

1 Section 5 breaks the cumulative analysis into two separate pieces which build upon each other.
 2 First, Section 5.2.1 examines concurrent project effects, considering potential additive effects of
 3 project components that are constructed during the same time period. Then, Section 5.2.2 describes
 4 the revisions to the cumulative analysis under each resource topic and the effects of these revisions
 5 on the cumulative impact analysis when considered in concert with the effects of the project effects
 6 described in Section 5.2.1. References have been made to specific sections of the chapters that have
 7 been revised. Analyses of the cumulative impacts for Alternatives 4A, 2D, and 5A are also included.

8 Table 5.2.1-1 in Section 5 of this RDEIR/SDEIS provides a summary of the potential interim
 9 implementation actions that could be implemented concurrently during the conveyance facility
 10 construction period as early implementation actions under CM2–CM11. The concurrent project
 11 analysis was included to ensure that the total combined impacts of the conveyance facility and other
 12 BDCP conservation measures (such as restoration actions scheduled to occur during conveyance
 13 facility construction) were fully evaluated in this RDEIR/SDEIS. Alternatives 4A, 2D, and 5A would
 14 not be expected to have the same magnitude of concurrent effects as other alternatives because
 15 habitat environmental commitments proposed under the new alternatives are limited to actions
 16 needed to offset effects of the conveyance facilities.

17 Proposed future projects that have since become more defined or developed since 2011 have been
 18 addressed in the revised cumulative impact analysis as appropriate in either a qualitative or
 19 quantitative fashion. The California Water Action Plan, California EcoRestore, and the Sustainable
 20 Groundwater Management Act are included in this list of interim implementation projects. For a
 21 complete list of such projects, consult Appendix 3D, *Defining Existing Conditions, No Action*
 22 *Alternative, No Project Alternative, and Cumulative Impact Conditions*, in Appendix A of the
 23 RDEIR/SDEIS.

24 **ES.4 Mitigation and Adaptive Management**

25 **ES.4.1 Mitigation Measures, Avoidance and Minimization** 26 **Measures, and Environmental Commitments**

27 This RDEIR/SDEIS presents the impacts of the action alternatives and incorporates a variety of
 28 methods to reduce adverse/significant impacts on the physical and human environment whenever it
 29 is feasible to do so. The methods used to reduce impacts include: 1) modification of project designs
 30 and construction assumptions to avoid or reduce potential project impacts, 2) incorporation of
 31 environmental commitments, AMMs and CMs into action alternatives, 3) application of additional
 32 mitigation measures to reduce alternative effects, and 4) use of a collaborative science, monitoring
 33 and adaptive management approach to address uncertainties and adjust project implementation as
 34 needed to avoid or reduce impacts. The following provides a summary of these methods used to
 35 reduce or avoid environmental effects with references to the various locations in the RDEIR/SDEIS.

36 **ES.4.1.1 Project Definition and Design of Project Elements**

37 This RDEIR/SDEIS includes analyses that reflect modification of the conveyance facility designs for
 38 Alternative 4, and the additional sub-alternatives 4A, 2D, and 5A. Design revisions were made to
 39 improve the constructability of the proposed conveyance facilities, reduce impacts on sensitive
 40 species and resources, avoid and reduce effects on private property owners, and reduce

1 construction costs. Some of the ways in which environmental effects have been reduced with new
2 facility designs include:

- 3 • Reducing visual and aesthetic resource and land use impacts related to north Delta diversion
4 intake pumping plants near the Sacramento River by consolidating and relocating the plants to
5 Clifton Court Forebay.
- 6 • Eliminating the realignment of SR 160 at the north Delta diversion intake sites to reduce
7 wetland/riparian impacts and effects on the Stone Lakes National Wildlife Refuge.
- 8 • Moving tunnel launch shaft sites off of Staten Island to reduce effects on greater sandhill cranes
9 and their habitat.
- 10 • Changing the location of permanent electric transmission lines to reduce potential effects on
11 bird species and aesthetic and visual resources effects.
- 12 • Consolidating reusable tunnel material disposal sites to use more State owned property and
13 reduce potential agricultural effects.
- 14 • Changing the tunnel alignment to terminate at the Northeast portion of Clifton Court Forebay on
15 State owned property.

16 Additionally, the new sub-alternatives are also defined to reduce the land use changes and
17 agricultural land conversion associated with natural community restoration and protections needed
18 to offset conveyance facility effects. Please refer to Section 3, *Conveyance Facility Modifications to*
19 *Alternative 4* and Section 4, *New Alternatives: Alternatives 4A, 2D, and 5A* for an overview of the
20 conveyance facility construction design changes.

21 **ES.4.1.2 Environmental Commitments, AMM's and Conservation** 22 **Measures**

23 This RDEIR/SDEIS also includes environmental commitments and AMMs that are Best Management
24 Practices and other actions that have been incorporated into the action alternatives to avoid and
25 reduce potential environmental impacts. CMs which are part of BDCP Alternatives 1A–9 (including
26 the modified Alternative 4 presented in this RDEIR/SDEIS) are intended to offset the biological
27 effects of the alternatives and establish a strategy to improve conditions for covered species. These
28 commitments, AMMs and CMs are distinguished from mitigation measures in that they are
29 commitments built into the definition of the action alternatives as compared to mitigation measures
30 which are recommended to reduce adverse or significant environmental impacts. For the new sub-
31 alternatives 4A, 2D, and 5A, environmental commitments are also included in the project definition
32 to distinguish habitat and other project components that have been modified from conservation
33 measures presented for BDCP Alternatives 1A–9 in the Draft EIR/EIS. All of the environmental
34 commitments and summaries of the AMMs are presented in Appendix 3B, *Environmental*
35 *Commitments, AMMs and CMs* in RDEIR/SDEIS Appendix A, along with a discussion of how the
36 actions would be effective at reducing various environmental effects.

37 **ES.4.1.3 Mitigation Measures**

38 To meet the requirements of CEQA and NEPA, mitigation measures are recommended in this
39 RDEIR/SDEIS to reduce significant or adverse impacts of the action alternatives to the extent
40 possible. Mitigation measures are recommended when the project design, environmental
41 commitments, AMMs and CMs are not sufficient to reduce impacts or when these project measures

1 are not relevant to a particular impact. In many cases mitigation measures are recommended to
 2 reduce the construction effects of conveyance facilities on resources located within the conveyance
 3 facility alignments. For example, impacts on agriculture, recreation, aesthetics and visual resources,
 4 and cultural resources that occur within conveyance facility alignments are identified as significant
 5 impacts for which mitigation measures are recommended to reduce the impacts. In other cases,
 6 mitigation measures are proposed to reduce impacts of the conveyance facilities on sensitive
 7 receptors or infrastructure such as in the case of air quality, noise, transportation and public
 8 services impacts. Although many of the operational effects of the conveyance facilities have been
 9 reduced by design of the facility operational criteria and rules, which reflect state and federal
 10 requirements of SWP/CVP operation, additional mitigation measures are included for some of the
 11 water quality and fish and aquatic resources impacts. In a number of cases significant impacts are
 12 identified for CEQA purposes that cannot be fully mitigated to a less-than-significant level. In all of
 13 these cases, mitigation measures are recommend to attempt to reduce the potential impact to the
 14 greatest extent possible.

15 Please refer to Table ES-9, Summary of BDCP/California WaterFix RDEIR/SDEIS Impacts and
 16 Mitigation Measures for a detailed summary of all of the impacts and mitigation measures included
 17 in the RDEIR/SDEIS. Full text of the mitigation measures are included by reference and presented in
 18 Appendix A and the Draft EIR/EIS.

19 **ES.4.2 Collaborative Science and Adaptive Management** 20 **Program**

21 Considerable scientific uncertainty exists regarding the Delta ecosystem, including the effects of CVP
 22 and SWP operations and the related operational criteria. To address this uncertainty, DWR,
 23 Reclamation, CDFW, USFWS, NMFS, and the public water agencies will establish a robust program of
 24 collaborative science, monitoring, and adaptive management. For the purposes of analysis, it is
 25 assumed that the Adaptive Management and Monitoring Plan (AMMP) developed for Alternative 4A
 26 would not, by itself, create nor contribute to any new significant environmental effects; instead, the
 27 AMMP would influence the operation and management of facilities and protected or restored habitat
 28 associated with Alternative 4A.

29 Collaborative science and adaptive management will support the proposed project by helping to
 30 address scientific uncertainty where it exists, and as it relates to the benefits and impacts of the
 31 construction and operations of the new water conveyance facility and existing CVP and SWP
 32 facilities. Specifically, collaborative science and adaptive management will, as appropriate, develop
 33 and use new information and insight gained during the course of project construction and operation
 34 to inform and improve:

- 35 ● the design of fish facilities including the intake fish screens;
- 36 ● the operation of the water conveyance facilities under the Section 7 biological opinion and
 37 2081(b) permit; and
- 38 ● habitat restoration and other mitigation measures conducted under the biological opinions and
 39 2081(b) permits.

40 In summary, the broad purposes of the program will be to: (1) undertake collaborative science, (2)
 41 guide the development and implementation of scientific investigations and monitoring for both

1 permit compliance and adaptive management, and (3) apply new information and insights to
2 management decisions and actions. Each purpose is further described below.

3 **Collaborative Science**

4 The program will provide guidance and recommendations on relevant science related to the
5 operations of the CVP and SWP within the Delta to inform implementation of the existing BiOps for
6 the coordinated operations of the SWP and CVP and the 2081(b) permit for the SWP facilities and
7 operations, as well as for the new biological opinion and 2081(b) for this proposed project. The
8 collaborative science effort will build on the progress being made by the existing Collaborative
9 Science and Adaptive Management Program (CSAMP) that was established to make
10 recommendations on the science needed to inform implementation of or potential changes to the
11 existing BiOps for the SWP and CVP operations, and proposed alternative management actions. The
12 CSAMP process and its Collaborative Adaptive Management Team (CAMT) rely on the Delta Science
13 Program to provide independent peer review of both science proposals and products.

14 Results from the collaborative science produced under the program would inform policy makers
15 from the agencies implementing or overseeing the proposed project. These policy makers would
16 determine whether and how to act on the information within the regulatory contexts of the
17 biological opinions, 2081(b) permits, and other relevant authorizations (e.g., Corps permits, State
18 Board authorizations).

19 **Monitoring**

20 Monitoring is a critical element of the adaptive management program and a required component of
21 ESA Section 7 biological opinions and CESA 2081(b) permits. In addition, monitoring is a critical
22 element of the collaborative science process that informs adaptive management decision-making.
23 The proposed compliance and effectiveness monitoring program for the CESA 2081(b) permit is
24 described in Chapter 6 of that permit application. These monitoring programs overlap but have
25 distinct elements owing to their overlapping but distinct species lists.

26 **Management Recommendations, Decisions, and Actions**

27 The collaborative science effort is expected to inform operational decisions within the ranges
28 established by the biological opinion and 2081(b) permit for the proposed project. However, if new
29 science suggests that operational changes may be appropriate that fall outside of the operational
30 ranges evaluated in the biological opinion and authorized by the 2081(b) permit, the appropriate
31 agencies will determine whether those changes should be implemented. An analysis of the biological
32 effects of any such changes will be conducted to determine if those effects fall within the range of
33 effects analyzed and authorized under the biological opinion and 2081(b) permit. If NMFS, USFWS,
34 or CDFW determine that impacts to listed species are greater than those analyzed and authorized
35 under the biological opinion and 2081(b) permit, consultation may need to be reinitiated and/or the
36 permittees may need to seek a 2081(b) permit amendment. Likewise, in the unlikely event analysis
37 shows that impacts to water supply are greater than those analyzed in this EIR/EIS, it may be
38 necessary to complete additional environmental review to comply with CEQA or NEPA.

39 The collaborative science process will also inform the design and construction of the fish screens on
40 the new intakes. This requires active study to maximize water supply, ensure flexibility in their
41 design and operation, and minimize effects to covered species. The collaborative science process

1 will similarly inform adaptive management of habitat restoration and other mitigation measures
2 required by the existing and new biological opinion and 2081(b) permit.

3 **Structure of Collaborative Science**

4 The collaborative science elements of the program will build on the experience gained in the CSAMP
5 process, Collaborative science for the proposed project is expected to follow a similar organizational
6 model in which management decisions are made by the appropriate agencies within their
7 authorities and collaborative science is undertaken by managers and scientists from participating
8 entities, and other stakeholders as will be described in the Memorandum of Agreement (MOA)
9 between DWR, Reclamation, the public water agencies, CDFW, NMFS, and USFWS. In keeping with
10 the existing CSAMP model, future members of the collaborative science process will have expertise
11 or technical skills that would enable them to contribute to the tasks outlined above. Membership
12 from each group will be limited to maintain the effectiveness of the group. Other senior scientists
13 may be invited to participate by mutual consent. If useful, the group could form technical subgroups
14 or use existing subgroups to inform its work. Decisions about what science to pursue would be made
15 by consensus. The group will integrate the work of relevant existing groups and processes (e.g.,
16 Delta Science Program and Interagency Ecological Program) to avoid duplicating work.

17 Funding for collaborative science and monitoring will be implemented, when feasible, using existing
18 resources from state, federal, and other programs, and the mitigation program of the water
19 conveyance facility. The mitigation program has money dedicated to the monitoring necessary to
20 support effective implementation of mitigation actions. Proponents of the collaborative science and
21 monitoring program will agree to provide or seek additional funding when existing resources are
22 insufficient. The budget will be based on annual workplans. The proponents also will ensure the
23 availability of funding for monitoring and the requirements defined in the biological opinion and
24 2081(b) permit.

25 **Scientific Basis for Adaptive Management**

26 Adaptive management is a systematic process to continually improve management policies and
27 practices by learning from our actions (Holling 1978; Walters 1986). It requires well-articulated
28 management objectives to guide decisions about what science to try, and explicit assumptions about
29 expected outcomes to compare against actual outcomes (Williams et al. 2009). Adaptive
30 management uses a process to clearly articulate objectives, identify management alternatives,
31 predict management consequences, recognize key uncertainties in advance, and monitor and
32 evaluate outcomes. This structured and systematic process is what differentiates adaptive
33 management from a trial and error approach (National Research Council 2004a; Williams 2011a).
34 Learning, facilitated through deliberate design and testing, is an integral component of adaptive
35 management (Williams et al. 2009; Allen et al. 2011; Williams 2011a).

36 Adaptive management is a particularly useful framework in the face of scientific uncertainty. The
37 principles of adaptive management lend themselves to water management and ecological
38 restoration in the Bay-Delta (CALFED Bay-Delta Program 2000; Reed et al. 2007, 2010; Healey 2008;
39 Dahm et al. 2009; National Research Council 2011; Parker et al. 2011, 2012; Delta Stewardship
40 Council 2013). In particular, a National Research Council (2011) panel found that despite the
41 challenges, there often is no better option for implementing water management regimes. The
42 adaptive management program for the proposed project will be designed and implemented with
43 these principals and scientific guidance in mind.