft BDCP and may modify the funding assumptions presented here*?" Does this "note to reader" leave the door open to possible state and federal financial contribution towards conveyance construction?

- After accounting for local water supply development, what is the real demand for water from the Delta?

- How much water will contractors receive for a total preferred project cost of $25 billion?

- Should MWD contractually commit to pay billions of dollars for BDCP without contractual commitments from its member agencies to pay for it?

Next Steps
Staff will continue to implement its multidisciplinary evaluation and analysis of the four Delta fix options. Based on the schedule outlined below in Table 6, staff will continue to develop its technical analysis, including responses to policy questions, for each of the four alternatives under review, for the September 26 Board meeting.

Table 6. Water Authority's BDCP Review Schedule

Meeting	Imported Water Committee/Board Activity	
7/25/2013	Provide input on scope of proposed Water Authority analysis of BDCP alternatives; Provide input on policy questions to be addressed	√
8/8/2013 Special Meeting	Overview of Bay-Delta and proposals for Delta fix, including description of alternatives	√
8/22/2013	Review of technical analysis – demand assumptions; alternative project yield assumptions; projected costs	√
9/12/2013 Special Meeting	BDCP economic study on cost-benefit of BDCP preferred alternative	
9/26/2013	Review of technical analysis (cont.), including responses to policy questions	
10/10/2013 Special Meeting	Summary of technical analysis: Comparison of alternatives with Delta Policy Principles	
10/24/2013	Information: Identify areas of concern; potential CEQA-NEPA comment letter	
11/21/2013	Action: EIR/EIS comment letter; consider adopting position on BDCP alternative(s)	

Prepared by: Glenn A. Farrel, Government Relations Manager
Amy Chen, Director of the MWD Program
Approved by: Dennis A. Cushman, Assistant General Manager

Attachment 1: July 30, 2013 letter from General Manager Stapleton to Deputy Secretary Meral
Attachment 2: August 2013 report "Draft Bay Delta Conservation Plan Statewide Economic Impact Report" (Dr. David Sunding)
Attachment 3: July 12, 2012 report "Benefit-Cost Analysis of Delta Water Conveyance Tunnels" (Dr. Jeffrey Michael)
Attachment 4: July 30, 2013 blog entry "Is the Bay Delta Conservation Plan a Doable Deal?" (Dr. Rodney Smith)
Attachment 5: August 27, 2013 blog entry "Will There Be Buyers of Bay Delta Conservation Plan Water?" (Dr. Rodney Smith)
Attachment 6: September 4, 2013 letter from General Manager Stapleton to Deputy Secretary Meral

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July 30, 2013

Dr. Gerald Meral
Deputy Secretary
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Dear Jerry:

Thank you for the efforts that you, your state and federal agency colleagues, and the Administration have made to bring the BDCP to the point where it stands today. We appreciate the opportunity that the release of an administrative draft of the BDCP affords us to provide comments and questions that should be addressed in the next draft. This letter is a follow-up to the Water Authority's previous correspondence on BDCP Chapter 8, and conversations we have had with you over the past year.

Like many other stakeholders, the San Diego County Water Authority anticipated the May 29 release of the final chapters of the administrative draft of the BDCP document and believed, based upon earlier representations, it would address the questions and concerns the Water Authority has raised over the past several years over project financing. In particular, we were anxious to review the new draft of Chapter 8 in light of the correspondence we sent you 11 months ago (attached), in which we raised a series of BDCP financing issues and concerns. Our subsequent conversations led us to believe these concerns would be addressed in the most current iteration of Chapter 8. Instead, and disappointingly, Chapter 8 begins with this jarring admission:

> *"Details of the financing... are still being determined through on-going discussion between the state and federal governments and between the government, the state and federal water contractors and other interests."*

After reviewing the newly-revised Chapter 8 of the BDCP administrative draft, seven years into the BDCP planning process, and nearly a year after commenting on the prior draft, the most critical financing issues confronting the BDCP have yet to be addressed.

As we shared with you previously, potential participants in the BDCP must have sufficiently detailed information to evaluate the cost-benefit (or feasibility) of participating in the project. We recently heard David Sunding report to the Metropolitan Water District of Southern California's (MWD) Board of Directors that a cost-benefit analysis has been produced for all urban and agricultural water contractors, and that it includes an urban cost-benefit analysis for all MWD member agencies. Would you please send a copy of the complete report to me in advance of Dr. Sunding's Sept. 12 appearance before our Board's Imported Water Committee?

As we have consistently stated, the Water Authority believes that any BDCP financing plan must include enforceable agreements to pay for the project, not only from state water contractors directly, but also from the member agencies or units that provide their revenues. The costs are far too high to simply rely on the hope that the contractors' water sales will be adequate over the long-term to pay the project's costs.

As the largest customer of the largest state water contractor – MWD – the Water Authority's member agency ratepayers have a great deal at stake in the BDCP process and its financing plan, its risks and contingencies. The Water Authority must be able to assess that the preferred alternative advocated by the BDCP program will provide sufficient benefits to be affordable for our member agency ratepayers. We also must ensure that our ratepayers are not at risk of paying BDCP costs associated with the water supplies of other MWD member agencies or other state or federal water contractors. The Water Authority is already in litigation with MWD over how it allocates its *current* State Water Project costs.

The Water Authority is concerned that future progress of the BDCP and efforts to resolve seemingly intractable conflicts in the Delta will falter if those expected to be participants in the BDCP are not able to evaluate the cost-benefit of the various alternatives or reasonably limit the risk that their ratepayers will be expected to assume. In this context, we renew our request that our comments and concerns raised in our August 28, 2012 correspondence regarding Chapter 8 of the BDCP administrative draft – *Implementation Costs and Funding Sources* – be addressed in the next draft.

Comments
In our August 28, 2012 correspondence, we identified three specific issue areas as lacking necessary discussion within Chapter 8:

- State water contractors that are wholesale water agencies should demonstrate that their customers – the member agencies or units that purchase their water and provide their revenue – have take-or-pay contracts or other enforceable, long-term commitments to pay the fixed costs of the project commensurate with the term of the BDCP obligation.

- It is important to analyze the possible effects of "step up" provisions – those bond pledges that may require other BDCP participants to assume the obligations of defaulting participants – on MWD and other participants in the BDCP.

- A careful legal analysis should be undertaken of MWD taxing authority within the BDCP due diligence process, to examine the feasibility and appropriateness of relying upon property taxes as additional back-up security for project debt.

<u>Take-Or-Pay Contracts/Enforceable Commitments</u>
As we have previously pointed out in discussions with you, MWD – which, as the largest state water contracting agency, is the foundation for financing the BDCP project – has been struggling over the past several years to pay its current fixed costs, let alone a substantially larger new cost associated with the BDCP. More than 80 percent of MWD's costs are fixed – however, less than 20 percent of MWD's revenues are paid from fixed charges. Conversely, more than 80 percent of MWD's revenues are from water sales – a variable revenue source – and those sales have

declined by 30 percent since 2007. Furthermore, MWD's member agencies are not required to purchase *any* water from MWD. The variability of water sales – and thus uncertain future water sales revenues – coupled with Southern California water agencies' current and future planned actions to implement the State's policy to reduce reliance on water supplies imported from the Delta, creates significant uncertainty regarding long-term financing of BDCP obligations. This should be a major concern for the State of California, whose full faith and credit will be expected to back up the financing of the project. And yet, Chapter 8 makes no mention of this material, foundational risk to BDCP financing.

The Water Authority believes that, at a minimum, state water contractors that are wholesale water agencies must demonstrate that their customers have take-or-pay contracts or other enforceable long-term commitments to pay the fixed costs of the BDCP project corresponding to the term of the BDCP obligation. The Water Authority continues to be prepared to make such a commitment to MWD as long as the Water Authority gets the water supplies in return for its payments. We also believe that the willingness to make a financial commitment to a Delta solution will largely determine the demand for Delta water supply, and therefore help inform the best sizing for the conveyance facility. It would not be in the state's best interest to construct a facility only to have it stranded because no one is willing to pay for it, or hoped-for water sales necessary to pay for it do not materialize.

"Step-Up" Provisions

Existing State Water Project contracts contain provisions under which non-defaulting contractors can be assessed to cover payments not made by defaulting contractors, up to 25 percent of the defaulting contractors' obligations. Additionally, the East Branch Extension of MWD's State Water Project contract has a provision obligating MWD to cover default by any and all other participants. These State Water Project contract stipulations are known as "step-up" provisions.

We are informed that bond underwriters for the BDCP project are expected to require a "step-up" provision by which each BDCP participant in BDCP-related bonds pledges to assume the obligations of defaulting participants. In fact, the newly-released Chapter 8, at Section 8.10.1.1.1 (page 8-81) provides that:

> "*Existing water contracts would need to be amended to include the new costs of the BDCP assigned to the state water contractors and the repayment schedule.*"

Since "step-up" provisions are already embodied within, and apply to, MWD's State Water Project contract, it would appear that such provisions would apply to the "new costs of the BDCP assigned to the state water contractors." Given those "step-up" provision obligations, we renew our request that Chapter 8 fully analyze the possible financial and economic effects of the "step-up" provisions on MWD and the other participants in the BDCP.

Property Taxes

Some have suggested that property taxes may be contemplated as back-up security for BDCP payment obligations of individual state water contractors. There are very clear and significant limitations in MWD's existing taxing authority under the provisions of the MWD Act:

- The Act limits MWD's ability to levy taxes to pay its State Water Project obligations.

MWD is limited to levying taxes for "*the composite amount required to pay (1) the principal and interest on general obligation bonded indebtedness of the district and (2) that portion of the district's payment obligation under [the SWP contract] which is reasonably allocable, as determined by the district, to the repayment by the state of principal and interest on [SWP bonds] as of [January 1, 1985] and used to finance construction of facilities for the benefit of the district.*"

- Although the Act contains override ability in the event of a fiscal crisis, as determined by the MWD board, the override is limited to only one year at a time. In such an event, the State of California and bondholders would be relying upon an annual vote of MWD's Board of Directors in which it "*...finds that a tax in excess of these restrictions is essential to the fiscal integrity of the district....*"

- It is unclear whether changes to the limitations provided under the MWD Act would require voter approval and/or new legislation. Chapter 8 should address and answer these questions.

Given these limitations and uncertainties, it is difficult to consider MWD's existing taxing authority as a meaningful back-up security for BDCP payment obligations. It is also highly questionable whether the financing of BDCP can be – or should be – backed by taxing authority that was authorized by voters decades ago, when the program was much different than is being discussed today. A careful legal analysis of MWD taxing authority should be included in the BDCP due diligence process if taxes are going to be relied upon as additional back-up security for BDCP project debt. The newly-released version of Chapter 8 is silent on this issue.

Based on the assurances that you previously provided to the Water Authority, we expected that the full consideration and analysis of the issues we have raised would be integrated in to the Chapter 8 analysis and conclusions. And yet, the current version of Chapter 8 of the BDCP administrative draft does not comprehensively or adequately conduct due diligence on all of the facts and circumstances described in this letter and our previous correspondence. We remain concerned that a potential cascading collapse of funding could occur if the proper due diligence is not undertaken in a timely manner.

We appreciate the opportunity to provide comments on the newly-released Chapter 8 of the BDCP administrative draft. We remain committed to working with you and all parties to evaluate, address, and resolve these critical financing issues.

Sincerely,

Maureen A. Stapleton
General Manager

Attachment: August 28, 2012 letter

San Diego County Water Authority
4677 Overland Avenue • San Diego, California 92123-1233
(858) 522-6600 FAX (858) 522-6568 www.sdcwa.org

August 28, 2012

Dr. Gerald Meral
Deputy Secretary
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Dear Jerry:

Thank you for visiting with us on Wednesday. We enjoyed our discussion, and appreciate the information you shared on the progress of the Bay-Delta Conservation Plan. We very much appreciate the efforts by you, Secretary Laird, Governor Brown, Secretary Salazar and all of the state and federal agencies in bringing the BDCP to this point.

We promised to send you the Water Authority's comments on BDCP Chapter 8. We understand that work is under way to produce a new draft of Chapter 8. It is our hope that the issues outlined below will be considered and addressed.

Introduction

The San Diego County Water Authority is a wholesale water agency providing a safe and reliable water supply to 24 public agencies in San Diego County, supporting our region's $186 billion economy and the quality of life of 3.1 million Californians. Highly dependent on imported water supplies, the Water Authority has historically and consistently been a strong advocate for the Delta and for the co-equal goals of providing a more reliable water supply for California, while protecting, restoring and enhancing the Delta ecosystem. The Water Authority's board of directors reaffirmed this longstanding support at its February 2012 board meeting. The board also adopted an updated set of policy principles relating to the Bay-Delta outlining the critical issues that must be resolved in the BDCP process; a copy of these Policy Principles is enclosed.

Chief among the Water Authority's concerns is the need to define the various components of the financing plan for the BDCP and the recently announced decision-tree concept in a manner that allows potential participants to evaluate the cost-benefit (or feasibility) of participating in the project. We believe the financing plan must include enforceable agreements to pay for the project, not only from state water contractors directly, but from the member agencies or units

that provide their revenues. The costs are simply too great to rely on the hope that there will be enough water purchasers over the long-term to pay the project's costs.

As the largest customer of the largest state water contractor – the Metropolitan Water District of Southern California (MWD) – the Water Authority's ratepayers have a great deal at stake in the BDCP process and its financing plan. The Water Authority must be able to assess not only that the project will provide sufficient benefits to be affordable by our ratepayers, but also that they are not at risk of paying BDCP costs associated with the water supplies of other MWD member agencies or state contractors. The Water Authority is already in litigation with MWD over how it allocates its current State Water Project costs.

The Water Authority is concerned that all of the progress that has been made in bringing the BDCP to this point will be stymied, and that the BDCP will fail if participants are not able to evaluate the cost-benefit of the project or reasonably limit the risk their ratepayers are being asked to assume. It is in this light that we offer the following brief comments on the administrative draft of Chapter 8 – *Implementation Costs and Funding Sources.*

Comments

As the largest state water contractor, MWD is the foundation for financing the project. And yet, MWD itself has been struggling over the past several years to pay its current fixed costs – let alone a substantially larger cost associated with the BDCP. The reason is simple: more than 80 percent of MWD's costs are fixed while less than 20 percent of its revenues are paid from fixed charges. More than 80 percent of MWD's revenues come from water sales. Yet, MWD's member agencies are not required to purchase *any* water from MWD. With its member agencies unwilling to sign take-or-pay contracts or make any other firm financial commitments to MWD to cover its fixed obligations, the agency remains heavily dependent on revenues from variable water sales. MWD's water sales have declined approximately 30 percent since 2008, with its firm sales declining to less than 1.3 million acre-feet in fiscal year 2012. MWD's member agencies – including the Water Authority – have also experienced significant reductions in sales. A direct consequence of these declining sales is sharply higher imported water rates that have made additional local water supply investments economically competitive. As a consequence, MWD's member agencies – and their sub-agencies -- are doing what they have been asked to do over the past 20 years: reducing reliance on water supplies imported from the Delta.

We are concerned that the BDCP will become the kind of "big ticket project" that MWD board members vocally and enthusiastically support – at the same time their agencies are unwilling to make enforceable commitments to pay for the project.

A final note on the subject of risk: because the project is anticipated to be financed through project revenues, we are informed that bond underwriters are expected to require a "step up" provision by which each BDCP participant in BDCP-related bonds pledges to assume the obligations of defaulting participants.[1] The current draft of Chapter 8 is silent on this issue, yet it is conceivable that some of the BDCP participants may default, which would cause remaining participants, including MWD, to assume a greater portion of the debt. It is important that Chapter 8 analyze the possible effects of the "step up" provisions on MWD and the other participants in the BDCP.

Some have suggested that property taxes may provide the ultimate security for BDCP payment obligations of individual contractors. Putting aside the question whether property taxes levied under the authorization of the Burns-Porter Act may be used to pay for new projects contemplated by the BDCP, it is important to remember that MWD's taxing authority is further limited by the provisions of the MWD Act.[2] Although the Act contains override ability in the event of a fiscal crisis as determined by the MWD board (one year at a time[3]), it effectively limits MWD's ability to levy taxes to pay its SWP obligations. It is also unclear whether changes to this limit would require voter approval. Thus, a careful legal analysis of MWD taxing authority should be included in the BDCP due diligence process if taxes are contemplated as additional back-up security for project debt.

To effectively evaluate the finances available for the BDCP, the drafters of Chapter 8 need to conduct comprehensive due diligence on all of the facts and

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[1] Under Section 50(h) of MWD's current State Water Project contract, non-defaulting contractors can be assessed to cover payments not made by defaulting contractors, up to 25 percent of the payment not made. Under Section 49(i) of its East Branch Extension of the State Water Project contract, MWD is obligated to cover a default by any and all other participants.

[2] Section 124.5 of the Metropolitan Water District Act limits MWD's property tax levy to *"the composite amount required to pay (1) the principal and interest on general obligation bonded indebtedness of the district and (2) that portion of the district's payment obligation under [the SWP contract] which is reasonably allocable, as determined by the district, to the repayment by the state of principal and interest on [SWP bonds] as of [January 1, 1985] and used to finance construction of facilities for the benefit of the district."*

[3] In such an event, the State of California would be relying upon an annual vote of MWD's Board of Directors in which it *"...finds that a tax in excess of these restrictions is essential to the fiscal integrity of the district...."*

circumstances described in this letter. Without such due diligence, the BDCP faces a potential cascading collapse of funding. At a minimum, state water contractors that are wholesale water agencies must demonstrate that their customers – the member agencies or units that buy their water and provide their revenues – have take-or-pay contracts or other enforceable commitments to pay the fixed costs of the project commensurate with the term of the BDCP obligation. The Water Authority continues to stand ready to make such a commitment to MWD that provides benefits commensurate with its payments.

Ultimately, the full faith and credit of the State of California will back up the bonds issued to build the conveyance project. Failure to secure enforceable financial commitments from the member agencies or units of water wholesale contractors could place all of California at significant risk of having tens of billions of dollars of new outstanding debt without sufficient water contractor payments to cover the debt service. This is why all California taxpayers have a stake in ensuring that there is a solid foundation and financing plan for the BDCP going forward.

Thank you again for providing the opportunity to comment on the administrative draft of Chapter 8 of the BDCP. We are committed to working with you and all parties to address and resolve these issues.

Sincerely,

Maureen A. Stapleton
General Manager

Enclosure: Water Authority Bay-Delta Policy Principles

San Diego County Water Authority

February 15, 2012

Attention: Imported Water Committee

Adopt Delta Policy Principles. (Action)

Staff recommendation
Adopt Delta Policy Principles to guide staff in evaluating Bay-Delta initiatives and the Water Authority's advocacy to ensure a successful implementation of a Delta solution.

Alternatives
1. Modify one or more draft principles.
2. Do not adopt Delta Policy Principles.

Fiscal impact
None.

Background
The Sacramento-San Joaquin Bay Delta is an important water supply source for Southern California. Metropolitan Water District (MWD) purchases water from the Department of Water Resources through its State Water Project (SWP) contract. MWD is the SWP's largest customer, providing more than50 percent of its revenues. As such, MWD is the principle source of revenue under the current SWP as it will be for any proposed Bay Delta solution. As the largest steady purchaser of MWD water, the Water Authority has a vital interest in assuring that any Bay Delta solution is financially sustainable. The Water Authority has advocated for a number of changes in the MWD rate structure, including securing take-or-pay contracts with its member agencies or other firm commitments to pay the fixed costs of a Delta conveyance project.

Discussion
The Water Authority has been a strong advocate for a sustainable Bay Delta solution. The Water Authority actively engages in Bay Delta issues at the MWD board and other forums including the State Capitol, where it lobbied for passage of the 2009 comprehensive Bay Delta bill package. The 2009 bill package approved as state policy the co-equal status of restoring the Delta ecosystem and creating a more reliable water supply for California. Recently, the Water Authority held two Bay-Delta workshops receiving input from stakeholders on their views of the issues and a Bay Delta solution. The Water Authority also participates directly on three Bay Delta Conservation Plan (BDCP) working groups on Conveyance, Governance and Finance.

The Water Authority has consistently advocated for a "right-size" solution in the Delta that is also supported by a broad range of stakeholders in order to reduce challenges to implementation. A central point of the Water Authority's advocacy position in determining the "right size" of a Bay

Delta solution is clear commitments to pay through take-or-pay contracts or legal equivalent to pay the fixed costs of a project.

The Delta Policy Principles will help guide staff as they evaluate the BDCP and other projects and actions relating to the Bay Delta solution. Draft principles were presented to this committee for review last month; the attached recommended principles reflect comments received on the prior draft.

Prepared by: Debbie S. Discar-Espe, Senior Water Resources Specialist
Reviewed by: Jeff Volberg, Government Relations Manager
Amy I. Chen, MWD Program Chief
Approved by: Dennis A. Cushman, Assistant General Manager

Attachment: Delta Policy Principles

San Diego County Water Authority
Delta Policy Principles

The San Diego County Water Authority Board of Directors supports a Bay Delta solution that will meet the co-equal goals and provide San Diego County with a reliable, high-quality supply of affordable, imported water consistent with the Water Authority's Urban Water Management Plan and Regional Facilities Optimization and Master Plan. The adopted policy principles will guide staff in evaluating projects and actions concerning the Bay-Delta.

Water Supply Reliability

- Continue to support the co-equal goals of water supply reliability and environmental restoration embodied in the 2009 Delta bill package.
- Support deliberative processes that are designed to ensure a meaningful dialogue with all stakeholders in order to reduce future conflicts and challenges to implementation of a Bay Delta solution.
- Provide regulatory certainty and predictable supplies to help meet California's water needs in the long-term.
- Encourage a Bay Delta solution that acknowledges, integrates and supports the development of water resources at the local level including water use efficiency, seawater and brackish water desalination, groundwater storage and conjunctive use, and recycled water including direct and indirect potable reuse.
- Improve the ability of water-users to divert water from the Delta during wet periods, when impacts on fish and ecosystem are lower and water quality is higher.
- Encourage the development of a statewide water transfer market that will improve water management.
- Support improved coordination of Central Valley Project and State Water Project (SWP) operations.

Ecosystem Restoration

- Restore the Bay-Delta ecosystem consistent with the requirements established under the state Natural Community Conservation Plan and the federal Habitat Conservation Plan, taking into account all factors that have degraded Bay-Delta habitat and wildlife.
- Work with all stakeholders to ensure a meaningful dialogue and that ecosystem restoration issues are addressed in an open and transparent process.

Finance and Funding

- Encourage and support a Bay Delta solution and facilities that are cost-effective when compared with other water supply development options for meeting Southern California's water needs.
- Require the total cost of any Bay Delta solution be identified before financing and funding decisions are made. The total cost must include the cost of facilities, mitigation and required or negotiated ecosystem restoration.
- Allocate costs of the Bay-Delta solution to stakeholders in proportion to benefits they receive.

- Seek and support independent financial analyses of Bay-Delta solution including the ability of all parties to pay their proportional costs.
- Require a firm commitment and funding stream by all parties to pay for the fixed costs associated with the proportional benefits they will receive from a Bay Delta solution, through take-or-pay contracts or legal equivalent.
- Condition financial support on provisions allowing access to any water conveyance or storage facilities that are included in the Bay Delta solution.
- Support the use of public funds to support specific projects and actions with identified costs that protect and restore the environment and provide broad-based public benefits.
- Oppose water user fees to fund ecosystem restoration and other public purpose, non-water-supply improvements in the Delta that benefit the public at large.

Facilities

- Require independent technical analysis of proposed key elements of the Bay-Delta solution, including forecasting future urban and agricultural demands and size and cost of any proposed conveyance facility, to ensure the solution realistically matches statewide needs.
- Support "right-sized" facilities to match firm commitments to pay for the Bay Delta solution.
- Allow access to all SWP facilities to facilitate water transfers.

Governance

- Support continued state ownership and operation of the SWP as a public resource.
- Support improved efficiency and transparency of all SWP operations.
- Oppose any transfer of operational control of the SWP or any of its facilities to MWD, the State Water Project Contractors, Central Valley Project Contractors, the State and Federal Contractors Water Agency, any entity comprised of MWD or other water project contractors, or any other special interest group.

DRAFT

BAY DELTA CONSERVATION PLAN
STATEWIDE ECONOMIC IMPACT REPORT

To see the full report please visit:
http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Draft_BDCP_Statewide_Economic_Impact_Report_8-5-13.sflb.ashx

BDCP Statewide Economic Impacts Factsheet:
http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Statewide_Economic_Impacts_Report_-_Fact_Sheet.sflb.ashx

BDCP Appendix 9.A Economic Benefits of Take Alternatives Factsheet:
http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Chapter_9A_Appendix_07-16-13_no_crops.sflb.ashx

August 2013

Jonathan Hecht, Ph.D.

The Brattle Group

David Sunding, Ph.D.

Executive Summary

This report presents an analysis of the statewide economic impact of the implementation of the Bay Delta Conservation Plan (BDCP). The BDCP sets out a comprehensive conservation strategy for the Sacramento–San Joaquin River Delta (Delta) designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework. The BDCP reflects the outcome of a multiyear collaboration between public water agencies, state and federal fish and wildlife agencies, nongovernment organizations, agricultural interests, and the general public. The BDCP is both a habitat conservation plan under the federal Endangered Species Act and a natural community conservation plan under the state Natural Community Conservation Planning Act. The BDCP is expected to result in endangered species permits from the state and federal fish and wildlife agencies for 56 species for a term of 50 years.

Economic impacts were estimated by measuring the various incremental costs and benefits of the BDCP to state and federal water contractors, Delta-dependent economic activities, non-market environmental amenities, and statewide income and employment. The impacts of the BDCP in these areas are summarized below, followed by an estimation of their associated costs and benefits. Economic impacts that could not be quantified because of a lack of data or high level of uncertainty regarding effects are discussed qualitatively.

ES.1 Welfare Impacts on State and Federal Water Contractors

ES.1.1 Incremental Costs to State and Federal Contractors

The direct costs to the state and federal water contractors for the BDCP result from the construction and operation of the new water conveyance facility (*Conservation Measure [CM] 1 Water Facilities and Operation*) and mitigation for impacts on covered species associated with CM1 construction and operation identified in both the BDCP and its environmental impact report/environmental impact statement (EIR/EIS). The total estimated cost of CM1 (construction and operation) and mitigation to the water contractors is as follows.

- The state and federal water contractors have committed to funding 100% of the construction and operation of CM1. Total CM1 capital costs are estimated at $14.5 billion in undiscounted 2012 dollars. Incremental operational costs over the 40 years of expected operations of the new water conveyance facility (from year 10 to 50) have been estimated at $1.9 billion in undiscounted 2012 dollars. Together, the construction and operational incremental costs of the new water conveyance facility total $16.4 billion in undiscounted 2012 dollars.
- The mitigation costs associated with the BDCP have been estimated in BDCP Chapter 8, *Implementation Costs and Funding Sources*, as a portion of eight conservation measures (California Department of Water Resources 2013). The total incremental mitigation costs to the

state and federal water contractors are estimated at $834.5 million in undiscounted 2012 dollars.[1]

- The sum of these costs is $17.2 billion (undiscounted 2012 dollars). The $17.2 billion in real expenditures assigned to the contractors has a net present value of $13.3 billion discounted at a 3% real discount rate.

See Section 2.1, *Incremental Costs Borne by State and Federal Water Contractors*, for details on these assumptions, methods, and results.

ES.1.2 Benefits to State and Federal Water Contractors

Implementation of the BDCP would result in direct economic benefits to the state's urban and agricultural water agencies receiving water supplies from the State Water Project (SWP) and Central Valley Project (CVP), referred to as the state and federal water contractors. These benefits include increased water supply reliability, improved water quality, and reduced seismic risks to Delta water supplies. Benefits from increased water supply reliability are measured separately for the urban and agricultural sectors.

The urban sector benefits of the BDCP are evaluated using the Supply-Demand Balance Simulation Model (SDBSIM). Agricultural benefits are calculated using the Statewide Agriculture Production (SWAP) model. The benefits from improved water quality mainly result from reduced salinity levels and are calculated using the Lower Colorado River Basin Water Quality Model for the Metropolitan Water District service areas, and the South Bay Water Quality Model for the Alameda County Water District, Zone 7, and Santa Clara Water District service areas.

Current seismic risks to the SWP and CVP arise from the potential for levee failure from seismic activity, which could result in the reduction of project deliveries for some period of time. The BDCP conveyance infrastructure would safeguard against such failures and would attenuate shortages resulting from seismic activity. The seismic risk reduction benefit is based on estimates of water availability with and without an earthquake, as well as the marginal value of water, which is estimated using the SDBSIM and SWAP models.

The analysis of the direct economic benefits of the BDCP assumes a 10-year planning and construction period for the new water conveyance facility, followed by a 40-year operating period. All BDCP benefits and costs presented are incremental to the Existing Conveyance scenario, described in BDCP Chapter 9, which assumes constraints on water operations similar to those described for CM1 in BDCP Chapter 3, Section 3.4.1 but without the new north Delta facilities. Benefits to the state and federal contractors across all categories total $18.0 billion (Table ES-1). Section 2.2, *Net Economic Benefit to State and Federal Water Contractors*, describes these assumptions, methods, and results.

Comparing incremental costs and benefits, implementing the BDCP would increase the economic welfare of the state and federal contractors by $4.7 billion. Table ES-1 displays summary welfare changes experienced by the state and federal water contractors.

[1] Some costs associated with tidal natural communities restoration (CM4) and the installation and operation of nonphysical fish barriers (CM16) are expected to occur whether or not the BDCP is approved and implemented. Therefore, these costs are not included in the estimate of the incremental costs of the BDCP to the state and federal water contractors.

Table ES-1. Summary of Welfare Impacts on State and Federal Contractors

Category of Benefits	Present Value Benefits ($ millions)
Water supply reliability	$15,722
Water quality	$1,819
Reduced seismic risk	$470
Total contractor benefits	**$18,011**
Total costs assigned to contractors	**$13,328**
Net welfare impact on contractors	**$4,683**

ES.2 Impacts Related to Delta-Dependent Economic Activities

The BDCP would have impacts on Delta-dependent economic activities including Delta agriculture, outdoor recreation, and transportation. Descriptions and brief summaries of the estimated impacts are presented below. Impacts on urban water treatment and commercial fisheries are discussed but not monetized.

ES.2.1 Salinity of Agricultural Water Supplies

The salinity changes resulting from the construction and operation of the new water conveyance facility (CM1) would have indirect economic impacts on Delta agriculture. Anticipated changes in salinity under the BDCP have been modeled using the Delta Simulation Model II (DSM-II), a hydrological simulation model created and maintained by the California Department of Water Resources (DWR). The DSM-II was used to predict Delta salinity levels at various locations across the Delta under the BDCP as well as under the Existing Conveyance scenario, which provides a basis for comparison.

The modeling methodology is adopted from that applied in the *Economic Sustainability Plan for the Sacramento-San Joaquin River Delta* (Delta ESP) (Delta Protection Commission 2012). The model was implemented as outlined in the ESP, with the exception of the incorporation of estimated salinity data from the DSM-II.

This study predicts that salinity changes as a result of the BDCP will lead to an annual decrease in average agricultural revenues in the Delta of $1.86 million. Assuming CM1 operations begin in 2025, this represents a net present value of $33.9 million (under a 3% real discount rate) through 2075. Predicted annual losses are much lower than those included in the Delta ESP, and reflect significantly smaller expected changes in salinity levels as a result of CM1 operations. While the Delta ESP predicted revenue changes from a lower bound of a 25% uniform salinity increase, DSM-II modeling suggests actual salinity levels would rarely increase by more than a few percentage points. Additionally, in some areas of the Delta, salinity levels are expected to decrease, further limiting the impacts of rising salinity experienced elsewhere. Section 3.1, *Salinity of Agricultural Water Supplies*, provides detail on the assumptions, methods, and results.

ES.2.2 Outdoor Recreation

The land use changes associated with CM1 and the other conservation measures (CM2–CM11, CM13–CM22) would affect outdoor recreational activities in the region. In some cases, existing recreational opportunities would be disrupted or eliminated. In other cases, recreational opportunities would be expanded.

This analysis used the Benefit Transfer Toolkit, developed by Dr. John Loomis of Colorado State University, to estimate the monetary costs of changes to recreation (Loomis and Richardson 2007). The toolkit uses a method called benefit transfer to take results of previous studies that have ascribed a value to outdoor recreation and customize them to fit a new context. In this study, the visitor use models included in the toolkit were used to estimate the change in recreational visits for different activities, given the changes in land use that would result from the BDCP. The models include nonconsumptive visits (birding and other wildlife viewing, hiking, recreational boating, camping, picnicking, and water contact sports), migratory bird–hunting visits, and freshwater fishing visits (shoreline- and boat-based). Unit-day values for different recreational activities were used to ascribe a value to these changes in recreational uses. Unit-day values are monetary estimates of the value of a day spent participating in a recreational activity that are specific to that type of activity or a group of similar activities.

Impacts of the BDCP on outdoor recreation would result primarily from the conservation measures that protect, restore, and enhance natural communities (CM2 through CM11) and those that address other ecological stressors on covered aquatic species in the Delta (CM13 through CM21). Restrictions on migratory waterfowl hunting lands imposed by CM1, CM2, and CM4 are estimated to result in total discounted costs ranging from $1.5 million to $3.0 million over the 50-year permit term. CM3, CM4, CM5, CM8 and CM9 are expected to result in increases in nonconsumptive recreation (e.g., hiking, picnicking, birding, wildlife viewing) and freshwater angling ranging from $223.3 million to $373.0 million. The net benefits of the BDCP on outdoor recreation in the Delta are thus estimated to range from $221.8 million to $370.0 million. Section 3.2, *Outdoor Recreation,* provides detail on the assumptions, methods, and results.

ES.2.3 Transportation

Economic impacts of the BDCP related to transportation disruptions and delays would result from CM1 construction, which will increase traffic volumes in the immediate Plan Area[2] and surrounding areas. To determine the economic impact of transportation delays resulting from CM1 construction, monetary costs of additional travel time spent by travelers in the region were estimated over the 9-year construction period. Additional travel times were estimated by comparing projected travel times in the region with and without CM1 construction.

To estimate the costs associated with travel delays, a value was applied for the opportunity cost of a traveler's time, which is the value of the time that a traveler must forego from spending on other activities due to their increased time spent in transit. Opportunity cost varies based on how the foregone time would have been spent (i.e., whether it is work or leisure time). This analysis incorporates the opportunity cost of time for both business and leisure travelers, since CM1 construction will affect both types of travelers.

[2] The Plan Area for the BDCP encompasses the statutory Sacramento–San Joaquin River Delta and Suisun Marsh.

Using the low and high monetized values for all-purpose transportation, a range for the total costs of travel time delays over the CM1 construction period was calculated. The model estimates approximately 4.4 million additional car-hours of traffic delays due to increased traffic from CM1 construction over 9-year construction period. These travel delays will result in a total discounted cost of between $73.8 million (low estimate) and $110.8 million (high estimate) over the analysis period of 2016 through 2024 with no mitigation measures. Measures to mitigate transportation impacts, identified in BDCP EIR/EIS Chapter 19 (California Department of Water Resources et al. 2013), are expected to reduce these total costs by $21.0 million to $31.5 million. Thus, the total cost associated with transportation disruptions and delays under the BDCP were estimated to range from $52.8 million to $79.3 million. Section 3.3, *Transportation*, provides detail on the assumptions, methods, and results.

ES.2.4 Other Delta-Dependent Economic Activities

The BDCP will affect area water quality primarily through operation of CM1 and from other conservation measures that would make changes to the physical landscape (CM2 through CM11). This analysis focused on the changes in concentrations of two key contaminants (bromide and nitrate), because the other contaminants considered in the BDCP EIR/EIS are not directly tied to adverse health impacts and do not have mandated thresholds for Delta waterways. Expected bromide and nitrate concentration levels at the four major pumping stations in the Delta were examined, because drinking water originating from the Delta comes from these pumping stations. Changes in bromide and nitrate concentrations were defined by subtracting the concentrations in area waters in the baseline scenario from the concentrations in the four operational BDCP scenarios (labeled H1 through H4 in the BDCP EIR/EIS). For both bromide and nitrate, the net effect of the BDCP is a decrease compared to the baseline scenario. The reductions from the BDCP in bromide and nitrate concentrations offer water security benefits for the region, reducing the potential negative economic cost of bromide or nitrate increases in the future. Given the uncertainty of unexpected increases in levels of these two key contaminants, the study does not monetize these water security benefits.

The primary impacts of the BDCP on Delta commercial fisheries result from effects related to Chinook salmon, which is the only major commercial fish species in the Delta. Other affected commercial species include threadfin shad, crayfish, and California bay shrimp, though the commercial markets for these species are much smaller than the Chinook salmon market. Overall effects of CM1 operations would benefit fall-run and late fall–run Chinook salmon through substantial reductions in entrainment, improved San Joaquin River and Delta flow conditions, and neutral or positive changes in upstream conditions. The effects of floodplain, tidal, channel margin, and riparian natural community restoration activities on Chinook salmon are expected to be beneficial, providing net increases in amounts and quality of available habitat, increasing habitat diversity, increasing overall productivity and reducing predation. Although adverse effects on Chinook salmon are expected near the end of the permit term due to climate change, the overall effect of BDCP restoration activities is expected to remain beneficial for fall-run Chinook salmon. The overall impacts of the BDCP on Delta commercial fisheries (including Chinook salmon and other smaller fisheries) are expected to be positive to both the population and commercial landings for these species. This study was not able to quantify and monetize the impacts of BDCP related to commercial fisheries due to the high level of uncertainty involved in forecasting populations of salmon and other species over time.

ES.3 Economic Impacts Related to Non-Market Environmental Amenities

The BDCP would have economic impacts related to a wide range of non-market environmental amenities including air quality, greenhouse gas emissions, flood risk, property values and viewscapes, and erosion and sedimentation. Descriptions and brief summaries of the estimated impacts are presented below. Impacts on flood risk, property value and viewscapes, erosion and sedimentation were evaluated qualitatively, because these impacts are difficult to quantify and monetize.

ES.3.1 Regional Air Quality

Economic impacts of the BDCP related to changes in regional air quality would result from the construction and operation of the new water conveyance facility (CM1) and construction of natural community protection, restoration, and enhancement measures (CM2 through CM11). Air quality impacts result from increases in emissions of contaminants that have been linked to adverse health outcomes. Air quality estimates were derived based on air quality models developed for the BDCP EIS/EIR. Section 4.1, *Regional Air Quality*, describes these models in detail.

The monetary costs of increased air emissions are based on costs incurred as a result of increases in morbidity (decreased health) and mortality (death) that can be linked to air contaminants. This analysis focuses on emissions of six criteria pollutants[3]—reactive organic gases, nitrogen oxides, carbon monoxide, particulate matter less than 10 micrometers in diameter, particulate matter less than 2.5 micrometers in diameter, and sulfur oxides—and links changes in emissions of these contaminants to changes in expected health costs for the region. The human health costs for each contaminant are estimated using widely accepted methods applied by the U.S. Environmental Protection Agency to evaluate the economic costs of national regulatory decisions on air quality standards.

Mitigation measures in the BDCP EIR/EIS are designed to reduce the projected health effects of BDCP contaminant emissions through the purchase of offsets. These offsets would be purchased when emissions of a particular contaminant exceed the air quality threshold established by an air quality management district over a year or in the course of a day. Offsets represent an alternative project or program that reduces the amount of a criteria contaminant. When an offset is purchased, the net emission is zero.[4] No health costs are realized when an offset is purchased, which reduces the total health costs of air emissions from construction activities. For the offsets, the avoided health costs were estimated and subtracted from the total health costs. The costs of purchasing the offsets were then added to the health costs. This study predicts that the total costs of changes in regional air quality will range from $10.8 million to $15.5 million. Section 4.1 provides details on the assumptions, methods, and results.

[3] Section 4.1, *Regional Air Quality*, summarizes the definition of the criteria contaminants and their potential health effects.

[4] Annual pollution offsets equal the total contaminant for that basin. Daily pollution offsets, however, equal the pollution amount exceeding California Environmental Quality Act levels.

ES.3.2 Greenhouse Gas Emissions

Economic burdens associated with increasing greenhouse gas (GHG) emissions are frequently monetized in terms of regulatory costs (e.g., cost to comply with Assembly Bill 32, the California Global Warming Solutions Act) or community costs (e.g., public health costs from deteriorating air quality).[5] This study focuses primarily on regulatory costs because GHG emissions generated by construction and operation of the BDCP will be offset to net zero through mitigation required by the EIR/EIS. Reduced community costs associated with climate change moderation are briefly discussed in relation to carbon sequestration benefits from land conversion and natural community restoration.

According to Assembly Bill 32, GHGs include the following gases: carbon dioxide, methane, nitrous oxide, perfluorinated carbons, sulfur hexafluoride, and hydrofluorocarbons. Construction of the new water conveyance facility (CM1) would generate GHG emissions during both construction and operation. Construction activities would result in short-term (temporary) emissions from mobile and stationary construction equipment exhaust, employee vehicle exhaust, electrical transmission, and concrete batching. Operation of the water conveyance facility would generate long-term (permanent) emissions from maintenance equipment exhaust and electrical generation. A portion of carbon dioxide emissions generated by calcination during cement manufacturing would also be reabsorbed (i.e., removed from the atmosphere) into concrete structures during the life of the BDCP.

GHG emissions associated with CM1 were quantified using data provided by DWR and accepted software tools, techniques, and emission factors. Information on the location and types of construction equipment required for the other conservation measures were unavailable. Consequently, GHG emissions resulting from implementation of these conservation measures were assessed qualitatively.

This study predicts costs of GHG emissions from CM1 ranging from $82.3 million to $236.7 million and economic benefits ranging from $35.3 million to $715.4 million. Net benefits would range from -$47.0 million to $478.7 million. The large range in potential benefits stems from a high degree of uncertainty in the carbon sequestration potential of tidal natural communities restoration (CM4). Section 4.2, *Greenhouse Gas Emissions*, provides details on the assumptions, methods, and results.

ES.3.3 Other Non-Market Environmental Amenities

The economic impacts of the BDCP on flood risk in the Delta would result from both the operation of the water conveyance facility (CM1) and the implementation of other conservation measures (CM2 through CM22), particularly tidal natural communities restoration (CM4) and seasonally inundated floodplain restoration (CM5). These components of the BDCP are expected to have both positive and negative influences on flood risk in the Delta. Changes to the volume and patterns of water flows can increase or decrease flood risk by adding more or less pressure on levees. Land use also plays a large role in the level of flood risk. Although the land use changes resulting from the BDCP will result in increases and decreases in flood risk, the overall change to flood risk in the Delta from the BDCP is expected to be minimal. Section 4.3, *Flood Risk*, discusses these impacts, how they have been valued in other studies, and the challenges of quantifying and monetizing these impacts in the Delta region.

[5] Refer to Section 4.1, *Regional Air Quality*, for an analysis of public health costs associated with criteria pollutant emissions generated by the BDCP.

The BDCP may affect area property values due to both the construction and operation of the new water conveyance facility (CM1) and implementation of other conservation measures, particularly natural community protection, restoration, and enhancement measures (CM2 through CM11). Section 4.4, *Property Values and Viewscapes*, considers the potential impacts of the BDCP related to property values that are not evaluated elsewhere (e.g., transportation delays, air quality), and impacts from changes to viewscapes and noise. To evaluate the potential impacts of CM1 on property values, studies of the impact of various kinds of infrastructure projects on nearby property values were reviewed. A similar review was also conducted of previous studies on the impact on property values for properties located adjacent to or nearby natural areas such as wetlands. The impacts of CM1 on property values are expected to be negative for properties near the new facilities. Positive effects on property values are expected for properties located near restoration sites. This study was unable to quantify or monetize these changes in property values and viewscapes; however, the total impact on property values is expected to be small in comparison with other statewide economic impacts of the BDCP.

The BDCP would result in changes to area erosion and sedimentation rates as a result of the construction and operation of the new water conveyance facility (CM1) and the protection, restoration, and enhancement measures (CM2 through CM11). BDCP-related impacts on erosion and sedimentation include potential changes in turbidity due to the construction and operation of CM1. In addition, CM2 through CM11 could change rates of erosion and sedimentation in area waterways due to the ecosystem services provided by the restored natural areas such as wetlands and grasslands. Section 4.5, *Erosion and Sedimentation*, discusses qualitatively the conservation measures expected to have impacts on rates of erosion and sedimentation.

ES.4 Summary of Welfare Impacts

The BDCP would greatly enhance the welfare of urban and agricultural water consumers receiving all or part of their water supplies from the Delta. The state and federal contractors would enjoy an enhanced level of water supply reliability, and would avoid prolonged water shortages that may result in the future from increasing environmental restrictions in the Delta. The net welfare gain to the state and federal contractors as a result of implementing the BDCP is $4.7 billion in 2012 dollars.

The BDCP would also affect individuals participating in Delta-dependent activities such as recreation, farming, and use of the regional road network. Impacts in these areas are expected to result in net benefits between $135 million and $257 million. In addition, the BDCP would affect various non-market environmental amenities such as carbon fluxes in the Delta and regional air quality. Taken together, these two categories of impacts are expected to result in small changes in welfare, ranging from -$58 million to roughly $463 million in net benefits over the 50-year permit term. The largest source of welfare gain is the possible reduction in carbon emissions resulting from restoration of tidal natural communities (CM4) in the Delta.

Adding all monetized impacts together, the BDCP would improve the economic welfare of California residents by $4.8 billion to $5.4 billion.

Table ES-2. Summary of Welfare Changes Resulting from Implementation of the BDCP (million $)

Category	Present Value Costs	Present Value Benefits	Present Value Net Benefits	Present Value Costs	Present Value Benefits	Present Value Net Benefits
	Low Value			High Value		
	A	B	C = A + B	D	E	F = D + E
State and Federal Water Contractors						
State and federal water contractors	-$13,328	$18,011	$4,683	-$13,328	$18,011	$4,683
Impacts on Delta-Dependent Economic Activities						
Salinity of agricultural water suppliers	-$34	$0	-$34	-$34	$0	-$34
Outdoor recreation	-$2	$223	$222	-$3	$373	$370
Transportation delays	-$53	$0	-$53	-$79	$0	-$79
Subtotal	**-$88**	**$223**	**$135**	**-$116**	**$373**	**$257**
Impacts on Non-Market Environmental Amenities						
Air quality	-$11	$0	-$11	-$16	$0	-$16
Greenhouse gas emissions	-$82	$35	-$47	-$237	$715	$479
Subtotal	**-$93**	**$35**	**-$58**	**-$252**	**$715**	**$463**
Total Welfare Impact	**-$13,509**	**$18,270**	**$4,761**	**-$13,696**	**$19,099**	**$5,403**

Notes:
Employment impacts are not show in this table, because the value added is through full-time equivalents, not dollars.
Numbers in the table may not add due to rounding.

ES.5 Impacts on Statewide Income and Employment

In addition to measuring changes in economic welfare, this study evaluates the statewide economic impact of the BDCP in terms of business output and employment. These impacts will result from the construction and operation under CM1, implementation of the other conservation measures (CM2–CM11, CM13–CM21), and increased water supply reliability. These positive impacts on output and employment will be offset to some degree by higher water costs and higher state spending, and by the loss of some agricultural land in the Delta.

ES.5.1 Impacts on State Income

The BDCP is expected to result in a significant increase in the sales of California businesses over the 50-year permit term. Table ES-3 summarizes the economic activity impacts associated with each of the following categories.

- **CM1 Water Facilities and Operation**. Economic activity generated through the planning and construction of the new water conveyance facility is estimated at $21.2 billion in California during an expected 10-year planning and construction period.[6] Operations and maintenance, assumed to begin in year 11, are expected to generate an estimated $1.3 billion of economic activity over the remaining 40 years of the permit term.

[6] All impacts are based on cost estimates in 2012 dollars and are discounted to present value at a 3% real discount rate.

- **Other Relevant Conservation Measures (CM2–CM11, CM13–CM21).** The construction and planning; operations and maintenance; land acquisition; and administrative implementation, monitoring, and research share of conservation measures involving the protection, restoration and enhancement of natural communities will result in an increase in economic activity of an estimated $9.4 billion over the 50-year permit term. The retirement of agricultural lands will result in an estimated loss of $2.8 billion in economic activity during the same period, for a net gain of an estimated $6.6 billion over the 50-year permit term.
- **Water Supply Reliability.** Economic activity generated from increased water supply reliability begins when the new north Delta water conveyance facility begins operation, expected in 2026. Impacts on the commercial/industrial/institutional sector and the agricultural sector are estimated to be a net gain of $67.5 billion and $5.9 billion, respectively, totaling $73.4 billion over the 40 years of dual conveyance operations in the Delta.

Taking all these impacts together, and netting out the business activity lost as a result of higher water costs and taxes, the BDCP will increase California state business output by $83.5 billion over the 50-year permit term.

Table ES-3. Changes in Economic Activity ($ Millions)

Category	Years 1–10	Years 10–20	Years 20–30	Years 30–40	Years 40–50	Total over 50 Years
CM1 Water Facilities and Operation						
Construction and planning	$21,238	$0	$0	$0	$0	$21,238
Operations and maintenance	$0	$474	$353	$263	$195	$1,285
Subtotal	**$21,238**	**$474**	**$353**	**$263**	**$195**	**$22,523**
Other Relevant Conservation Measures (CM2–CM11, CM13–CM21)						
Construction and planning	$2,486	$1,318	$987	$690	$132	$5,612
Operations and maintenance	$497	$529	$364	$282	$217	$1,890
Land acquisition[b]	$319	$197	$137	$102	$0	$755
Other[c]	$342	$298	$204	$156	$103	$1,103
Agricultural land retirement[d]	($319)	($584)	($672)	($677)	($539)	($2,791)
Subtotal	**$3,325**	**$1,757**	**$1,020**	**$553**	**($87)**	**$6,569**
Water Supply Reliability						
Commercial/industrial/institutional	$0	$24,919	$18,542	$13,797	$10,266	$67,525
Agricultural	$0	$2,181	$1,623	$1,208	$899	$5,910
Subtotal	**$0**	**$27,100**	**$20,165**	**$15,005**	**$11,165**	**$73,435**
Increased Water Rates and Taxes						
Induced Output Impact	($16,327)	($925)	($777)	($580)	($411)	($19,019)
Subtotal	**($16,327)**	**($925)**	**($777)**	**($580)**	**($411)**	**($19,019)**
Total Economic Impacts Across All Categories	**$8,236**	**$28,407**	**$20,761**	**$15,241**	**$10,863**	**$83,508**

[a] All impacts are based on cost estimates in 2012 dollars and are discounted to present value at a 3% real discount rate.

[b] Represents the impacts from payments made to landowners to acquire reserve lands for protection, restoration, and enhancement either in fee title or as conservation easement.

[c] Impacts from administrative implementation, monitoring, and research costs.

[d] Represents agricultural revenue loss from decreased agricultural activity that would result from the conversion of agricultural lands to reserve lands. Impacts due to conversion of agricultural lands to water conveyance facilities were not modeled; however, these impacts are small in comparison, representing only 10% of agricultural retirement under the BDCP.

ES.5.2 Impacts on Employment

Significant job gains and increases in employee compensation will result from construction and operation of the new water conveyance facility (CM1), the implementation of other conservation measures (CM2–CM11, CM13–CM21), and improved water reliability. Job creation will be offset somewhat by job losses from the conversion of agricultural land to the water conveyance facilities and reserve lands. There will also be induced job losses associated with increased water rates and taxes.

Table ES-4 and Table ES-5 summarize the employment impacts and employee compensation impacts, respectively, associated with each of the three categories below. The analysis of employment compensation does not currently include employment compensation impacts from water reliability due to lack of data.

- **CM1 Water Facilities and Operation**. Employment impacts associated with planning and construction of the new water conveyance facility will create an estimated 110,596 full-time equivalent (FTE) jobs and increase employment compensation by an estimated $7.8 billion in California during an expected 10-year planning and construction period.[7] The operations and maintenance expenses are assumed to begin in year 11 and will create an additional estimated 11,331 FTE jobs and increase employment compensation by $510 million over the remaining 40 years of the permit term. This will result in an annual rate of just under 283 FTE operations and maintenance positions.
- **Other Relevant Conservation Measures (CM2–CM11, CM13–CM21).** The construction and planning; operations and maintenance; land acquisition; and administrative implementation, monitoring, and research share of the protection, restoration, and enhancement measures will result in an estimated 92,589 FTE jobs and $3.5 billion in employee compensation over the 50-year permit term. The retirement of agricultural lands will result in an estimated loss of 36,819 FTE jobs and $807 million in employee compensation during the same period, for a net gain of an estimated 55,770 FTE jobs and $2,732 million in compensation over the 50-year permit term.
- **Water Supply Reliability.** Employment impacts resulting from increased water supply reliability begin when the BDCP comes into operation. Impacts on the commercial/industrial/institutional sector and the agricultural sector are estimated to be 761,840 jobs and 257,824 jobs, respectively, totaling 1,019,664 jobs over the 50-year permit term.

Overall, the BDCP will create or preserve an estimated 1.1 million FTE jobs. Construction of new conveyance facilities and restoration areas will also result in $11.0 billion in additional employee compensation over the 50-year permit term.

[7] FTE or full-time equivalent is defined as the number of total hours worked divided by the maximum number of compensable hours in a work year as defined by law. For example, an FTE of 1.0 means that the position is equivalent to 1 full-time worker, while an FTE of 0.5 means the position is equivalent to a half-time worker.

Table ES-4. Statewide Employment Impact Summary (Full-Time Equivalent Jobs[a])

Category	Years 1–10	Years 10–20	Years 20–30	Years 30–40	Years 40–50	Total over 50 Years
CM1 Water Facilities and Operation						
Construction and planning	110,596	0	0	0	0	110,596
Operations and maintenance	0	2,833	2,833	2,833	2,833	11,331
Subtotal	**110,596**	**2,833**	**2,833**	**2,833**	**2,833**	**121,928**
Other Relevant Conservation Measures (CM2–CM11, CM13–CM21)						
Construction and planning	15,962	11,338	11,414	10,733	2,753	52,200
Operations and maintenance	3,494	4,909	4,539	4,727	4,879	22,548
Land acquisition[b]	2,016	1,676	1,580	1,572	0	6,844
Other[c]	2,070	2,400	2,219	2,280	2,028	10,998
Agricultural land retirement[d]	(2,092)	(5,076)	(7,824)	(10,569)	(11,258)	(36,819)
Subtotal	**21,450**	**15,247**	**11,928**	**8,743**	**(1,598)**	**55,770**
Water Supply Reliability						
Commercial/ industrial/ institutional	0	190,460	190,460	190,460	190,460	761,840
Agricultural	0	64,456	64,456	64,456	64,456	257,824
Subtotal	**0**	**254,916**	**254,916**	**254,916**	**254,916**	**1,019,664**
Increased Water Rates and Taxes						
Induced Employment Impact	(88,322)	(5,004)	(4,202)	(3,137)	(2,221)	(102,885)
Subtotal	**(88,322)**	**(5,004)**	**(4,202)**	**(3,137)**	**(2,221)**	**(102,885)**
Total Employment Impacts Across All Categories	**43,725**	**267,992**	**265,475**	**263,355**	**253,930**	**1,094,477**

[a] Jobs are defined as full-time equivalents (total hour worked divided by average annual hours worked in full-time jobs.)

[b] Represents the employment impact from payments made to landowners to acquire reserve lands for protection, restoration, and enhancement either in fee title or as conservation easement.

[c] Impacts from administrative implementation, monitoring, and research costs.

[d] Represents agricultural revenue loss from decreased agricultural activity that would result from the conversion of agricultural lands to reserve lands. Impacts due to conversion of agricultural lands to water conveyance facilities were not modeled; however, these impacts are small in comparison, representing only 10% of agricultural retirement under the BDCP.

Table ES-5. Statewide Employee Compensation Impact Summary (million $[a])

Category	Years 1–10	Years 10–20	Years 20–30	Years 30–40	Years 40–50	Total over 50 Years
CM1 Water Facilities and Operation						
Construction and planning	$7,791	$0	$0	$0	$0	$7,791
Operations and maintenance	$0	$188	$140	$104	$78	$510
Subtotal	**$7,791**	**$188**	**$140**	**$104**	**$78**	**$8,301**
Other Relevant Conservation Measures (CM2–CM11, CM13–CM21)						
Construction and planning	$923	$489	$366	$256	$49	$2,084
Operations and maintenance	$192	$204	$140	$109	$84	$728
Land acquisition[b]	$103	$64	$44	$33	$0	$245
Other[c]	$149	$130	$89	$68	$45	$482
Agricultural land retirement[d]	($92)	($169)	($194)	($196)	($156)	($807)
Subtotal	**$1,275**	**$718**	**$446**	**$270**	**$22**	**$2,732**
Total Employment Impacts Across All Categories (except water reliability)	**$9,066**	**$907**	**$586**	**$375**	**$99**	**$11,033**

[a] All impacts are based on cost estimates in 2012 dollars and are discounted to present value at a 3% real discount rate.

[b] Represents the employment impact from payments made to landowners to acquire reserve lands for protection, restoration, and enhancement either in fee title or as conservation easement.

[c] Impact from administrative implementation, monitoring, and research costs.

[d] Represents agricultural revenue loss from decreased agricultural activity that would result from the conversion of agricultural lands to reserve lands. Impacts due to conversion of agricultural lands to water conveyance facilities were not modeled; however, these impacts are small in comparison, representing only 10% of agricultural retirement under the BDCP.

ES.6 Findings of Statewide Economic Impacts of the BDCP

Implementing the BDCP would substantially increase economic welfare, business activity, and employment in California. The BDCP would prevent future reductions in SWP and CVP deliveries that may result from implementation of stricter environmental flow requirements in the Delta. By maintaining and stabilizing Delta exports at close to levels of the recent past, the BDCP would increase California business output by over $83.5 billion and create or preserve up to 1.1 million California jobs. Construction and operation of water conveyance facilities in the Delta and implementation of other conservation measures would result in $11.0 billion in additional compensation (i.e., salary and benefits) to California workers.

The BDCP would generate $4.7 billion in net benefits to the state and federal water contractors that receive SWP and CVP deliveries from the Delta. These benefits result from improved water supply reliability, reduced salinity, and reduced seismic risks to water supplies.

The BDCP would have an impact on individuals participating in Delta-dependent activities such as recreation, farming, and use of the regional road network. Across the activities that could be evaluated quantitatively, the BDCP is expected result in a small increase in economic welfare of $135

million to $257 million. In addition, the BDCP would affect various non-market environmental amenities such as carbon fluxes in the Delta and regional air quality. Taken together, these two categories of impacts are expected to result in small changes in welfare, ranging from -$58 million to roughly $463 million in net benefits over the 50-year permit term. The large range of potential economic benefits is largely due to the high uncertainty in carbon sequestration potential of the extensive tidal wetlands restored under the BDCP.

Adding all monetized impacts together, the BDCP would result in an improvement in the economic welfare of California residents of between $4.8 billion and $5.4 billion. These totals do not include additional expected statewide economic costs and benefits to the activities or values in the Delta that could not be quantified or monetized in this study: flood risk, property values and viewscapes, commercial fisheries, urban water treatment, and erosion and sedimentation. The BDCP is expected to have a net positive economic effect on commercial fisheries. In all other cases, the BDCP may have both positive and negative economic effects, but those effects are predicted to be small. It is unlikely that these unmonetized categories of impacts are large relative to the welfare gains from improved water supply reliability, or to the stimulus effect of the BDCP on California output and employment. Therefore, the BDCP is predicted to result in substantial economic benefits to California businesses and residents.

EBERHARDT SCHOOL OF BUSINESS

Business Forecasting Center

Benefit – Cost Analysis of Delta Water Conveyance Tunnels

July 12, 2012

Summary

This report updates an initial benefit-cost analysis of the water conveyance tunnels at the center of the Bay Delta Conservation Plan (BDCP). We find the tunnels are not economically justified, because the costs of the tunnels are roughly 2.5 times larger than their benefits. The economic benefits of the tunnels include water supply, water quality, and earthquake risk reduction to areas served by export water agencies. The economic costs include capital costs, operating and maintenance costs, and the costs to in-Delta and upstream water users.

Benefit-cost analysis is an essential and normal part of assessment and planning of large infrastructure projects such as the $13 billion water conveyance tunnel proposal, but has not been part of the BDCP. This report fills an important information gap for policy makers and water ratepayers who will ultimately bear the multi-billion dollar costs of the project.

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Benefit – Cost Analysis of Delta Water Conveyance Tunnels

A pair of large water conveyance tunnels is being considered as the centerpiece of the Bay Delta Conservation Plan (BDCP). The tunnels would divert water from the Sacramento River and convey it around the Delta to state and federal water projects serving southern California rather than continuing to convey the fresh water through Delta channels. The construction cost of the tunnels is estimated at $13 billion. Essentially, the project is an updated version of the peripheral canal defeated by California voters in 1982.

This report updates an initial comprehensive economic benefit-cost analysis of the proposed tunnel with the latest information from the BDCP. Primarily using the results of the BDCP's own economic benefit and cost studies, we find benefit-cost ratios ranging from 0.3 to 0.5, meaning that there are between $1.90 and $3.36 of costs for every $1 in economic benefits. When these very low benefit-cost ratios are considered alongside the inconsistent and incomplete financial plans, it is clear that the Delta water conveyance tunnels proposed in the draft BDCP are not justified on an economic or financial basis.

The BDCP is considering a variety of sizes and operating criteria for the water conveyance tunnel. This analysis focuses on a scenario that is reported to be the preferred alternative emerging in BDCP negotiations.[1] Two large tunnels will be built to convey water below the Delta along with three intakes on the Sacramento river that can divert 9,000 cfs (cubic feet per second) from the river. The project would result in average annual water exports in a range between 4.3 maf (million acre feet) and 5.5 maf. The level of water exports through the tunnel depends on a 15-year decision-tree process based upon scientific studies of the effectiveness of the BDCP's habitat investments in recovering endangered fish populations. The studies and decision-tree process would be concurrent to the tunnel construction, so the water yield of the tunnels would not be known until after they are built.

This assessment examines a favorable water supply scenario for the water agencies that would finance the tunnels, average water exports of 5.3 maf, near the maximum level. This analysis looks only at the water conveyance proposal in the BDCP, and does not evaluate habitat creation proposals that provide their own benefits and would have several billion dollars in additional construction costs that would be primarily financed by the water bond recently moved to the 2014 ballot. As noted in a later section, this separate analysis of water conveyance infrastructure and habitat is consistent with Department of Water Resources' economic analysis guidelines.

This preliminary benefit-cost assessment can be updated with new information as it becomes available. Our intention is to motivate public agencies and others to conduct comprehensive benefit-cost analysis, and to provide appropriate economic justification of the project. Given the poor performance of the tunnel in this initial benefit-cost analysis with several assumptions favorable to tunnel construction, we believe it is highly unlikely that any subsequent benefit-cost analysis will find that the project is economically justified.

[1] For example, see "Gov. Jerry Brown's delta fix is not much of a plan." *San Francisco Chronicle,* July 9, 2012, and presentations at the June 20, 2012 meeting of the Bay Delta Conservation Plan.

Benefit-Cost Analysis

Benefit-cost analysis of large infrastructure projects is common practice, and broadly considered to be an essential part of good public policy analysis of large capital projects. For example, high-speed rail, the other California mega-project in the news, has included multiple benefit-cost assessments as the plan has evolved. The most recent accompanied the revised business plan and found most scenarios had about $2 in expected benefits for every $1 in expected costs.[2] The benefit-cost ratio of high-speed rail is five times higher than the benefit-cost ratio we have calculated for the Delta water conveyance tunnel.

Benefit-cost analysis of the tunnel conveyance has been called for in numerous reports and reviews of the BDCP, but still has not been appropriately conducted by any state agencies or published in any independent academic studies before this report. The Department of Water Resources (DWR) has an Economic Analysis Guidebook that provides a comprehensive description of DWR's approach to benefit-cost analysis.[3]

The DWR Economic Analysis Guidebook states the importance of benefit-cost analysis well,

> Economic analysis is a critical element of the water resources planning processes because it not only evaluates the economic justification of alternative plans but it can assist in plan formulation. (p. 1)
>
> The economic analysis should answer questions such as, Should the project be built at all? Should it be built now?, Should it be built to a different configuration or size? Will the project have a net positive social value for Californians irrespective of to whom the costs and benefits accrue? (p. 5)
>
> Benefit-cost analysis is the procedure where the different benefits and costs of proposed projects are identified and measured (usually in monetary terms) and then compared with each other to determine if the benefits of the project exceed its costs. Benefit-cost analysis is the primary method used to determine if a project is economically justified. A project is justified when:
>
> - estimated total benefits exceed total estimated economic costs;
> - each separable purpose (for example, water supply, hydropower, flood damage reduction, ecosystem restoration, etc.) provides benefits at least equal to its costs;[4]
> - the scale of development provides maximum net benefits; and

[2]The April 2012 high-speed rail benefit-cost analysis can be downloaded from http://www.cahighspeedrail.ca.gov/assets/0/152/431/6515fa4a-a098-4b88-9f19-19f0e1475e19.pdf. The business plan and benefit-cost analysis of high-speed rail have been criticized for optimistic ridership projections, but this debate has strengthened the policy and planning process for the high-speed rail project. Many of the economic benefits of high-speed rail are health related such as reduced traffic fatalities and air pollution from reduced highway travel and the benefit-cost analysis attached monetary values to health and environmental benefits.

[3] The DWR Economic Analysis Guidebook is on the web at http://www.water.ca.gov/pubs/planning/economic_analysis_guidebook/econguidebook.pdf

[4] This bullet point is critically important to the BDCP which some argue can only be evaluated as a package of water conveyance and habitat improvement projects. The DWR economic analysis guidebook is correct in stating that water supply and habitat projects should be evaluated separately.

- there are no more-economical means of accomplishing the same purpose. (p. 13)

The benefits and costs of an investment occur at different points in time, and can extend for very long time horizons. Benefit-cost analysis examines a full stream of costs and benefits over the expected life of the project. For this analysis, we examined 50 years after the expected completion of the tunnels in 2025.

The long streams of benefits and costs are compared using a present discounted value in current dollars. A discount rate, comparable to an interest rate, is used to account for the time value of money or the opportunity costs of using funds for a public investment. Public investment has opportunity costs, because it competes with and crowds out funding for private consumption, investment or alternative public investments.

Benefit-cost results can be sensitive to the level of the discount rate, and the choice of discount rate is sometimes controversial in benefit cost analysis. Federal government guidelines recommend the use of a 7% discount rate.[5] The DWR Economic Analysis Guidebook endorses a 6% discount rate. Many economists recommend a lower discount rate, such as 3%, when looking at long-lived investments or regulations to combat long-run, global issues such as climate change. This analysis uses scenarios with a 3% and 6% discount rate.

Benefit-cost analysis is not just a pass/fail test to be taken after an investment proposal is finalized. It should be conducted and refined throughout a planning process as it yields valuable insights about a projects strengths, weaknesses, and overall merit. The absence of benefit-cost analysis throughout the BDCP process is a significant weakness that has left policy makers poorly informed to make a decision about a very costly investment with far ranging economic effects.

The objective of this report is to fill an important information void, and to challenge tunnel proponents to make their economic case using an accepted and established benefit-cost framework. Most of the values for benefits and costs in this report are taken directly or clearly derived from BDCP documents or reports sponsored or cited by tunnel proponents. Most assumptions required to derive values are made in ways that favor building the tunnel. The detailed sources and discussion of study assumptions are in the sections that follow.

Benefits of a Delta Water Supply Tunnel

The delta water supply tunnels would provide four types of potential benefits: higher export water supply, improved export water quality, earthquake risk reduction for water exports, and possible environmental benefits for endangered fish species. There is a trade-off between increasing water supply from the tunnels and their potential benefits for fish.

[5] See Office of Management and Budget, Circular No A-94. http://www.whitehouse.gov/omb/circulars_a094#7

The California Department of Water Resources has recently contracted with the Brattle Group to conduct an Economic Benefit Analysis of the BDCP led by Dr. David Sunding.[6] The quantification of economic benefits in this section follows the framework in the scope of work in the "Benefits Analysis," and the values used in this report are taken directly from the preliminary results presented by Dr. Sunding at the BDCP public meeting on June 20, 2012.[7] The benefits in the Brattle presentation are for the period of 2022 to 2050, whereas this analysis assumes the tunnels would open in 2025 and considers benefits from fifty years of operation, 2025 to 2074. To make the adjustment, we calculated the average annual benefit in the 29 years of the Brattle analysis, and assumed it was constant over the fifty year period from 2025 to 2074.[8]

The Brattle analysis is not a comprehensive statewide benefit-cost analysis, but has a more narrow purpose to "assess whether the benefits of BDCP are sufficient to justify the costs to the agencies receiving project water supplies." In addition to providing reliable, current estimates for several components of benefit-cost analysis, the Brattle "Benefits Analysis" raises some additional considerations for financial feasibility that are discussed later in this report.

Export Water Supply:

The Brattle group estimates the present value of water supply benefits from 2022 to 2050 at $1.898 billion for urban users and $1.138 billion for agricultural exporters using a 3% discount rate. This equates to average annual operating benefits of about $361 per acre foot, averaged across both agricultural and urban water exports. The average annual benefit of $136 million for urban agencies and $81 million for agricultural agencies creates a present value of export water supply benefits of $3.916 billion using a 3% discount rate and $1.700 billion using a 6% discount rate when this annual benefit of the tunnels is extended over the 50 year period beginning in 2025.

Export Water Quality Benefits:

Improved export water quality is a significant benefit of the proposed Delta tunnel. The Brattle group estimates the present value of water quality benefits from 2022 to 2050 at $1.802 billion

[6] The Economic Benefit Scope of Work is available at http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Economics_Benefit_Scope_of_Work.sflb.ashx

[7] Dr. Sunding's presentation from the meeting is available on the BDCP website, http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/June_2012_Public_Meeting_Presentation_6-20-12.sflb.ashx. Some minor adjustments to the Brattle results have been made to reflect two differences in the scenario analyzed in this report. We assume the tunnel begins operation in 2025 as stated in BDCP documents, not the more optimistic 2022 used in the Brattle modeling. Also, we analyze benefits and costs out to 2075, 50 years of operation, rather than the 2050 end date in the Brattle analysis by assuming benefits continue at a constant annual rate beyond 2050. This assumption may understate total benefits somewhat, but by a much smaller amount than cutting the analysis off in 2050.

[8] This simplifying assumption may somewhat understate benefits since the benefits of the tunnel grow slowly over time and are likely to be somewhat higher in the post 2050 period than the pre-2050 period. However, it may also overstate benefits in the early years that are less affected by discounting. Overall, it has little effect on the results. An alternative option to ignore years after 2050 would result in much lower benefit estimates and significantly bias the analysis against the tunnels.

for all water exporters using a 3% discount rate. This equates to average annual benefits of $129 million after the tunnels are operating. If this annual benefit is extended over a 50 year period beginning in 2025, the present value of export water quality benefits are $2.328 billion using a 3% discount rate and $1.010 billion using a 6% discount rate.

When considering water quality benefits, it is important to note that the tunnel itself does not do anything to purify water supplies. It improves export water quality, because the tunnel moves Delta water exporters' diversion points to a stretch of the Sacramento River between Clarksburg and Courtland where water quality is better. The new intake would be upstream of the existing diversions of Sacramento River water by most Delta farmers, the Contra Costa Water District, and the cities of Stockton and Antioch, whereas the current intakes are downstream of these users. Thus, any water quality benefits received to the export projects will be at least partially offset by a degradation of water quality to those water users who will now be downstream of the massive intakes of the new tunnel. Many of these offsetting costs have not been thoroughly analyzed, but are at the root of much of the opposition to the proposed Delta tunnels. Some of these potential costs are included in the In-Delta and Upstream Impacts section in the cost assessment that follows.

Earthquake Risk Reduction:

A massive earthquake that floods Delta islands and disrupts water conveyance is frequently cited as the most important economic justification for an isolated water conveyance facility around the Delta. This is inaccurate. The Delta tunnels are often incorrectly portrayed as the only way to protect the economy from a catastrophic earthquake risk, and economic risks of water supply disruption are often inflated by including non-water supply economic losses. In this section, we first assess the economic benefit from the tunnels' earthquake protection assuming that there are no seismic upgrades to the Delta levee system. We use these values in the benefit-cost analysis. Second, we discuss alternative options for reducing seismic risk that protect against a broader set of economic risks at lower cost than the tunnels.

The scope of work for the BDCP "Economic Benefit" analysis described a correct approach for an economic assessment of seismic risks, "After developing estimates of the probability of various outage scenarios, Contractor will calculate expected losses and characterize the risk inherent to the current system." In the June 20 presentation at the BDCP meeting, the Brattle analysis did not include probabilities of outage scenarios or calculate expected losses. It only showed losses from a scenario when a massive earthquake occurs on the first year the tunnels are operating. However, it is straight forward to use these results to derive the expected annual losses called for in the scope of work.

The length of seismic outages that are currently being discussed as likely, especially in light of recent and planned responses to the levee and emergency response system and the effect of freshwater flushing out the Delta, is on the order of 6 to 12 months. According to the June 20 presentation by the Brattle Group, the estimated present value cost of an outage occurring in 2022 as $722 million for 6 months, and $2.093 billion for a 12 month water supply outage. The effect of discounting needs to be eliminated to calculate an expected annual loss. The undiscounted cost of a 6 to 12 month outage in 2022 is $970 million to $2.812 billion.

To calculate an expected value, these undiscounted expected annual losses would be multiplied by an annual probability of such a seismic event and failure occurring. According to Figure 5 in the executive summary[9] of the Delta Risk Management Strategy Phase 1 report, the annual probability of 10+ islands failing from earthquake is about 3%, and the annual probability of 30 or more islands failing is about 1%. Many engineers feel that these failure probabilities are far too high[10], but we utilize them below in the absence of more current published probabilities.

Table 1 Expected annual urban losses from a Delta earthquake

Annual Probability	6 mos outage ($970m)	12 mos outage ($2,812m)
.03	$29.1 m	$84.4 m
.02	$19.4 m	$56.3 m
.01	$9.7 m	$28.1 m

The median value in the table is about a $29 million expected annual urban losses that could be avoided if the Delta water supply tunnels were built. The Brattle presentation did not calculate agricultural losses, but assuming that the urban to agriculture ratio of earthquake protection benefits is similar to the water supply benefits, the expected annual benefits from earthquake protection are $48 million annually for urban and agriculture combined. If this annual benefit is extended over a 50 year period beginning in 2025, the present value of earthquake protection benefits are $866 million using a 3% discount rate and $376 million using a 6% discount rate. Although we use these values in the benefit-cost analysis, they are likely to be far too high as the earthquake probabilities are lower, and, as explained below, there are less costly options that could lower the risk of seismic water export outages to near zero.

If a massive earthquake were to cause ten or more Delta islands to simultaneously flood, the human and economic losses that would result are much larger than the impact on water supplies. According to the Delta Risk Management Strategy (DRMS) reports, hundreds of people in the Delta would drown in such a catastrophic flood, possibly more. In addition, the DRMS reports found that interruptions of export water supply would be only 20% of the economic loss of such a catastrophe. Much larger economic losses would come from disruptions to natural gas systems, electricity transmission and generation, state highways, ports, railroads, and significant losses of in-Delta businesses, homes, and farmland. Given the scale of these potential losses to multiple types of economic infrastructure, it makes sense to consider seismic upgrades to the Delta levee system that protect all economic values in the Delta, including water exports. Unlike a tunnel, seismic levee upgrades could also save hundreds of lives and prevent environmental destruction of such a catastrophic flood.

Two reports by state agencies have identified seismic levee upgrades as a viable earthquake risk reduction strategy in the Delta.[11] The Delta Protection Commission Economic Sustainability

[9] http://www.water.ca.gov/floodmgmt/dsmo/sab/drmsp/docs/drms_execsum_ph1_final_low.pdf

[10] For example, Dr. Robert Pyke, a well-known geotechnical engineer states that the probability of an earthquake flooding ten or more islands is much lower than 1%.

[11] "Economic Sustainability Plan for the Sacramento-San Joaquin River Delta." Delta Protection Commission. January 2012. http://www.forecast.pacific.edu/desp.html. "Risks and Options to Reduce Risks to Fishery and Water Supply Uses of the Sacramento/San Joaquin Delta." Department of Water Resources and Department of

Plan estimated the cost of 300 to 600 miles of seismic levee upgrades at between $2 billion and $4 billion, including riparian habitat enhancements on the enlarged levees. The Department of Water Resources' January 2008 AB 1200 found an "Improved Levees" scenario with 100 miles of seismic upgrades to eight islands in the south Delta was the lowest cost of three promising risk reduction strategies, including a peripheral canal.[12] In addition, a 2007 PPIC report estimated the cost of a similar Dutch style, "Fortress Delta" strategy at $4 billion.[13] Seismic levee upgrades are 1/6 to 1/3 the cost of the proposed water conveyance tunnel, and provide a much larger and broader range of risk reduction benefits to the economy.

Understanding the larger picture of earthquake risk is essential because benefit-cost analysis is based on "with and without" comparisons to the next best alternative. It is hard to envision that the state and federal governments would allow the seismic risk to human life and other economic assets in the Delta to remain unaddressed even if water exporters moved ahead with a Delta tunnel. Since necessary seismic upgrades to Delta levees could be completed by the time a Delta tunnel conveyance was constructed, a water supply tunnel would create no additional seismic protection for water exports. In this scenario, the earthquake risk reduction benefits of the water supply tunnel are zero.[14] Although we believe zero is a more appropriate value for benefit-cost analysis, we utilize the higher estimates that assume that alternative strategies to reduce seismic risk are not implemented, and thus the risks to the broader economy and public safety are ignored.

Environmental Benefits:

At equal levels of water exports, a water supply tunnel could have environmental benefits for endangered fish over the current diversion location in the south Delta that causes reverse flows in some Delta rivers and entrainment of endangered fish in the pumps. However, as water exports are increased beyond the no-tunnel estimate of 4.7 maf of average exports, the marginal environmental benefits of a tunnel diminish. The BDCP's most recent "effects analysis" found that an operating plan that includes 5.9 maf of average exports would harm many of the endangered species the BDCP intends to help. This benefit-cost analysis assumes an increase in water exports to a slightly lower level of 5.3 maf, near the top of the 4.3maf to 5.5maf range that is reported to be under current consideration. At higher levels of water exports, most if not all environmental benefits that could directly result from a tunnel are consumed or monetized in the form of higher water exports, and the environmental benefits of

Fish and Game. January 2008.
http://www.water.ca.gov/floodmgmt/dsmo/sab/drmsp/docs/AB1200_Report_to_Legislature.pdf.

[12] The seismic upgrade of only 8 islands was found to reduce the cost of water export interruptions from the largest Delta earthquake by 2/3, and the strategy had the largest overall economic risk reduction because it also protected other economic assets from flood in the case of an earthquake.

[13] The PPIC ruled out a "fortress Delta" solution in 2007, because its $4 billion cost was seen as too high, and they assumed a peripheral canal cost only $3 billion. The PPIC also ignored or downplayed public safety and the risk to non-water supply infrastructure. See "Envisioning Futures for the Sacramento-San Joaquin Delta" Public Policy Institute of California, February 2007. http://www.ppic.org/main/publication.asp?i=671

[14] If the tunnel conveyance were implemented as part of a Delta policy package that prevented or delayed seismic levee upgrades in the Delta, it could be argued that that the net earthquake risk reduction benefits of a tunnel are negative compared to the next best alternative.

the BDCP would come from an extensive program of habitat restoration separately funded by state and federal taxpayers. If the tunnel did not result in increased water exports, there could be an increase in environmental benefits, but the water supply benefits would drop to zero. This trade-off between export water supplies and environmental benefits has been at the center of much of Delta discussions. Because increased water exports are essential to financing the tunnel by water contractors, we believe that a more environmentally beneficial scenario of tunnel conveyance that does not result in increases export water supplies is financially infeasible and irrelevant. Thus, we focus on the most realistic case of high water exports.

Costs of a Delta Water Supply Tunnel

Capital Costs:

We use the $12.7 billion construction cost estimate from Chapter 8 of the February 29, 2012 Draft Bay Delta Conservation Plan (BDCP).[15] There are news reports that tunnel cost estimates have risen to $14 billion[16] and possibly more. However, the proposed design change to a 9,000 cfs system with three intakes and large gravity fed tunnels may reduce construction costs. The elimination of two intakes and an intermediate pumping plant from the original 15,000 cfs design could reduce the cost estimate by about $2 billion. However, the gravity flow tunnels may have to be larger than originally estimated[17] which would increase costs. Since there are conflicting reports that costs have increased or decreased by roughly $2 billion, we stay with the original cost estimate. These figures are easy to revise once updated cost estimates are available. In addition, this construction cost estimate does not include costs for "avoidance and minimization" measures associated with construction of the tunnel conveyance, since no cost estimate for this component was included in the most recent draft of BDCP.

Chapter 8 of the BDCP describes a financing strategy for construction that would involve issuing a series of 4 revenue bonds with 40 year repayment terms. Debt servicing costs are estimated at $1.1 billion annually from 2021 through 2056, and the last of the bonds would be retired in 2061. Table 8-61 of BDCP Chapter 8 details the distribution of the $12.7 billion in construction costs over time. The present value of these construction costs are $10.777 billion using a 3% discount rate and $9.205 billion using a 6% discount rate.

Operating and Maintenance Costs:

The February 29, 2012 draft BDCP estimates operation and maintenance costs for the Delta tunnel at $85 million annually, including $17.8 million in electricity costs.[18] For the 50 year

[15] http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/BDCP_Chapter_8_-_Implementation_Costs_and_Funding_Sources_2-29-12.sflb.ashx

[16] Weiser, M. *Sacramento Bee,* February 20, 2012. "Water Tunnels Would Be Huge Project—If They Clear Huge Obstacles."

[17] Chapter 8 of the BDCP states that the tunnels would accommodate 7,000 cfs gravity feed, and DWR representatives at the June 20 meeting says that sizing had not been finalized but acknowledged that 9,000 cfs gravity feed tunnels may have to be larger than 15,000 cfs tunnels with an intermediate pumping plant.

[18] The electricity share of operating costs could decrease if tunnels are sized for gravity flows. Since electricity is a relatively small share of operating costs, we have not made an adjustment without further details of the impact.

period beginning in 2025, the present value of operating and maintenance costs are $1.533 billion using a 3% discount rate and $665 million using a 6% discount rate.

In-Delta and Upstream Costs:

The water supply tunnel will generate a variety of costs on in-Delta and upstream uses. As discussed before, the large new diversion on the Sacramento River will degrade water quality for those who divert Sacramento River downstream from the proposed intakes. These users include Delta farmers, the Contra Costa Water District, the Cities of Antioch and Stockton, industrial user such as power plants in eastern Contra Costa County, and the North Bay Aquaduct that serves Napa and Solano. In addition, the footprint of the tunnel facility will eliminate Delta farmland and property (although less than a surface canal), and three massive new water intakes will create substantial visual and noise pollution along a scenic, rural stretch of the Sacramento River, harming Delta residents and detracting from recreation and tourism in the area. Upstream users, such as the North State Water Alliance, are concerned that the tunnel operation could reduce upstream water supplies, and result in lower reservoir levels which could affect hydroelectric power generation and recreational use of reservoirs.

Economic values have not been estimated for most of these impacts. The Delta Protection Commission Economic Sustainability Plan estimated a water conveyance tunnel would result in an average of $65 million in annual losses for Delta agriculture; including about $50 million in losses from reduced water quality, and an additional $15 million in annual crop losses from roughly 8,000 acres of farmland lost to construction impacts and the physical footprint of the facilities.[19] It is possible that a tunnel with fewer intakes and operated for environmental benefits would be more protective of in-Delta water quality and result in lower impacts on Delta agriculture. Even if Delta agriculture impacts were lower than $65 million, the other impacts to in-Delta urban water intakes, Delta communities, and upstream water users would surely push the overall cost of in-Delta and upstream impacts higher. We use $65 million as a very conservative, preliminary estimate of the annual costs to in-Delta and upstream interests, and have not made any estimate of in-Delta costs associated with the construction activity itself. For the 50 year period beginning in 2025, the present value of estimated in-Delta and upstream costs are $1.173 billion using a 3% discount rate and $509 million using a 6% discount rate.

Benefit-Cost Ratio

Table 2 summarizes the benefits and costs detailed in the previous section. Using both a 3% and 6% discount rate, the economic benefits of the tunnels are about $7 billion less than the costs. Even without discounting, meaning that the time value or opportunity cost of money is ignored, the benefits are still $500 million lower than the cost through 2074. The benefit-cost ratio ranges from 0.3 to 0.5 depending on the discount rate used. Alternatively, costs are two to three times higher than the benefits.

[19] http://www.forecast.pacific.edu/desp.html

Table 2 Benefits and Costs of Delta Tunnels through 2074

Results are expressed as present discounted values calculated with 3% and 6% discount rates. Ending year of 2074 is fifty years after estimated completion of tunnels in 2025. (millions of current dollars)

Benefits ($ millions)	**3% Discount Rate**	**6% Discount Rate**
Export Water Supply at 5.3 maf of exports	3,916	1,670
Export Water Quality	2,328	1,010
Earthquake Risk Reduction	866	376
Environmental Benefits at 5.3maf of exports	0	0
Total Benefits ($ millions)	**7,110**	**3,056**
Costs ($ millions)		
Debt Service Capital Cost	10,777	9,205
Operation and Maintenance	1,533	666
In-Delta and Upstream Impacts	1,173	509
Total Costs ($ millions)	**13,484**	**10,380**
Net Benefits ($ millions)	**-6,374**	**-7,324**
Benefit-Cost Ratio	**0.527**	**0.297**
Cost-Benefit Ratio	**1.90**	**3.36**

Table 3 Estimated Annual Benefits and Costs in 2030

Benefits ($ millions)	**2030 Benefits/Costs**
Export Water Supply at 5.3 maf of exports	217
Export Water Quality	129
Earthquake Risk Reduction	47
Environmental Benefits at 5.3maf of exports	0
Total Annual Benefits ($ millions)	393
Costs ($ millions)	
Debt Service Capital Cost	1,100
Operation and Maintenance	85
In-Delta and Upstream Impacts	65
Total Annual Costs ($ millions)	**1,250**

Although we have been careful to use the most recent reliable values from the BDCP and reports of other state agencies, there is uncertainty surrounding any assessment of this kind. The uncertainties and any omitted values are balanced between items that help and harm the economic case for the tunnels. For example, the in-delta and upstream costs are almost certainly underestimated, and include no in-Delta impacts from the construction process, in-Delta municipal water supply and quality impacts, and a host of potential upstream impacts on water supplies from the Sacramento Valley to the east side of the San Joaquin Valley. As discussed in a previous section, the earthquake risk reduction benefit is likely overstated since it ignores the alternative of seismic upgrades to the Delta levee system. The water supply benefits and capital costs may also prove to be too optimistic, further weakening the case for the tunnels. On the other hand, the tunnels would facilitate water transfers from areas north of the Delta, benefits that have not been valued in this analysis. In addition, the initial Brattle

results did not include urban benefits to Santa Clara which receives some of their water supplies from the Delta. The cost of the tunnels may also be reduced if an alternative with fewer intakes is selected. Overall the uncertainties and omissions are balanced and it seems very unlikely that any of them could be large enough to change the conclusion given the size of the gap between costs and benefits.

Some socio-economic considerations are also not included in the analysis. Most notably, the values of agricultural water do not include multiplier effects to capture the broader regional economic benefits created by water supplies. There are legitimate reasons why these indirect impacts are generally excluded from benefit-cost analysis, but the special role of agriculture in supporting the economic base of the Central Valley should be acknowledged. If these socio-economic values of agricultural production were included, the benefits would increase by about $100 million per year, a roughly 25% increase in total benefits. However, it is important to note that these socio-economic impacts are present for both areas that benefit from water exports from the tunnels, and for the in-Delta and upstream areas that are potentially harmed. Incorporating socio-economic impacts would increase both the benefits and the costs of the tunnels.

Financial Feasibility and Ratepayer Impacts

Benefit-cost analysis is sometimes confused with financial analysis and ratepayer impacts. Benefit-cost analysis does not estimate rate increases as these depend upon a number of financing assumptions, the amount of public investment, cost recovery principles, and business considerations of individual utilities. Benefit-cost analysis is a tool for policy analysis and decision making that informs whether a project is economically justified and should be built.

In contrast, financial feasibility analysis simply investigates whether a project can be financed and paid for, whether or not it is economically desirable or the most cost-effective way to meet a given objective. Financial feasibility must be demonstrated for certain regulatory requirements, and also must be proven to investors who are needed to buy bonds to finance construction. Financial feasibility is clearly linked to estimating ratepayer impacts since increased water rate revenue will be required to finance the bonds.

Despite the differences, the benefit-cost calculations raise serious questions about financial feasibility. If only the benefits and costs to water exporters in Table 2 are considered, the total benefits of the tunnels are still about $6 billion shy of the total costs that would be paid by the water agencies. However, there could be additional benefits to water agencies that are not accounted for in Table 2, such as the value of regulatory assurances that would be part of the BDCP. Financial feasibility also raises concerns about how the costs would be distributed across the state and federal water projects and urban and agricultural agencies.

Regulatory Assurance under the Endangered Species Act:

The tunnels are proposed as part of the BDCP, a habitat conservation plan (HCP) that may reduce regulatory risk to the exporting water agencies from further cuts in Delta water exports due to Endangered Species Act protections for endangered fish. This regulatory assurance would have tremendous value to the water agencies.

Despite its value to water agencies, we did not include regulatory assurance in the comprehensive benefit-cost analysis because the assurance does not create any value from a comprehensive, statewide perspective. Regulatory assurance transfers the risk of a negative environmental outcome from the export water agencies to the environment, taxpayers, and in-Delta and upstream resource users who might have to pay in place of water agencies if the tunnels turn out to be negative for endangered fish. If the value of the fisheries and the Delta environment are as high as the Brattle Group and BDCP estimate, then shifting this risk away from water exporters could actually be a net negative from a statewide perspective.

Despite the lack of statewide value, there is no denying that regulatory assurance is valuable to water exporters and contributes to their financial feasibility. But what is it worth? Preliminary modeling from the Brattle Group presented at the June 20, 2012 BDCP meeting suggests the value of regulatory assurance could be as high as $11 billion. That would exceed the $6-7 billion shortfall suggested by the benefit-cost analysis. However, this issue begs another important question.

Does regulatory assurance and a valid HCP granting incidental take permits for the water agencies require the peripheral tunnels? According to this analysis, the water agencies could pay up to $6 billion in habitat improvements for an HCP on the current through Delta conveyance system, and still come out economically ahead of paying for the $13 billion tunnels. It seems logical that the necessary investments for an HCP and regulatory assurance on a no-tunnel alternative would be no more expensive than the $4 billion expense of habitat creation in the current BDCP proposal. Taxpayers would benefit greatly from this approach since a water bond that further burdens the state's beleaguered general fund would be unnecessary to finance Delta habitat upgrades.

Will Costs Be Allocated Proportional to Water Supply, Economic Benefits, or Population?

Although the BDCP has yet to release a detailed financial plan with cost allocations between Delta export water agencies, the agencies have said that the cost of the tunnel would be paid in proportion to the water received through the tunnel. For example, Metropolitan Water District, has said it expects its ratepayers to pay for 28% of the cost of the tunnel, equivalent to their share of Delta water exports. However, the high cost of the Delta project raises serious affordability questions for the agricultural users who receive the majority of water exported from the Delta. The cost of irrigating with water exported through the tunnels would exceed the profits of many crops grown in the Central Valley.

A proportional financing plan is simple to implement, prevents cross-subsidies between urban and agricultural users and is consistent with California Proposition 218. However, financial feasibility for a proportional financing plan requires the benefits to exceed the cost for every water agency, a much tougher standard than assessing whether the collective benefits to the agencies exceed the collective costs to the agencies. As discussed above, a proportional cost allocation means the tunnels are clearly financially infeasible for agricultural water agencies who receive the majority of water exported from the Delta under proportional cost allocation.

The most recent draft of the BDCP suggests a non-proportional financing approach, and compares the cost of the tunnel to urban rather than agricultural water supply projects. In fact,

the draft BDCP financial analysis states the project is feasible because its per capita cost is smaller than some urban water projects financed by local urban water agencies. But the per capita financial feasibility analysis in the draft BDCP is inconsistent with the statements water contractors have made about proportional financing for the past five years. At the June 26, 2012 board meeting of the Metropolitan Water District (MWD), directors clearly expressed disapproval of the per capita financing suggested in the latest draft BDCP and MWD staff concurred.

Despite the fact that proportional cost allocation will clearly not work for financing the tunnels, water agencies have not put forward any other approach with their boards or ratepayers. The facts are that the tunnels are financially marginal for water agencies collectively, and that urban water use produces 2/3 of the benefit with 1/3 the water, and agricultural water use is 1/3 the benefit with 2/3 of the water. Financing the tunnels will either require a subsidy for agricultural users from urban ratepayers or taxpayers, or significant sales of water from agricultural to urban water agencies that will lead to fallowed fields in the Central Valley but more funds for bond repayment. But urban agencies and the government are adamant that there will be no ratepayer or taxpayer subsidies for farmers. And farmers insist that they have no intention of selling their water supplies to urban areas.

The result is that mere days from the Governor's expected announcement that the state is building the tunnels, water agencies still can't provide details on how much it will really cost their ratepayers or explain how they would generate the nearly $1.2 billion per year necessary for debt service and operating costs. There has been some informal discussion about pricing strategies that would yield more revenue for debt service such as differential pricing by reliability or allocating costs proportional to economic benefits instead of water quantity. However, it is unclear if such new pricing schemes are practical, supported by ratepayers or consistent with Proposition 218.

Of course, the main reason that financing the tunnels is so challenging is that the project does not provide economic benefits that exceed its cost. The recent recession is a powerful reminder that no amount of financial engineering can change the fundamental economics of an investment from bad to good.

Conclusion

This report updates an initial benefit-cost analysis of the water conveyance tunnels at the center of the Bay Delta Conservation Plan (BDCP). Primarily using the results of the BDCP's own economic benefit and cost studies, we find a benefit-cost ratios ranging from 0.3 to 0.5, meaning that there are between $1.90 and $3.36 of costs for every $1 in economic benefits. To put this in perspective, this benefit-cost ratio is 80% lower than those estimated for the State's high-speed rail project.

When these very low benefit-cost ratios are considered alongside the inconsistent and incomplete financial plans, it is clear that the Delta water conveyance tunnels proposed in the draft BDCP are not justified on an economic or financial basis.

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Is the Bay Delta Conservation Plan a Doable Deal?

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Part 1: DWR underestimates capital costs of BDCP water facility by $2 billion

Beats me whether the Bay Delta Conservation Plan ("BDCP") is a doable deal. My reaction is from a review of the meeting notes and materials posted by Chris Austin in Maven's Notebook on the July 17th presentation by the Department of Water Resources. Ms. Austin has provided an invaluable service of making available detailed meeting notes (in her characteristic factual style) and source documents for her readers. Whatever one's view is on the BDCP, all should express their gratitude to Maven.

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At this stage, the BDCP is still a “concept deal.” Some concept deals mature into real projects. Others wither away. Further refinements in analysis and consideration will determine BDCP’s destiny. BDCP has problem children:

- Capital costs: understated
- Cost of water: obscured
- Project risks: not transparently addressed
- The prospect of “New Water Bonds” (to fund conservation of species): overstated
- The case for economic benefits: not yet compelling

As the BDCP conversation moves from internal deliberations within DWR and its consultants to the water community, water users, public and (most importantly?) capital markets, BDCP proponents will find that they must address fundamental questions more thoroughly (and in some cases correctly). A prudent person needs more refinements and analysis before making a responsible “go” decision.

My Perspective

This is the first post in a series on the BDCP. My purpose is not to advocate on behalf or against the BDCP. Instead, my purpose is to share my perspective on the factual and analytical foundations behind DWR’s project assessment. As such, I am drawing upon more than three decades of experience in putting together transactions, conducting due diligence on water investments, and managing projects.

From this perspective, I read Chris Austin’s post of meeting notes and materials as an exercise in due diligence. Imagining myself in a conference room on the top floor of a downtown office building, the “DWR team” walked into the room to “pitch their deal” to a client. Here are my observations (commensurate with my remuneration?).

Before sharing my “client” report, let me state the limited scope of my review on project costs. I’m using DWR’s estimates of costs of the myriad of activities in the BDCP. I am also focusing on the water facility, although all the considerations discussed below may equally apply to mitigation activities and species conservation efforts. In effect, my client has asked me “can this dog hunt for water users”? For reasons discussed in my third post in this series, I look at the viability of public funding for conservation of species.

Environmental Concerns: A Court Battle over the Santa Ana Sucker August 19, 2013
Is Relying on the 2014 Water Bond To Help Fund California’s Bay Delta Conservation Plan A Good Bet? August 8, 2013

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August 13 update: Based on feedback, I was unclear about the "scenario" of my posts. Stratecon does not have a client for this analysis. Instead, I have taken the approach of SUPPOSE I had a client who asked me to conduct a due diligence review. As such, what would I say? The discussion and analysis is SOLELY mine. I apologize for the confusion. It has always been our policy (for 30 plus years) to disclose whether any issue written about also involves a client.

How Do the Numbers Work?

As a Ph.D. economist, I'm comfortable with "the lingo": constant dollars, nominal dollars, discount rates, real interest rates, nominal interest rates, present value and so on. Below, I focus on the cost of the water conveyance facility that accounts for the bulk of estimated project costs.

Let's start with the estimated capital cost of the BDCP's water facility. DWR estimates the sum of annual construction, design and (construction) permitting costs incurred over the first 10 years of the project at $14.5 billion (2012$) (Table 8-7, Chapter 8). The estimate is in 2012$; that is, the estimated cost of the project under 2012 market conditions. The cost estimate reflects historical cost estimates prepared in earlier years adjusted by "various price indices, including consumer price indices . . . and civil works construction cost indices . . ." (section 8.3.3, Chapter 8).

What is the project's anticipated start date? Not explicitly stated. I take a hint that the "first year of the project" is after receipt of permits from federal and state environmental agencies and through the permit term (section 8.3.1). Diving deep into the background materials, the first project year is evidently ~~2015~~ 2016 with construction expenditures occurring through 2025 (see Table 8-49, Chapter 8). A simple declarative sentence would have been appreciated–"assumption: the project starts in the year ~~2015~~ 2016."

Assuming that the cost projections are correct, the financial valuation calculates the present value of the capital expenditure schedule. (Oddly, DWR does not state of the date of its valuation–more below). Present value takes into account the time value of money. Since the cost

estimates are in 2012$, the calculation uses a “real interest rate” (an interest rate adjusted for inflation). Based on Department of Interior guidelines, DWR uses a real interest rate of 2.25%. Assuming an inflation rate of 2.1%, the real interest rate is consistent with a nominal interest rate (interest rate not adjusted by inflation) of 4.375% (approximately). The discussion at the July 22nd meeting raised issues about interest rate assumptions (see my next post in this series).

Under these assumptions, the present value of capital expenditures on the BDCP water facility is $12.7 billion (2012$) as of (the unstated valuation date of) January 1, ~~2015~~ 2016. (I was able to replicate within $7 million DWR’s estimate assuming a January 1, ~~2015~~ 2016 start date for calculation of present value–the small difference is probably due to rounding of numbers.)

Under the BDCP plan, state and federal water contractors would pay these construction costs, operation costs and mitigation costs. The present value of operating costs and mitigation costs each equal about 5% of the present value of capital costs. Therefore, the discussion continues its focus on the bulk of the financial commitment—capital costs.

Capital Costs of Water Facility Understated

DWR excludes three considerations (either by oversight or assumption) that understates the present value of capital costs for the water facility:

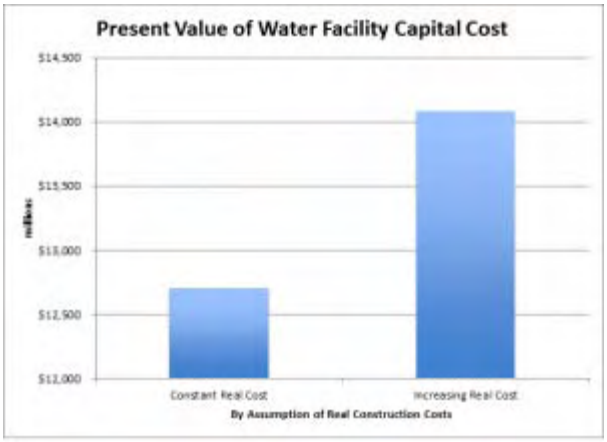
- Increases in real construction costs between 2012 and the construction period (oversight)
- Mid-year adjustment in the calculation of present value (technical oversight)
- Cost of finance (by assumption)

As shown below, reasonable accommodation for these considerations increases the estimated present value of capital costs by $1.9 to $2.2 billion. In other words, federal and state water contractors would have a $14.7 to $14.9 billion obligation to cover on January 1, 2015, not $12.7 billion in inflation-adjusted dollars.

Increases in Real Costs Between 2012 and the End of the Construction Period

As with many water projects, completion of construction is many years after the date of estimated capital costs (2012$). By concentrating on inflation-adjusted (2012) dollars, DWR correctly removes the effect of inflation. However, DWR did not consider the impact of changes in the real (inflation-adjusted) cost of construction activities. Since 2000, for example, the Bureau of Reclamation construction cost indices have increased at an annual rate of 3.7% while the Consumer Price Index increased at an annual rate of 2.6%. In other words, the real cost of construction activities (as measured by the Bureau's cost indices) has increased at an annual rate of 1.1%.

Remarkably, DWR does not discuss the trends in cost indices. Ironically, it updates historic cost estimates to 2012 with adjustment based on cost indices (see above). Based on the Bureau of Reclamation indices, projecting an annual increase of 1.1% in the inflation-adjusted cost through the construction period of the BDCP project increases the present value of water facility construction costs by $1.4, from $12.7 billion to $14.1 billion (see chart).



My purpose is not to criticize DWR (their approach is a common one). Instead, my purpose is to note that perhaps a reason construction projects are almost always more costly than initially estimated is that opinions of probable cost ignore increases in the real cost of construction between the time an opinion of probable cost is prepared and when construction is completed. Project analysis that ignores the trends in economic conditions misstates project costs. When real costs are rising, project costs are inevitably understated. The opposite is also true.

Mid-Year Adjustment

This is a technical issue worth $308 million. DWR calculates present value evidently assumes that all costs occur year-end. As a practical matter, cash flows occur throughout the year. The mid-year adjustment assumes that cash outflows are uniformly distributed throughout the year (consult a finance book for details). This adjustment is consistent with discussion at the July 17th meeting about taking into account accrued interest when the timing of cash outflows do not match the timing of cash inflows (more on this in my next post in this series).

Cost of Finance

DWR expressly does not develop a finance plan as part of its project assessment. While this is common practice, this materially understates the cost of BDCP capital investment. Capital financing is not free. Underwriting costs alone could be hundred of million of dollars.

Capital financings also have debt service requirements. For the State Water Project, the debt service reserve is 6 months of the maximum annual debt service payment over the life of bonds. The debt service requirement on a $14.4 billion capital investment is $409 million for a 40-year bond (DWR loan term) using DWR's interest rate assumptions. Water users must either put up this money at financing (a form of equity investment) or increase their borrowing by the amount of the debt reserve (the common practice in municipal finance).

There is good news about debt reserves. During the term of the financing, short-term interest can be earned (present value of interest earnings is $76 million assuming a 1% return from short-term, low risk instruments). When the bonds are paid-off, the debt reserve could also be released back to water users. Assuming that the term of the financing is 40 years, the present value of having $409 million released in 40 years is $72 million. Therefore, the net cost of the debt reserve is $260 million (rounded).

This estimate of the required debt reserve may be understated. While DWR puts up a debt reserve of 50% of maximum annual debt service, debt reserves of 100% of maximum annual debt service is more common in municipal finance. If this were the case for the BDCP water facility, then the net cost of the debt reserve would be $521 million.

In other words, by not developing a finance plan, DWR's cost analysis is incomplete. Again, DWR's approach is common in the industry. Economics and finance teach that the present value analysis (provided that one chooses the "correct" interest rate) accurately takes into account financing. The "correct" interest rate includes the interest payment to financiers plus an amortization of financing costs, such as underwriting costs (which are not included in my estimate) and debt reserves (which are included). Again, more on this in my next post in this series where the reader's bonus is yet another concept of interest–"true interest cost".

Altogether Now

The table below collects the adjustments (I show the range of the debt reserve depending on whether a debt reserve involves six months or one-year of maximum annual debt service):

Item	*Amount (billion)*
DWR Estimate of Present Value of Capital Expenditures	$12.708
Adjustment for Increased Real Costs Through Construction	$1.375
Sub-Total	$14.082
Mid-Year Adjustment	$0.308
Sub-Total	$14.390
Debt Service Reserve	
Size of reserve	$0.409 ($0.817)
Value of Earned Interest	-$0.076 (-$0.152)
Value of release at end of financing	-$0.057 (-$0.114)

Net Cost	$0.260 ($0.521)
Grand Total	$14.650 ($14,911)

Conclusion

Economics and finance must be integrated into project cost assessment and DWR's assessment of the BDCP water facility is no exception. Actual project costs depend on market conditions when they are built, not years earlier when preliminary cost analyses were prepared. Project financing includes more than interest rates. Financial reserves must also be committed. We will see that the finance plan will also have a critical impact on water costs incurred by water users when we discuss debt coverage ratios.

With a $14.7 to $14.9 billion estimated capital cost obligation, what is the cost of water for water users? See my next post in this series on interest rates, risk premium, risk assessments and the cost of water.

This entry was posted in Bay Delta Conservation Plan and tagged Capital Cost of BDCP water facility, Economic trends and opinion of probabl costs, Finance plan and project cost assessment on July 30, 2013 by Rodney T. Smith.

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Executive Blogger

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Will There Be Buyers of Bay Delta Conservation Plan Water?

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Beats me! Let's see.

California's Department of Water Resources ("DWR") argues that BDCP water is a bargain. I do not find the pitch compelling. The cost of water is understated. The BDCP water supply is "non-firm" and not at all comparable to alternatives discussed. What should be done? Use a subscription process and find out if federal and state water contractors are willing to enter into contracts to purchase BDCP water.

BDCP's $300/AF to $400/AF Water?

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DWR states that "with a cost of $13.3 billion, the implicit cost of water of the BDCP ranges from $302/AF to $408/AF." I have (approximately) replicated the calculation by amortizing the assumed cost over 50 years at a 3% interest rate divided by average annual yield of water for the high Delta outflow and low Delta outflow scenarios (differences due to rounding?). There are three reasons why these estimates are too low:

- BDCP cost estimates understated by $2 billion due to the growth in capital costs (adjusted for inflation) between preparation of opinions of probable cost and initiation of construction, timing requirements of cash flows during the construction period, and the cost of debt service reserves
- Ignores the difference in timing between the capital commitment (at the start of construction) versus the start of water deliveries (a decade later)
- Inadequate consideration of project risks

A more reasonable range for the estimated annual cost of BDCP water (inflation adjusted) is $625/AF $890/AF. And, this cost is before application of debt coverage ratios for capital financing to set water rates that would yield water rates in the range of $840/AF to $1,190/AF.

BDCP Water Is Inferior to Stated Alternatives

DWR also discusses BDCP water as if it were comparable to desalination, recycling and other local projects. BDCP water is not a reliable water supply. It is non-firm water. In contrast, desalination and recycling are reliable water supplies. In addition, these water sources deliver water at the buyer's distribution system. The BDCP water available at Banks and Tracy in Northern California. Moreover, the project risks (at least for desalination) are vastly different from the BDCP water conveyance facililty. For desalination projects, the technology has been around for decades (and improving). Seawater has been desalinated, delivered and used.

The "water yield" of the BDCP is the result of computer modeling

Even if BDCP water were cheaper than these alternatives (and it may not be—see above), BDCP should indeed sell at a significant discount. BDCP water supply is inferior.

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Is Relying on the 2014 Water Bond To Help Fund California's Bay Delta Conservation Plan A Good Bet? August 8, 2013

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The lack of comparability between BDCP and desalination is stunning. DWR's narrative on comparative costs suffers from a severe case of "oversell."

Find Committed Water Users

Rather than dueling commentary, a productive exercise would be to see if this project has any takers. Based on the reporting at mavensnotebook.com, the next steps are consultations on cost allocation among state and federal water contractors. A better approach would be to put together proposed contracts and see who signs up.

There are principles of market mechanisms address controversy in agency decision-making worth consideration:

Define project rights. The state and federal government could treat the BDCP water conveyance facility as a supplemental project. The definition of project water available can use DWR's calculation of BDCP project yield. A "BDCP unit" would be an apportioned share of project yield and an apportioned share of project costs to defined delivery points (Banks and Tracy). If DWR issues project debt, pass debt obligations through into a Unit's financial obligation (this follows approach of the original State Water Project).

If this sounds like the contract structure of the Colorado Big Thompson Project, it should. What is truly new? In fact, the Northern Colorado Water Conservancy District (project operator) used this approach for its original project in the 1950s, as well as for the Windy Gap project that represented a supplemental yield to the original project.

Subscription process. Rather than engaging in "discussions" of cost allocation between and among state and federal contractors, offer units to qualified water users. Qualified water users could be limited to existing stated and federal contractors or extended to entities that meet defined eligibility criteria. The BDCP water conveyance project is viable if water users enter into commitments to purchase at least the number of project units available. (If total offers exceed available units, allocate units on the basis of purchase offers.) If purchase orders are less than units available, then the project is not viable in its current form.

There are three alternatives in the case of insufficient water user interest:

- Market unsubscribed units to a broader class of water users than originally eligible
- Redesign the project to meet lower demand at prices acceptable to water users expressing an interest
- Abandon the project

Trading BDCP Units. The BDCP units would be binding contractual commitments of water users. Allow subsequent trading of units to allow flexibility in project utilization over times as circumstances change. Further, reward the water users that step up to the BDCP project at inception if this indeed proves an excellent investment. Over time, these water users can either enjoy the fruits of their wisdom or enjoy the financial rewards if the economic value of BDCP units appreciates over time. (The CPT price history suggests that the original founders of the Colorado Big-Thompson project made an excellent investment!)

*State and Federal Agencies Critical Rol*e. State and federal agencies continue their critical roles of defining, constructing and operating the BDCP water conveyance facility. Using market mechanisms to see if the BDCP water is worth the costs is not revolutionary. Water agencies have traded SWP Table A contracts and CVP entitlements in California since at least the 1990s. DWR assembled contracts for the original SWP project with interested water agencies willing to enter into long-term agreements to meet the SWP's planned size. While the "implementation problems" are legendary, the original SWP project represented an economic win as shown by water agencies paying millions of dollars to acquire Table A contract amounts, warts and all.

Why solicitation is better. The solicitation process enables each state and federal contractor to make its own decision. In contrast, "cost allocation" negotiations will understandably be dominated by how various "groups" should be treated. The exercise will understandably be co-opted by coalition building. There will be contractors who may find them coerced into a deal, if there is one.

If a BDCP water deal comes out of a non-sensual process, conflict has a tendency to prevail. As evidenced by California's experience with the Peripheral Canal a generation ago, project losers become ballot initiative opponents (more on this in a later post). With water bonds facing a headwind in today's economic environment, a divided water user

community does not bode well for the prospect of water bond initiatives.

Is BDCP Too Premature for a Water User Solicitation?

First, if it is too premature for a water user solicitation, how will cost allocation negotiations work? Either the parties have eoungh information about project yield and costs to make decisions, or they don't.

Second, one does not need complete and full information to make decisions. Has there ever been a real deal where this has been the case? I doubt it. To the extent that there are major uncertainties remaining, the terms of the offering can have specified outs—e.g, a price schedule not to exceed a defined amount, major milestones achieved no later than defined dates, etc. Unless there is sufficient interest in the project at this stage, why invest more time and millions of dollars of effort to find out later that "this dog won't hunt"?

Concluding Thought

California has the opportunity to build on its existing traditions of using market mechanisms. Putting the BDCP water conveyance project to a "market test" would be another step in the evolution of California water institutions. An added benefit would be that the market approach outlined above would be transparent and operated under rules known by all.

This entry was posted in Bay Delta Conservation Plan, Decision Making and tagged BDCD water supply, BDCP water v. desalination, cost of BDCP water on August 27, 2013 by Rodney T. Smith.

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September 4, 2013

Dr. Gerald Meral
Deputy Secretary
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Dear Jerry:

We look forward to having you and David Sunding at our September 12 meeting to discuss the economics of the BDCP. As you know, the Water Authority is conducting an assessment of several Delta fix proposals, including the BDCP preferred alternative. We are particularly interested in exploring the level of reliability assurance the San Diego region would be provided by these proposals and the range of financial obligations to which our ratepayers would be exposed.

Your May presentation to our board preceded the release of BDCP Chapter 8. We expected Chapter 8 to address many of the questions our directors raised with you during your presentation before them in May and the questions I provided by letter to you on August 28, 2012. You can understand our disappointment when we found that the most critical financing issues confronting the BDCP have yet to be addressed. The Water Authority's comments on the latest Chapter 8 draft were forwarded to you on July 30, 2013. We look forward to receiving a response.

As indicated in my prior correspondence, to assist in your preparation for September 12, we've summarized below questions you promised to answer when you spoke at our May Board meeting as well as a few questions raised by our board members since then. We would appreciate hearing your responses to these questions at the September 12 meeting. In addition, please note that at the July MWD meeting, our MWD delegates requested of Dr. Sunding that he provide specific information that would be valuable in informing the board on BDCP financing issues: 1) the detailed calculation that generated the "implicit water supply cost range" for BDCP; and 2) a complete cost benefit analysis to urban agencies, including the Water Authority. Both of these were referenced in Dr. Sunding's presentation to the MWD board. Dr. Sunding has informed us that he is not authorized to release this information to the Water Authority without the consent of the BDCP. I requested this information in my July 30 letter to you, and reiterate it here. Will you please provide these reports in advance of your September 12 appearance?

Questions

Project yield:

- A "decision tree" process is proposed to determine the yield of BDCP following the construction of the facilities, and thereafter, an adaptive management process will govern project operations. The cost-benefit analysis we've seen relies on a range of yields to determine the cost-benefit for contractors. How certain is BDCP on the range of yields to be produced following the decision tree/adaptive management process? Have the regulatory agencies agreed to provide any assurances that the yield from the high flow operational scenario would be the "floor" in terms of project yield?

Project financing mechanism:

- The project will benefit both contractors served by the State Water Project and Central Valley Project. How would the financial responsibilities for the federal contractors be structured?
- For the state contractors' portion, will it be financed through state revenue bonds similar to the existing structure? Will financing still depend upon the full faith and credit of the state of California? Will the state continue to require a step-up provision be included?
- Will property taxes be depended upon to provide the ultimate security for bond holders? Will the state rely upon contractors' existing taxing authority to back up their commitments to the BDCP? If so, would that require special legislation or a vote of the people?
- You have previously mentioned the possibility that the project may be financed through a joint powers agreement or a joint powers authority (or public financing authority) between project participants. We would appreciate it if you could clarify how each of these structures would work, and what the differences are between them.

Project cost sharing:

- At our Board May meeting, you mentioned that "it's hard to picture [parties financing things equally] sustaining itself." And that the BDCP is "not counting on any federal financing at all." You said that Dr. Sunding's report will show "the urban benefits of this project are enormous and … dwarf the ag benefits because … microchips (are) worth more than corn." You then said "that doesn't mean you have to change the proportional share of how you finance it … but ... will be a discussion between the ag and urban contractors… and [the Water Authority] will be undoubtedly an integral part of that." However, MWD management has repeatedly told its board the costs would be shared roughly half and half between the state water project contractors and the central project

contractors, and within each contractor group, obligations would be divided based upon contract entitlement; and we have not heard anything otherwise from MWD management. And although we appreciate the opportunity to participate in the BDCP Finance Workgroup, the Water Authority has been excluded from finance negotiations. Please clarify how the project cost would be allocated between urban and agricultural contractors and how the Water Authority may participate in these negotiation discussions.

- In Dr. Sunding's BDCP cost benefit analysis for individual urban agencies, what assumptions were used in terms of cost sharing between the urban and agricultural agencies?
- BDCP anticipates 33 percent of the total project financing to come from public financing (federal and state). What would happen if the public share of the costs does not materialize? Who would bear those costs?
- You have stated that the anticipated cost of the preferred alternative is approximately $5 per month per household. What is the calculation and assumptions you have used for that projection?

Existing agreements:

- How would various agreements such as the coordinated operations agreement between state and federal governments and Monterey agreements, and existing contracts (both at the state and federal level) be impacted by the project cost-sharing negotiations?

Project benefit sharing:

- You mentioned at our May Board meeting that BDCP is a "voluntary project" and that the "state cannot impose these costs on anyone, including [the Water Authority]." You said if an agency decides not to be part of the project, that desire would be honored and the project would be financed without those agencies. If wholesalers such as MWD or Kern County Water Agency decide to proceed with a project, but one or more of their member agencies does not want to do so, how would that agency opt-out of participating in the project? How would that work?
- If some contractors opt out and the project is built, how would the project "benefits" be allocated? Who will be the arbitrator in determining how much project yield post-BDCP is from the new conveyance facilities, and how much is from existing facilities?

Existing obligations to address environmental issues:

- You indicated in May that costs related to existing biological opinions and CVPIA environmental mitigations are approximately $800 million. We would like to know how those obligations are being addressed in the context of BDCP,

including who is paying for the existing obligations and who will be paying for these obligations as BDCP moves forward.

We look forward to seeing you and Dr. Sunding on September 12. If you have any questions before then, please do not hesitate to call.

Sincerely,

Maureen A. Stapleton
General Manager