

## 4.3.4 Water Quality

The water quality changes described for Alternative 4A reflect assumed water conveyance facilities operations. Alternative 4A includes water conveyance operational criteria similar to Alternative 4 (Operational Scenario H), but would be limited to operations within the range of Scenarios H3 and H4, as fully described in Chapter 3, *Description of Alternatives*, in Appendix A of the RDEIR/SDEIS. Alternative 4A operations are represented by the Scenarios H3 and H4 as follows:

- Scenario H3 – Includes spring outflow consistent with D-1641 and fall outflow consistent with Fall X2 requirements of the FWS 2008 BiOp.
- Scenario H4 – Includes higher spring outflow requirements than D-1641, and Fall X2 requirements of the FWS 2008 BiOp.

H3 and H4 operational criteria differ in the spring outflow that is assumed, and represent the range of operational effects of Alternative 4A. The facilities operations and maintenance impact analysis compares Alternative 4A results over the range of outcomes from the operational sub-scenarios to Existing Conditions (CEQA) and the No Action Alternative (NEPA).

The water quality changes described for Alternative 4A are also affected by assumptions regarding the extent of habitat restoration to be implemented. As described in Section 4.1.2, *Description of Alternative 4A*, of this RDEIR/SDEIS, Alternative 4A does not include the full suite of conservation actions included in Alternative 4. Aside from the water conveyance facilities, the most important differences from a water quality perspective are:

- CM2 – Yolo Bypass Improvements: this is included in Alternative 4, but not included in Alternative 4A; and
- CM4 – Tidal Natural Communities Restoration: includes 65,000 acres in Alternative 4, but would be significantly less under Alternative 4A.

This results in somewhat different patterns of water withdrawals from the Delta, and potentially somewhat different effects on water quality and aquatic habitat conditions in the Plan Area than analyzed for Alternative 4. As described in Section 4.1.2, *Description of Alternative 4A*, of this RDEIR/SDEIS, actions associated with Alternative 4 that are not proposed to be implemented under Alternative 4A would continue to be pursued as part of existing, but separate, projects and programs associated with the 2008 USFWS and 2009 NMFS BiOps (e.g., 8,000 acres of tidal habitat restoration and Yolo Bypass improvements), California EcoRestore, and the 2014 California Water Action Plan.

The analysis of boron, bromide, chloride, Dissolved organic carbon (DOC), electrical conductivity (EC), and nitrate under Alternative 4A in the ELT is based on modeling conducted for Alternative 4 in the ELT, which assumes implementation of Yolo Bypass Improvements and 25,000 acres of tidal natural communities restoration. As described above, Yolo Bypass Improvements are not a component of Alternative 4A and the amount of tidal habitat restoration (i.e. Environmental Commitment 4) would be significantly less than that represented in the modeling. In general, the significance of this difference is that the assessment of bromide, chloride, and EC for Alternative 4A, relative to Existing Conditions and the No Action Alternative (ELT), likely overestimates increases in bromide, EC, and chloride that could occur, particularly in the west Delta. Nevertheless, there is notable uncertainty in the results of all quantitative assessments that refer to modeling results, due

1 to the differing assumptions used in the modeling and the description of Alternative 4A and the No  
2 Action Alternative (ELT).

3 Due to the reduced suite of environmental commitments in Alternative 4A compared to Alternative  
4 4 (in particular, significantly less tidal restoration), there generally are fewer significant impacts  
5 identified for Alternative 4A than for Alternative 4.

6 Impact WQ-1: Effects on Ammonia Concentrations Resulting from Facilities Operations and  
7 Maintenance

#### 8 *Upstream of the Delta*

9 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS),  
10 substantial point and non-point sources of ammonia-N do not exist upstream of the SRWTP at  
11 Freeport in the Sacramento River watershed, in the watersheds of the eastern tributaries  
12 (Cosumnes, Mokelumne, and Calaveras Rivers), or upstream of the Delta in the San Joaquin River  
13 watershed. Thus, like Alternative 4, operation of the water conveyance facilities under Alternative  
14 4A would have negligible, if any, effect on ammonia concentrations in the rivers and reservoirs  
15 upstream of the Delta relative to Existing Conditions and the No Action Alternative (ELT and LLT).  
16 Any negligible increases in ammonia-N concentrations that could occur in the water bodies of the  
17 affected environment located upstream of the Delta would not be of frequency, magnitude and  
18 geographic extent that would adversely affect any beneficial uses or substantially degrade the  
19 quality of these water bodies, with regard to ammonia.

#### 20 *Delta*

21 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS), a  
22 substantial decrease in Sacramento River ammonia concentrations is expected under Alternative 4A  
23 relative to Existing Conditions, due to planned lowering of ammonia in the SRWTP effluent  
24 discharge, and this is expected to decrease ammonia concentrations for all areas of the Delta that are  
25 influenced by Sacramento River water. Concentrations of ammonia at locations not influenced  
26 notably by Sacramento River water would change little relative to Existing Conditions, due to the  
27 similarity in San Joaquin River and San Francisco Bay concentrations and the lack of expected  
28 changes in either of these concentrations. Thus, Alternative 4A would not result in substantial  
29 increases in ammonia concentrations in the Plan Area, relative to Existing Conditions.

30 Relative to the No Action Alternative (ELT and LLT), the primary mechanism that could potentially  
31 alter ammonia concentrations under Alternative 4A is decreased flows in the Sacramento River,  
32 which would lower dilution available to the SRWTP discharge. This flow change would be  
33 attributable only to operations of the water conveyance facilities, since the same assumptions  
34 regarding SRWTP discharge ammonia concentrations, water demands, climate change, and sea level  
35 rise apply to both Alternative 4A and the No Action Alternative (ELT and LLT). A simple mass  
36 balance calculation was performed to calculate ammonia concentrations downstream of the SRWTP  
37 discharge (i.e., downstream of Freeport) under Alternative 4A and the No Action Alternative (ELT)  
38 to assess the effects of the flow changes. Monthly average CALSIM II flows at Freeport and the  
39 upstream ammonia concentration (0.04 mg/L-N; Central Valley Water Board 2010a:5) were used,  
40 together with the SRWTP permitted average dry weather flow (181 mgd) and seasonal ammonia  
41 limitations (1.5 mg/L-N in Apr–Oct, 2.4 mg/L-N in Nov–Mar), to estimate the average change in  
42 ammonia concentrations downstream of the SRWTP. Table 4.3.4-1 shows monthly average and  
43 long-term annual average predicted concentrations under the H3 and H4 operations scenarios. As

1 Table 4.3.4-1 shows, average monthly ammonia concentrations in the Sacramento River  
2 downstream of Freeport (upon full mixing of the SRWTP discharge with river water) under  
3 Alternative 4A and the No Action Alternative (ELT) are expected to be similar. In comparison to the  
4 No Action Alternative (ELT), minor increases in monthly average ammonia concentrations would  
5 occur during January through March, July through September, and during November for both  
6 operations scenarios (H3 and H4). Minor decreases in ammonia concentrations are expected for  
7 scenarios H3 and H4 in April and May. A minor increase in the annual average concentration would  
8 occur under Alternative 4A, compared to the No Action Alternative (ELT). Relative to the No Action  
9 Alternative (LLT), Alternative 4A is expected to result in similar minor increases in Sacramento  
10 River ammonia concentration, because the increased water demands, climate change, and sea level  
11 rise in the LLT would occur under both alternatives, and neither would affect ammonia sources or  
12 loading. The estimated ammonia concentrations in the Sacramento River downstream of Freeport  
13 under Alternative 4A would be similar to existing source water concentrations for the San Francisco  
14 Bay and San Joaquin River. Consequently, changes in source water fraction anticipated under  
15 Alternative 4A, relative to the No Action Alternative (ELT and LLT), are not expected to substantially  
16 increase ammonia concentrations at any Delta locations.

17 Ammonia concentrations downstream of Freeport in the Sacramento River under Alternative 4A  
18 would be similar to those under Alternative 4 (see Table 8-67 in Appendix A of the RDEIR/SDEIS).  
19 As stated for Alternative 4, any negligible increases in ammonia concentrations that could occur at  
20 certain locations in the Delta under Alternative 4A would not be of frequency, magnitude and  
21 geographic extent that would adversely affect any beneficial uses or substantially degrade the water  
22 quality at these locations, with regard to ammonia.

23 Table 4.3.4-1. Estimated Ammonia (mg/L as N) Concentrations in the Sacramento River Downstream  
24 of the Sacramento Regional Wastewater Treatment Plant for the No Action Alternative Early Long-  
25 term (ELT) and Alternative 4A

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Average
No Action Alternative (ELT)	0.076	0.082	0.068	0.060	0.057	0.060	0.058	0.062	0.067	0.060	0.067	0.063	0.065
Alternative 4A, Scenario H3	0.076	0.086	0.068	0.061	0.058	0.061	0.057	0.060	0.067	0.063	0.071	0.075	0.067
Alternative 4A, Scenario H4	0.076	0.086	0.068	0.061	0.058	0.061	0.057	0.060	0.067	0.063	0.071	0.066	0.066

26

27 *SWP/CVP Export Service Areas*

28 As discussed above, for areas of the Delta that are influenced by Sacramento River water, including  
29 Banks and Jones pumping plants, ammonia-N concentrations are expected to decrease under  
30 Alternative 4A, relative to Existing Conditions (in association with less diversion of water influenced  
31 by the SRWTP). Like Alternative 4, this decrease in ammonia-N concentrations for water exported  
32 via the south Delta pumps is not expected to result in an adverse effect on beneficial uses or  
33 substantially degrade water quality of exported water, with regard to ammonia. Furthermore, as  
34 discussed above, for all areas of the Delta, including Banks and Jones pumping plants, ammonia  
35 concentrations are not expected to be substantially different under Alternative 4A relative to the No  
36 Action Alternative (ELT and LLT). Thus, any negligible increases in ammonia concentrations that

1 could occur at Banks and Jones pumping plants would not be of frequency, magnitude and  
2 geographic extent that would adversely affect any beneficial uses or substantially degrade water  
3 quality at these locations, with regard to ammonia.

4 *NEPA Effects:* In summary, ammonia concentrations in water bodies upstream of the Delta, in the  
5 Plan Area, and the waters exported to the SWP/CVP Export Service Areas are not expected to be  
6 substantially different under Alternative 4A relative to the No Action Alternative (ELT and LLT).  
7 Thus, effects of the water conveyance facilities on ammonia are considered to be not adverse.

8 *CEQA Conclusion:* The magnitude and direction of changes in ammonia concentrations in water  
9 bodies upstream of the Delta, in the Plan Area, or the waters exported to the SWP/CVP Export  
10 Service Areas would be approximately the same as expected under Alternative 4, relative to Existing  
11 Conditions. There would be no substantial, long-term increase in ammonia concentrations in the  
12 rivers and reservoirs upstream of the Delta, in the Plan Area, or the waters exported to the CVP and  
13 SWP service areas under Alternative 4A relative to Existing Conditions. As such, Alternative 4A is  
14 not expected to cause additional exceedance of applicable water quality objectives/criteria by  
15 frequency, magnitude, and geographic extent that would cause adverse effects on any beneficial uses  
16 of waters in the affected environment. Because ammonia concentrations are not expected to  
17 increase substantially, no long-term water quality degradation is expected to occur and, thus, no  
18 adverse effects on beneficial uses would occur. Ammonia is not CWA Section 303(d) listed within  
19 the affected environment and thus any minor increases that could occur in some areas would not  
20 make any existing ammonia-related impairment measurably worse because no such impairments  
21 currently exist. Because ammonia is not bioaccumulative, minor increases that could occur in some  
22 areas would not bioaccumulate to greater levels in aquatic organisms that would, in turn, pose  
23 substantial health risks to fish, wildlife, or humans. Based on these findings, this impact is  
24 considered to be less than significant. No mitigation is required.

25 Impact WQ-2: Effects on Ammonia Concentrations Resulting from Implementation of  
26 Environmental Commitments 3, 4, 6–12, 15, and 16

27 *NEPA Effects:* Some habitat restoration activities included in Environmental Commitments 3, 4, and  
28 6–11 would occur on lands in the Delta formerly used for irrigated agriculture. Although this may  
29 decrease ammonia loading to the Delta from agriculture, increased biota in those areas as a result of  
30 restored habitat may increase ammonia loading originating from flora and fauna. Ammonia loaded  
31 from organisms is expected to be converted rapidly to nitrate by established microbial communities.  
32 Thus, these land use changes would not be expected to substantially increase ammonia  
33 concentrations in the Delta. Implementation of Environmental Commitments 12, 15, and 16 do not  
34 include actions that would affect ammonia sources or loading. Based on these findings, the effects on  
35 ammonia from the implementation Environmental Commitments 3, 4, 6–12, 15, and 16 under  
36 Alternative 4A are determined to not be adverse.

37 *CEQA Conclusion:* Land use changes that would occur from the environmental commitments are not  
38 expected to substantially increase ammonia concentrations, because the amount of area to be  
39 converted would be small relative to existing habitat, and any resulting ammonia would likely be  
40 rapidly converted to nitrate. Thus, it is expected there would be no substantial, long-term increase in  
41 ammonia concentrations in the rivers and reservoirs upstream of the Delta, in the Plan Area, or the  
42 waters exported to the SWP/CVP Export Service Areas due to implementation of Environmental  
43 Commitments 3, 4, 6–12, 15, and 16 relative to Existing Conditions. As such, implementation of these  
44 environmental commitments would not be expected to cause additional exceedance of applicable

1 water quality objectives/criteria by frequency, magnitude, and geographic extent that would cause  
2 significant impacts on any beneficial uses of waters in the affected environment. Because ammonia  
3 concentrations would not be expected to increase substantially from implementation of these  
4 environmental commitments, no long-term water quality degradation would be expected to occur  
5 and, thus, no significant impact on beneficial uses would occur. Ammonia is not CWA Section 303(d)  
6 listed within the affected environment and thus any minor increases that could occur in some areas  
7 would not make any existing ammonia-related impairment measurably worse because no such  
8 impairments currently exist. Because ammonia is not bioaccumulative, minor increases that could  
9 occur in some areas would not bioaccumulate to greater levels in aquatic organisms that would, in  
10 turn, pose substantial health risks to fish, wildlife, or humans. Based on these findings, this impact is  
11 considered less than significant. No mitigation is required.

12 Impact WQ-3: Effects on Boron Concentrations Resulting from Facilities Operations and  
13 Maintenance

14 *Upstream of the Delta*

15 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS),  
16 under Alternative 4A there would be no expected change to the sources of boron in the Sacramento  
17 River and east-side tributary watersheds and, thus, resultant changes in flows from altered system-  
18 wide operations would have negligible, if any, effects on the concentration of boron in the rivers and  
19 reservoirs of these watersheds. The modeled annual average lower San Joaquin River flow at  
20 Vernalis would decrease by 1%, relative to Existing Conditions (in association with the different  
21 operational components of Alternative 4A in the ELT, climate change, and increased water  
22 demands) (Table Bo-1 in Appendix B of this RDEIR/SDEIS). The reduced flow relative to Existing  
23 Conditions would result in possible increases in long-term average boron concentrations of up to  
24 about 0.5% relative to the Existing Conditions. Flows would remain virtually the same as the No  
25 Action Alternative (ELT), and thus flow changes would not result in substantial boron increases  
26 relative to the No Action Alternative (ELT). The increased boron concentrations, relative to Existing  
27 Conditions, under Alternative 4A in the ELT would not increase the frequency of exceedances of any  
28 applicable objectives or criteria and would not be expected to cause further degradation at  
29 measurable levels in the lower San Joaquin River, and thus would not cause the existing impairment  
30 there to be discernibly worse. Consequently, Alternative 4A in the ELT would not be expected to  
31 cause exceedance of boron objectives/criteria or substantially degrade water quality with respect to  
32 boron, and thus would not adversely affect any beneficial uses of the Sacramento River, the east-side  
33 tributaries, associated reservoirs upstream of the Delta, or the San Joaquin River.

34 Effects of Alternative 4A in reservoirs and rivers upstream of the Delta in the LLT relative to Existing  
35 Conditions and the No Action Alternative (LLT) would be expected to be similar, because the climate  
36 change and sea level rise that would occur in the LLT would not affect boron sources in these areas.

37 *Delta*

38 Effects of water conveyance facilities on boron under Alternative 4A in the Delta would be similar to  
39 the effects discussed for Alternative 4. To the extent that habitat restoration actions would alter  
40 hydrodynamics within the Delta region, which affects mixing of source waters, these effects are  
41 included in this assessment of water quality changes due to water conveyance facilities operations  
42 and maintenance. However, there would be less potential for increased boron concentrations at  
43 western Delta locations associated with restoration environmental commitments under Alternative

1 4A because very little would occur relative to Alternative 4. Other effects of environmental  
2 commitments not attributable to hydrodynamics are discussed within Impact WQ-4. See Chapter 8,  
3 Section 8.3.1.3, *Plan Area*, in Appendix A of the RDEIR/SDEIS for more information regarding the  
4 hydrodynamic modeling methodology.

5 The effects of Alternative 4A relative to Existing Conditions and the No Action Alternative (ELT) are  
6 discussed together because the direction and magnitude of predicted change are similar. Relative to  
7 the Existing Conditions and No Action Alternative (ELT), Alternative 4A would result in increased  
8 long-term average boron concentrations for the 16-year period modeled at most of the interior  
9 Delta locations (increases up to 8% at the S. Fork Mokelumne River at Staten Island, 11% at Franks  
10 Tract, and 15% at Old River at Rock Slough) (Tables Bo-4 and Bo-5 in Appendix B of this  
11 RDEIR/SDEIS). The long-term average boron concentrations at most of the western Delta  
12 assessment locations would not change measurably. The long-term annual average and monthly  
13 average boron concentrations, for either the 16-year period or drought period modeled, would  
14 never exceed the 2,000 µg/L human health advisory objective (i.e., for children) or the 500 µg/L  
15 agricultural objective at the majority of assessment locations, which represents no change from the  
16 Existing Conditions and No Action Alternative (ELT) (Table Bo-3 in Appendix B of this  
17 RDEIR/SDEIS). A small increase in the frequency of exceedances 500 µg/L agricultural objective at  
18 the Sacramento River at Mallard Island (i.e., as much as 7% in the drought period relative to the No  
19 Action Alternative [ELT]) would not be anticipated to substantially affect agricultural diversions  
20 which occur primarily at interior Delta locations. Minor reductions in long-term average assimilative  
21 capacity of up to 9% at interior Delta locations (i.e., Old River at Rock Slough) would occur with  
22 respect to the 500 µg/L agricultural objective (Tables Bo-6 and Bo-7 in Appendix B of this  
23 RDEIR/SDEIS). However, because the absolute boron concentrations would still be well below the  
24 lowest 500 µg/L objective for the protection of the agricultural beneficial use under Alternative 4A,  
25 the levels of boron degradation would not be of sufficient magnitude to substantially increase the  
26 risk of exceeding objectives or cause adverse effects to municipal and agricultural water supply  
27 beneficial uses, or any other beneficial uses, in the Delta (Figure Bo-1 in Appendix B of this  
28 RDEIR/SDEIS).

29 Effects of Alternative 4A in the Delta in the LLT, relative to Existing Conditions and the No Action  
30 Alternative (LLT), would be expected to be similar to those described above for the ELT. Boron  
31 concentrations may be higher at western Delta locations due to greater effects of climate change on  
32 sea level rise that would occur in the LLT; however, these effects are independent of the alternative.  
33 Further, boron is of concern in waters diverted for agricultural use, which primarily occurs in the  
34 interior Delta, and based on Delta source water characteristics (see Table 8-42 in Appendix A of the  
35 RDEIR/SDEIS), boron concentrations in the interior Delta would be expected to remain suitable for  
36 agricultural use.

#### 37 *SWP/CVP Export Service Areas*

38 Under the Alternative 4A, long-term average boron concentrations would decrease at the Banks  
39 pumping plant (as much as 25%) and at Jones pumping plant (as much as 22%) relative to Existing  
40 Conditions, and the reductions would be similar compared to No Action Alternative (ELT) (Tables  
41 Bo-4 and Bo-5 in Appendix B of this RDEIR/SDEIS) as a result of export of a greater proportion of  
42 low-boron Sacramento River water. Commensurate with the decrease in exported boron  
43 concentrations, boron concentrations in the lower San Joaquin River may be reduced and would  
44 likely alleviate or lessen any expected increase in boron concentrations at Vernalis associated with  
45 flow reductions (see discussion of Upstream of the Delta), as well as locations in the Delta receiving

1 a large fraction of San Joaquin River water. Reduced export boron concentrations also may  
2 contribute to reducing the existing CWA Section 303(d) impairment in the lower San Joaquin River  
3 and associated TMDL actions for reducing boron loading. These same effects on boron at the Banks  
4 and Jones pumping plants would be expected in the LLT, because the primary effect of climate  
5 change on sea level rise and boron concentrations is expected in the western Delta.

6 Maintenance of SWP and CVP facilities under Alternative 4A would not be expected to create new  
7 sources of boron or contribute towards a substantial change in existing sources of boron in the  
8 affected environment.

9 *NEPA Effects:* In summary, relative to the No Action Alternative (ELT and LLT), Alternative 4A  
10 would result in relatively small increases in long-term average boron concentrations in the Delta,  
11 not measurably increase boron levels in the lower San Joaquin River, and reduce boron levels in  
12 water exported to the SWP/CVP export service areas. However, the predicted changes would not be  
13 expected to cause exceedances of applicable objectives or further measurable water quality  
14 degradation, and thus would not constitute an adverse effect on water quality.

15 *CEQA Conclusion:* Based on the above assessment, any modified reservoir operations and  
16 subsequent changes in river flows under Alternative 4A, relative to Existing Conditions, would not  
17 be expected to result in a substantial adverse change in boron levels upstream of the Delta. Small  
18 increases in boron levels predicted for interior Delta locations in response to a shift in the Delta  
19 source water percentages would not be expected to cause exceedances of objectives, or substantial  
20 degradation of these water bodies. Alternative 4A maintenance also would not result in any  
21 substantial increases in boron concentrations in the affected environment. Boron concentrations  
22 would be reduced in water exported from the Delta to the CVP/SWP Export Service Areas, thus  
23 reflecting a potential improvement to boron loading in the lower San Joaquin River.

24 Boron is not a bioaccumulative constituent, thus any increased concentrations under Alternative 4A  
25 would not result in adverse boron bioaccumulation effects to aquatic life or humans. Relative to  
26 Existing Conditions, Alternative 4A would not result in substantially increased boron concentrations  
27 such that frequency of exceedances of municipal and agricultural water supply objectives would  
28 increase. The levels of boron degradation that may occur under Alternative 4 would not be of  
29 sufficient magnitude to cause substantially increased risk for adverse effects to municipal or  
30 agricultural beneficial uses within the affected environment. Long-term average boron  
31 concentrations would decrease in Delta water exports to the SWP and CVP service area, which may  
32 contribute to reducing the existing CWA Section 303(d) impairment of agricultural beneficial uses in  
33 the lower San Joaquin River. Based on these findings, this impact is determined to be less than  
34 significant. No mitigation is required.

35 Impact WQ-4: Effects on Boron Concentrations Resulting from Implementation of  
36 Environmental Commitments 3, 4, 6–12, 15, and 16

37 *NEPA Effects:* The implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 for  
38 Alternative 4A present no new direct sources of boron to the affected environment, including areas  
39 upstream of the Delta, within the Delta region, and in the SWP/CVP Export Service Areas. Habitat  
40 restoration activities in the Delta, while involving increased land and water interaction within these  
41 habitats, would not be anticipated to contribute boron which is primarily associated with source  
42 water inflows to the Delta (i.e., San Joaquin River, agricultural drainage, and Bay source water).  
43 Moreover, some habitat restoration would occur on lands within the Delta currently used for  
44 irrigated agriculture, thus replacing agricultural land uses with restored habitats. The potential

1 reduction in irrigated lands within the Delta may result in reduced discharges of agricultural field  
2 drainage with elevated boron concentrations, which would be considered an improvement  
3 compared to the No Action Alternative (ELT and LLT). Consequently, as they pertain to boron,  
4 implementation of the environmental commitments would not be expected to adversely affect any of  
5 the beneficial uses of the affected environment.

6 *CEQA Conclusion:* Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 for  
7 Alternative 4A would not present new or substantially changed sources of boron to the affected  
8 environment upstream of the Delta, within Delta, or in the SWP/CVP Export Service Areas. As such,  
9 their implementation would not be expected to substantially increase the frequency with which  
10 applicable Basin Plan objectives or other criteria would be exceeded in water bodies of the affected  
11 environment located upstream of the Delta, within the Delta, or in the SWP/CVP Export Service  
12 Areas or substantially degrade the quality of these water bodies, with regard to boron. Based on  
13 these findings, this impact is considered to be less than significant. No mitigation is required.

14 Impact WQ-5: Effects on Bromide Concentrations Resulting from Facilities Operations and  
15 Maintenance Upstream of the Delta

#### 16 *Upstream of the Delta*

17 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS),  
18 under Alternative 4A in the ELT there would be no expected change to the sources of bromide in the  
19 Sacramento River and east-side tributary watersheds. Thus, changes in the magnitude and timing of  
20 reservoir releases north and east of the Delta would have negligible, if any, effect on the sources, and  
21 ultimately the concentration of bromide in the Sacramento River, the eastside tributaries, and the  
22 various reservoirs of the related watersheds. The modeled annual average lower San Joaquin River  
23 flow at Vernalis would decrease slightly (1%) compared to Existing Conditions and would remain  
24 virtually the same as the No Action Alternative (ELT), and thus flow changes would not result in  
25 substantial bromide increases. Moreover, there are no existing municipal intakes on the lower San  
26 Joaquin River, which is the beneficial use most sensitive to elevated bromide concentrations.  
27 Consequently, Alternative 4A in the ELT would not be expected to adversely affect the MUN  
28 beneficial use, or any other beneficial uses, of the Sacramento River, the San Joaquin River, the  
29 eastside tributaries, or their associated reservoirs upstream of the Delta due to changes in bromide  
30 concentrations.

31 Effects of Alternative 4A in reservoirs and rivers upstream of the Delta in the LLT relative to Existing  
32 Conditions and the No Action Alternative (LLT) would be expected to be similar, because the climate  
33 change and sea level rise that would occur in the LLT would not affect bromide sources in these  
34 areas.

#### 35 *Delta*

36 Modeling scenarios included assumptions regarding how certain habitat restoration activities would  
37 affect Delta hydrodynamics. To the extent that restoration actions would alter hydrodynamics  
38 within the Delta region, which affects mixing of source waters, these effects are included in this  
39 assessment of water quality changes due to water conveyance facilities operations and maintenance.  
40 Other effects of environmental commitments not attributable to hydrodynamics are discussed  
41 within Impact WQ-6. See Chapter 8, Section 8.3.1.3, *Plan Area*, in Appendix A of the RDEIR/SDEIS for  
42 more information regarding the modeling methodology.



1 Estimates of bromide concentrations at Delta assessment locations were generated using a mass  
2 balance approach, and using relationships between EC and chloride and between chloride and  
3 bromide and DSM2 EC output. See Chapter 8, Section 8.3.1.3, *Plan Area*, in Appendix A of the  
4 RDEIR/SDEIS for more information regarding these modeling approaches. The assessment below  
5 identifies changes in bromide at Delta assessment locations based on both approaches.

6 Based on the mass balance modeling approach for bromide, relative to Existing Conditions,  
7 Alternative 4A long-term average bromide concentrations would increase in the S. Fork Mokelumne  
8 River at Staten Island, and decrease at all other assessment locations (Table Br-1 in Appendix B of  
9 this RDEIR/SDEIS). Average bromide concentrations at Staten Island would increase from 50 µg/L  
10 under Existing Conditions to 63–64 µg/L (26–28% increase depending on operations scenario) for  
11 the modeled 16-year hydrologic period (1976–1991). However, multiple interior and western Delta  
12 assessment locations would have an increased frequency of exceedance of 50 µg/L, which is the  
13 CALFED Drinking Water Program goal for bromide as a long-term average applied to drinking water  
14 intakes (Table Br-1 in Appendix B of this RDEIR/SDEIS). These locations are the S. Fork Mokelumne  
15 River at Staten Island, Franks Tract, Old River at Rock Slough, Sacramento River at Emmaton, San  
16 Joaquin River at Antioch, and Sacramento River at Mallard Island. The greatest increase in frequency  
17 of exceedance of the CALFED Drinking Water Program long-term goal of 50 µg/L would occur in the  
18 S. Fork Mokelumne River (24–25% increase depending on operations scenario) and Sacramento  
19 River at Emmaton (2–4% increase depending on operations scenario). The increase in frequency of  
20 exceedance of the 50 µg/L threshold at the other locations would be 2% or less. Similarly, these  
21 locations would have an increased frequency of exceedance of 100 µg/L, which is the concentration  
22 believed to be sufficient to meet currently established drinking water criteria for disinfection  
23 byproducts (Table Br-1 in Appendix B of this RDEIR/SDEIS). The greatest increase in frequency of  
24 exceedance of 100 µg/L would occur at Franks Tract (6% increase) and San Joaquin River at Antioch  
25 (4–5% increase depending on operations scenario). The increase in frequency of exceedance of the  
26 100 µg/L threshold at the other locations would be 3% or less.

27 Changes in long-term average bromide concentrations and changes in threshold exceedance  
28 frequencies relative to the No Action Alternative (ELT) are generally of similar magnitude to those  
29 previously described relative to Existing Conditions (Table Br-1 in Appendix B of this  
30 RDEIR/SDEIS). However, unlike the Existing Conditions comparison, relative to the No Action  
31 Alternative (ELT), long-term average bromide concentrations at Buckley Cove would increase under  
32 Alternative 4A, although the increases would be relatively small (<1%).

33 Results of the modeling approach which used relationships between EC and chloride and between  
34 chloride and bromide were consistent with the discussion above, and assessment of bromide using  
35 these modeling results leads to the same conclusions as are presented above for the mass balance  
36 approach (Tables Br-2 in Appendix B of this RDEIR/SDEIS).

37 Unlike Alternative 4, there would be no increased bromide concentration or frequency of  
38 exceedance of bromide thresholds in Barker Slough at the North Bay Aqueduct under Alternative 4A  
39 relative to Existing Conditions and the No Action Alternative (ELT). Also, the magnitude of bromide  
40 concentration increases at Mallard Slough and in the San Joaquin River at Antioch during their  
41 historical months of use, relative to Existing Conditions and the No Action Alternative (ELT) would  
42 be generally similar to those described for Alternative 4 (Tables Br-5 and Br-6 in Appendix B of this  
43 RDEIR/SDEIS), and the frequency of exceedance of bromide thresholds would be similar (Tables Br-  
44 3 and Br-4 in Appendix B of this RDEIR/SDEIS). As described for Alternative 4, the use of seasonal  
45 intakes at these locations is largely driven by acceptable water quality, and thus has historically

1 been opportunistic. Opportunity to use these intakes would remain, and the predicted increases in  
2 bromide concentrations at Antioch and Mallard Slough would not be expected to adversely affect  
3 MUN beneficial uses, or any other beneficial use, at these locations.

4 The effects of Alternative 4A in the LLT in the Delta region, relative to Existing Conditions and the  
5 No Action Alternative (LLT), would be expected to be similar to that described above. There may be  
6 higher bromide concentrations in the LLT in the western Delta, but this would be associated with  
7 sea level rise, not the project alternative, because the primary source of bromide to the Delta is sea  
8 water intrusion.

#### 9 *SWP/CVP Export Service Areas*

10 Under Alternative 4A, long-term average bromide concentrations at the Banks and Jones pumping  
11 plants, based on the mass balance modeling approach, would decrease. Long-term average bromide  
12 concentrations for the modeled 16-year hydrologic period at the pumping plants would decrease by  
13 as much as 48% relative to Existing Conditions and 44% relative to the No Action Alternative (ELT)  
14 (Table Br-1 in Appendix B of this RDEIR/SDEIS). As a result, less frequent exceedances of the 50  
15 µg/L and 100 µg/L assessment thresholds would occur and an overall improvement in SWP/CVP  
16 Export Service Areas water quality would occur respective to bromide. Commensurate with the  
17 decrease in exported bromide, an improvement in lower San Joaquin River bromide would also  
18 occur since bromide in the lower San Joaquin River is principally related to irrigation water  
19 deliveries from the Delta. Results of the modeling approach which used relationships between EC  
20 and chloride and between chloride and bromide are consistent with the mass balance results, and  
21 assessment of bromide using these modeling results leads to the same conclusions as are presented  
22 for the mass balance approach (Table Br-2 in Appendix B of this RDEIR/SDEIS).

23 The effects of Alternative 4A in the LLT in the SWP/CVP Export Service Areas, relative to Existing  
24 Conditions and the No Action Alternative (LLT), would be expected to be similar to that described  
25 above, because the sea level rise that could occur in the LLT would not be expected to result in  
26 substantial bromide contributions to the water exported at Banks and Jones pumping plants.

27 Maintenance of SWP and CVP facilities under Alternative 4A would not be expected to create new  
28 sources of bromide or contribute towards a substantial change in existing sources of bromide in the  
29 affected environment. Maintenance activities would not be expected to cause any substantial change  
30 in bromide such that MUN beneficial uses, or any other beneficial use, would be adversely affected  
31 anywhere in the affected environment.

32 *NEPA Effects:* In summary, the operations and maintenance activities under Alternative 4A, relative  
33 to the No Action Alternative (ELT and LLT) would result in an increased frequency of exceedance of  
34 the 50 µg/L and 100 µg/L bromide thresholds for protecting against the formation of disinfection  
35 byproducts in treated drinking water at the S. Fork Mokelumne River at Staten Island, Franks Tract,  
36 Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, and  
37 Sacramento River at Mallard Island. However, long-term average bromide concentrations would  
38 increase only in the S. Fork Mokelumne River at Staten Island and San Joaquin River at Buckley  
39 Cove; there would be decreases in long-term average bromide concentrations at the other  
40 assessment locations. The long-term bromide concentration in the S. Fork Mokelumne River at  
41 Staten Island would be less than the concentration believed to be sufficient to meet currently  
42 established drinking water criteria for disinfection byproducts, and the increase in the San Joaquin  
43 River at Buckley Cove would be minimal (<1%). Thus, these increased bromide concentrations are

1 not expected to result in adverse affects to MUN beneficial uses, or any other beneficial use, at these  
2 locations. Based on these findings, this effect is determined to not be adverse.

3 *CEQA Conclusion:* While greater water demands under Alternative 4A would alter the magnitude  
4 and timing of reservoir releases north and east of the Delta, these activities would have negligible, if  
5 any, effect on the sources of bromide, and ultimately the concentration of bromide in the  
6 Sacramento River, the San Joaquin River, the eastside tributaries, and the various reservoirs of the  
7 related watersheds, as described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of  
8 the RDEIR/SDEIS).

9 Under Alternative 4A there would be an increased frequency of exceedance of the 50 µg/L and 100  
10 µg/L bromide thresholds for protecting against the formation of disinfection byproducts in treated  
11 drinking water at the S. Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock  
12 Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at  
13 Mallard Island. However, long-term average bromide concentrations would increase only in the S.  
14 Fork Mokelumne River at Staten Island and decrease at all other assessment locations. The long-  
15 term bromide concentration in the S. Fork Mokelumne River at Staten Island (63–64 µg/L) would be  
16 less than the 100 µg/L believed to be sufficient to meet currently established drinking water criteria  
17 for disinfection byproducts. Further, as described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in  
18 Appendix A of the RDEIR/SDEIS), the use of seasonal intakes at Antioch and Mallard Island is largely  
19 driven by acceptable water quality, and thus has historically been opportunistic and opportunity to  
20 use these intakes would remain. Thus, these increased bromide concentrations would not be  
21 expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations.

22 The assessment of effects on bromide in the SWP/CVP Export Service Areas is based on assessment  
23 of changes in bromide concentrations at Banks and Jones pumping plants. Long-term average  
24 bromide concentrations at the Banks and Jones pumping plants are predicted to decrease by as  
25 much as 48% relative to Existing Conditions and there would be less frequent exceedance of  
26 bromide concentration thresholds.

27 Based on the above, Alternative 4A would not cause exceedance of applicable state or federal  
28 numeric or narrative water quality objectives/criteria because none exist for bromide. Alternative  
29 4A would not result in any substantial change in long-term average bromide concentration or  
30 exceed 50 and 100 µg/L assessment threshold concentrations by frequency, magnitude, and  
31 geographic extent that would result in adverse effects on any beneficial uses within affected water  
32 bodies. Bromide is not a bioaccumulative constituent and thus concentrations under this alternative  
33 would not result in bromide bioaccumulating in aquatic organisms. Increases in exceedances of the  
34 100 µg/L assessment threshold concentration would be 6% or less at all locations assessed, which is  
35 considered to be less than substantial long-term degradation of water quality. The levels of bromide  
36 degradation that may occur under the Alternative 4A would not be of sufficient magnitude to cause  
37 substantially increased risk for adverse effects on any beneficial uses of water bodies within the  
38 affected environment. Bromide is not CWA Section 303(d) listed and thus the minor increases in  
39 long-term average bromide concentrations would not affect existing beneficial use impairment  
40 because no such use impairment currently exists for bromide. Based on these findings, this impact is  
41 less than significant. No mitigation is required.

1 Impact WQ-6: Effects on Bromide Concentrations Resulting from Implementation of  
2 Environmental Commitments 3, 4, 6–12, 15, and 16

3 *NEPA Effects:* Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 would present  
4 no new sources of bromide to the affected environment, including areas Upstream of the Delta,  
5 within the Plan Area, and the SWP/CVP Export Service Areas. Some habitat restoration activities  
6 would occur on lands in the Delta formerly used for irrigated agriculture. Such replacement or  
7 substitution of land use activity would not be expected to result in new or increased sources of  
8 bromide to the Delta. Therefore, as they pertain to bromide, implementation of these environmental  
9 commitments would not be expected to adversely affect MUN beneficial use, or any other beneficial  
10 uses, of the affected environment.

11 Environmental Commitment 4 would result in some tidal habitat restoration, however, the areal  
12 extent would be small relative to the existing and No Action Alternative tidal area and, thus not  
13 expected to appreciably affect the magnitude of daily tidal water exchange at the restoration areas  
14 or alter other hydrodynamic conditions in adjacent Delta channels that would result in measurable  
15 bromide concentration changes.

16 In summary, implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 under  
17 Alternative 4A relative to the No Action Alternative (ELT and LLT), would have negligible, if any,  
18 effects on bromide concentrations. Therefore, the effects on bromide from implementing  
19 Environmental Commitments 3, 4, 6–12, 15, and 16 are determined to not be adverse.

20 *CEQA Conclusion:* Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 under  
21 Alternative 4A would not present new or substantially changed sources of bromide to the affected  
22 environment. Some environmental commitments may replace or substitute for existing irrigated  
23 agriculture in the Delta. This replacement or substitution would not be expected to substantially  
24 increase or present new sources of bromide. Thus, implementation of Environmental Commitments  
25 3, 4, 6–12, 15, and 16 would have negligible, if any, effects on bromide concentrations throughout  
26 the affected environment, would not cause exceedance of applicable state or federal numeric or  
27 narrative water quality objectives/criteria because none exist for bromide, and would not cause  
28 changes in bromide concentrations that would result in significant impacts on any beneficial uses  
29 within affected water bodies. Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16  
30 would not cause significant long-term water quality degradation such that there would be greater  
31 risk of significant impacts on beneficial uses, would not cause greater bioaccumulation of bromide,  
32 and would not further impair any beneficial uses due to bromide concentrations because no uses are  
33 currently impaired due to bromide levels. Based on these findings, this impact is considered less  
34 than significant. No mitigation is required.

35 Impact WQ-7: Effects on Chloride Concentrations Resulting from Facilities Operations and  
36 Maintenance

37 *Upstream of the Delta*

38 The effects of Alternative 4A on chloride concentrations in reservoirs and rivers upstream of the  
39 Delta would be the similar to those effects described for Alternative 4 (see Chapter 8, Section 8.3.3.9  
40 in Appendix A of the RDEIR/SDEIS). Chloride loading in these watersheds would remain unchanged  
41 and resultant changes in flows from altered system-wide operations would have negligible, if any,  
42 effects on the concentration of chloride in the rivers and reservoirs of these watersheds. There  
43 would be no expected change to the sources of chloride in the Sacramento River and east-side

1 tributary watersheds, and changes in the magnitude and timing of reservoir releases north and east  
2 of the Delta would have negligible, if any, effect on the sources, and ultimately the concentration of  
3 chloride in the Sacramento River, the eastside tributaries, and the various reservoirs of the related  
4 watersheds. The modeled annual average lower San Joaquin River flow at Vernalis would decrease  
5 slightly (1%) compared to Existing Conditions and would remain virtually the same as the No Action  
6 Alternative (ELT), and thus flow changes would not result in substantial chloride increases.  
7 Moreover, there are no existing municipal intakes on the lower San Joaquin River. Consequently,  
8 Alternative 4A in the ELT would not be expected to cause exceedances of chloride  
9 objectives/criteria or substantially degrade water quality with respect to chloride, and thus would  
10 not adversely affect any beneficial uses of the Sacramento River, the eastside tributaries, associated  
11 reservoirs upstream of the Delta, or the San Joaquin River.

12 Effects of Alternative 4A in reservoirs and rivers upstream of the Delta in the LLT relative to Existing  
13 Conditions and the No Action Alternative (LLT) would be expected to be similar, because the climate  
14 change and sea level rise that would occur in the LLT would not affect chloride sources in these  
15 areas.

### 16 *Delta*

17 Modeling scenarios included assumptions regarding how certain habitat restoration activities would  
18 affect Delta hydrodynamics. The amount of habitat restoration completed under Alternative 4A  
19 would be substantially less than under Alternative 4. To the extent that restoration actions would  
20 alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are  
21 included in this assessment of water quality changes due to water conveyance facilities operations  
22 and maintenance. Other effects of environmental commitments not attributable to hydrodynamics  
23 are discussed within Impact WQ-8. See Chapter 8, Section 8.3.1.3, *Plan Area*, in Appendix A of the  
24 RDEIR/SDEIS for more information regarding the hydrodynamic modeling methodology.

25 Estimates of chloride concentrations at Delta assessment locations were generated using a mass  
26 balance approach and EC-chloride relationships and DSM2 EC output. See Chapter 8, Section 8.3.1.3,  
27 *Plan Area*, in Appendix A of the RDEIR/SDEIS for more information regarding these modeling  
28 approaches. The assessment below identifies changes in chloride at Delta assessment locations  
29 based on both approaches.

30 Modeling of chloride using both the mass balance approach and EC-chloride relationship predicts  
31 that Alternative 4A in the ELT would result in similar or reduced long-term average chloride  
32 concentrations, relative to Existing Conditions, for the 16-year period modeled at all assessment  
33 locations except for the S. Fork Mokelumne River at Staten Island. The increase in long-term average  
34 chloride concentration at Staten Island would be 4 mg/L (25%) based on the mass balance modeling  
35 and 2 mg/L (9%) based on the EC-chloride relationship (Tables CI-6 through CI-9 in Appendix B of  
36 this RDEIR/SDEIS). These increases are extremely small in absolute terms and relative to applicable  
37 water quality objectives, and are within the estimated modeling uncertainty. The results differ from  
38 Alternative 4, under which there would be increased long-term average chloride concentrations also  
39 at the North Bay Aqueduct at Barker Slough. The change in long-term average chloride  
40 concentrations relative to the No Action Alternative (ELT) would be similar to those relative to  
41 Existing Conditions.

42 The following outlines the modeled chloride changes relative to the applicable objectives and  
43 beneficial uses of Delta waters.

1 *Municipal Beneficial Uses Relative to Existing Conditions*

2 Estimates of chloride concentrations generated using EC-chloride relationships were used to  
3 evaluate the 150 mg/L Bay-Delta WQCP objective for municipal and industrial beneficial uses on a  
4 basis of the percent of years the chloride objective is exceeded for the modeled 16-year period. The  
5 objective is exceeded if chloride concentrations exceed 150 mg/L for a specified number of days in a  
6 given water year at Antioch and Contra Costa Pumping Plant #1. For Alternative 4A, the modeled  
7 frequency of objective exceedance would decrease at the Contra Costa Pumping Plant #1 from 6.7%  
8 of years under Existing Conditions, to 0% of years under operations scenario H3 and H4 (Table CI-1  
9 in Appendix B of this RDEIR/SDEIS).

10 Evaluation of the 250 mg/L Bay-Delta WQCP objective for chloride utilized results from both the  
11 mass balance approach and EC-chloride relationship. The basis for the evaluation was the predicted  
12 number of days the objective would be exceeded for the modeled 16-year period.

13 Based on the mass balance approach, there would be a decreased frequency of exceedance of the  
14 250 mg/L objective under Alternative 4A, relative to Existing Conditions, at all locations except in  
15 the Sacramento River at Mallard Island and the Sacramento River at Emmaton. In the Sacramento  
16 River at Mallard Island, the frequency of objective exceedance would increase from 85% under  
17 Existing Conditions to 86% under Alternative 4A for the entire period modeled under both  
18 operations scenarios (Table CI-2 in Appendix B of this RDEIR/SDEIS). In the Sacramento River at  
19 Emmaton, there would be an increase in chloride objective exceedance during the drought period  
20 modeled, from 55% to 57% under operations scenario H3, although these changes are within the  
21 uncertainty of the modeling approach; there would be no increase in objective exceedances under  
22 operations scenario H4.

23 The mass balance results also indicate reduced assimilative capacity with respect to the 250 mg/L  
24 objective during certain months and at certain locations. In the San Joaquin River at Antioch, there  
25 would be a reduction in assimilative capacity in March and April of up to 18% for the 16-year period  
26 modeled, and 61% for the drought period modeled (Tables CI-12 and CI-14 in Appendix B of this  
27 RDEIR/SDEIS). Assimilative capacity at the Contra Costa Pumping Plant #1 also would be reduced,  
28 in February through June by up to 5% for the entire period modeled and 7% for the drought period  
29 modeled. These estimates include the effect of climate change and sea level rise, as well as the  
30 alternative. Comparisons to the No Action Alternative (ELT) below provide an assessment of the  
31 effect of the alternative alone.

32 When utilizing the EC-chloride relationship to model chloride concentrations for the 16-year period,  
33 trends in frequency of exceedance and use of assimilative capacity would be similar to that  
34 discussed when utilizing the mass balance modeling approach (Tables CI-3, CI-13, and CI-15 in  
35 Appendix B of this RDEIR/SDEIS). However, the EC-chloride relationships predicted changes of  
36 lesser magnitude, where predictions of change utilizing the mass balance approach were generally  
37 of greater magnitude, and thus more conservative. As discussed in Chapter 8, Section 8.3.1.3, *Plan*  
38 *Area*, in Appendix A of the RDEIR/SDEIS, in cases of such disagreement, the approach that yielded  
39 the more conservative predictions was used as the basis for determining adverse impacts.

40 *CWA Section 303(d) Listed Water Bodies—Relative to Existing Conditions*

41 Tom Paine Slough in the southern Delta is on the state's CWA Section 303(d) list for chloride with  
42 respect to the secondary MCL of 250 mg/L. Monthly average chloride concentrations at the Old  
43 River at Tracy Road for the 16-year period modeled, which represents the nearest DSM2-modeled

1 location to Tom Paine Slough, would be generally similar under Alternative 4A in the ELT relative to  
2 Existing Conditions, and thus, would not be further degraded on a long-term basis and Alternative  
3 4A in the ELT would thus not make this impairment discernibly worse (Figure CI-1 in Appendix B of  
4 this RDEIR/SDEIS).

5 Suisun Marsh also is on the state's CWA Section 303(d) list for chloride in association with the Bay-  
6 Delta WQCP objectives for maximum allowable salinity during the months of October through May,  
7 which establish appropriate seasonal salinity conditions for fish and wildlife beneficial uses. With  
8 respect to Suisun Marsh the monthly average chloride concentrations for the 16-year period  
9 modeled would generally increase under Alternative 4A in the ELT relative to Existing Conditions in  
10 March through May at the Sacramento River at Mallard Island (Figure CI-2 in Appendix B of this  
11 RDEIR/SDEIS) and at Collinsville (Figure CI-3 in Appendix B of this RDEIR/SDEIS), and increase  
12 substantially in October through May at Montezuma Slough at Beldon's Landing (i.e., over a doubling  
13 of concentration in December through February) (Figure CI-4 in Appendix B of this RDEIR/SDEIS).  
14 However, modeling of Alternative 4A assumed no operation of the Montezuma Slough Salinity  
15 Control Gates, but the project description assumes continued operation of the Salinity Control Gates,  
16 consistent with assumptions included in the No Action Alternative. A sensitivity analysis modeling  
17 run conducted for Alternative 4 scenario H3 at the LLT with the gates operational consistent with  
18 the No Action Alternative resulted in substantially lower EC levels than indicated in the original  
19 Alternative 4 modeling results for Suisun Marsh, but EC levels were still somewhat higher than EC  
20 levels under Existing Conditions for several locations and months. Although chloride was not  
21 specifically modeled in these sensitivity analyses, it is expected that chloride concentrations would  
22 be nearly proportional to EC levels in Suisun Marsh. Additionally, although these analyses were only  
23 conducted at the LLT, they are expected to generally also apply to the ELT. Another modeling run  
24 with the gates operational and restoration areas removed resulted in EC levels nearly equivalent to  
25 Existing Conditions (see Appendix 8H Attachment 1 in Appendix A of the RDEIR/SDEIS for more  
26 information on these sensitivity analyses). Since Alternative 4A in the ELT includes operation of the  
27 gates, and includes very little tidal restoration area, it is anticipated that chloride increases in Suisun  
28 Marsh predicted via the modeling would not occur, and that chloride in Suisun Marsh under  
29 Alternative 4A in the ELT would be very similar to Existing Conditions. For these reasons, any  
30 changes in chloride in Suisun Marsh are expected to have no adverse effect on marsh beneficial uses.

#### 31 *Municipal Beneficial Uses Relative to No Action Alternative (ELT)*

32 Similar to the assessment conducted for Existing Conditions, estimates of chloride concentrations  
33 generated from EC-chloride relationships were used to evaluate the 150 mg/L Bay-Delta WQCP  
34 objective for municipal and industrial beneficial uses. For Alternative 4A in the ELT, the modeled  
35 frequency of objective exceedance would not change at the Contra Costa Pumping Plant #1--the No  
36 Action Alternative (ELT) and Scenarios H3 and H4 all would have 0% exceedance (Table CI-1 in  
37 Appendix B of this RDEIR/SDEIS).

38 Based on the mass balance approach, the frequency of exceedance of the 250 mg/L objective under  
39 Alternative 4A in the ELT would be the same, or would decrease, at all locations relative to the No  
40 Action Alternative (ELT) (Table CI-2 in Appendix B of this RDEIR/SDEIS). Estimates of long-term use  
41 of assimilative capacity using the mass balance results indicated the potential for reduced  
42 assimilative capacity with respect to the 250 mg/L objective for certain months and locations.  
43 Calculations using the long-term monthly average concentrations showed that in the San Joaquin  
44 River at Antioch, there would be a reduction in assimilative capacity in April of 2% for the entire  
45 period modeled and 32% for the drought period modeled under operations scenario H3, but an

1 increase in assimilative capacity under operations scenario H4 for both the entire period modeled  
2 and the drought period (Tables CI-12 and CI-14 in Appendix B of this RDEIR/SDEIS). The same  
3 approach showed that assimilative capacity at the Contra Costa Pumping Plant #1 also would be  
4 reduced in March through June, by up to 5%, and in October by up to 21% for the entire period  
5 modeled. During the drought period modeled, there would be similar reductions of assimilative  
6 capacity in April through June by up to 3% and a reduction in assimilative capacity of up to 88% in  
7 September (Tables CI-12 and CI-14 in Appendix B of this RDEIR/SDEIS). However, this approach  
8 used long-term average chloride concentrations, which can be heavily influenced by changes in a  
9 small number of years when chloride concentrations would already be very high. Additionally, when  
10 long term averages are just below the objective, very small changes in chloride that are within the  
11 modeling uncertainty can result in very high estimates of use of assimilative capacity. To further  
12 investigate the potential for water quality degradation with respect to chloride, the concentrations  
13 of chloride during individual water years was examined.

14 This further examination was limited to the mass balance approach, since when utilizing the EC-  
15 chloride relationship to model monthly average chloride concentrations for the 16-year period,  
16 trends in frequency of exceedance and use of assimilative capacity were similar to that discussed for  
17 the mass balance modeling approach (Tables CI-3, CI-13, and CI-15 in Appendix B of this  
18 RDEIR/SDEIS). However, utilizing the EC-chloride relationships predicted changes of lesser  
19 magnitude, where predictions of change utilizing the mass balance approach were generally of  
20 greater magnitude, and thus more conservative. As discussed in Chapter 8, Section 8.3.1.3, *Plan Area*,  
21 in Appendix A of the RDEIR/SDEIS, in cases of such disagreement, the approach that yielded the  
22 more conservative predictions was used as the basis for determining adverse impacts.

23 Figure CI-9 shows chloride concentrations in April during the five-year drought period (1987–1991)  
24 at Antioch, where Tables CI-12 and CI-14 in Appendix B of this RDEIR/SDEIS indicated up to 32%  
25 use of assimilative capacity. The figure shows that during three of the five years, chloride  
26 concentrations increased relative to the No Action Alternative (ELT) and decreased in the other two  
27 years. The absolute differences estimated are fairly small and may be within modeling uncertainty.  
28 Figures CI-10 and CI-11 show a box and whisker plot and exceedance plot for April at Antioch for all  
29 dry and critical water years modeled (not just the 1987–1991 drought period). These graphs show  
30 that while the median chloride concentration is slightly increased relative to the No Action  
31 Alternative (ELT) under both scenarios, the maximums, 25<sup>th</sup> percentile, and 75<sup>th</sup> percentile values  
32 are all decreased. Based on this analysis, long-term degradation is not expected at Antioch in April  
33 during drought years.

34 Figure CI-12 shows chloride levels in September at Contra Costa Pumping Plant #1 during the  
35 drought period (1987–1991), where Tables CI-12 and CI-14 in Appendix B of this RDEIR/SDEIS  
36 indicated 88% use of assimilative capacity. In general, changes in chloride concentrations relative to  
37 the No Action Alternative (ELT) are fairly small, and may be within modeling uncertainty. Figures CI-  
38 13 and CI-14 show a box and whisker plot and exceedance plot for September at Contra Costa  
39 Pumping Plant #1 for all dry and critical water years modeled (not just the 1987–1991 drought  
40 period). These graphs show that the median chloride concentration is slightly decreased relative to  
41 the No Action Alternative (ELT) under both scenarios, and chloride concentrations are generally  
42 similar to the No Action Alternative (ELT) throughout the range seen. The 88% use of assimilative  
43 capacity was shown because long term averages were just below the criterion, so a very small  
44 increase in chloride (that is probably within the modeling uncertainty) resulted in a very high  
45 estimate of use of assimilative capacity. Similar results are shown in Figure CI-15, CI-16, and CI-17  
46 for October at Contra Costa Pumping Plant #1. Median concentrations decreased slightly, and the



1 exceedance plot shows generally similar concentrations throughout the range seen. Figure CI-15  
2 shows that while some years see increased concentrations (e.g., 1978, 1989), other years see  
3 decreased concentrations (e.g., 1980, 1982). Based on this analysis, long-term degradation is not  
4 expected at Contra Costa Pumping Plant #1 in September during drought years, or October on a  
5 long-term average basis.

6 Furthermore, sensitivity analyses conducted of Alternative 4 Scenario H3 without restoration areas  
7 indicated lower chloride levels in the western Delta than with the restoration areas. It is thus likely  
8 that modeling of Alternative 4A that does not include restoration areas would show lower levels of  
9 chloride at Antioch in April, and at Contra Costa Pumping Plant #1 in September and October than is  
10 shown herein using the Alternative 4 (ELT) modeling.

11 Based on the low level of water quality degradation estimated for the western Delta, and the lack of  
12 exceedance of water quality objectives, Alternative 4A is not expected to have substantial adverse  
13 effects on municipal and industrial beneficial uses in the western Delta.

#### 14 *CWA Section 303(d) Listed Water Bodies—Relative to No Action Alternative (ELT)*

15 With respect to the state's CWA Section 303(d) listing for chloride, Alternative 4A would generally  
16 result in similar changes to those discussed for the comparison to Existing Conditions. Monthly  
17 average chloride concentrations at Tom Paine Slough would not be further degraded on a long-term  
18 basis, based on changes that would occur in Old River at Tracy Road (Figure CI-1 in Appendix B of  
19 this RDEIR/SDEIS). Modeling indicated that monthly average chloride concentrations at source  
20 water channel locations for the Suisun Marsh would increase substantially in some months during  
21 October through May relative to the No Action Alternative (ELT) (Figures CI-2, CI-3, and CI-4 in  
22 Appendix B of this RDEIR/SDEIS), but the results of sensitivity analyses performed indicate that  
23 chloride increases in Suisun Marsh predicted via the modeling would not occur, and that chloride in  
24 Suisun Marsh under Alternative 4A in the ELT would be very similar to the No Action Alternative  
25 (ELT). Depending on where tidal restoration areas assumed to be included in the No Action  
26 Alternative are located, chloride concentrations under Alternative 4A could be less than under the  
27 No Action Alternative (ELT). For these reasons, any changes in chloride in Suisun Marsh are  
28 expected to have no adverse effect on marsh beneficial uses.

29 The effects of Alternative 4A in the LLT in the Delta region, relative to Existing Conditions and the  
30 No Action Alternative (LLT), would be expected to be similar to effects in the ELT. With greater  
31 climate change and sea level rise, additional outflow may be required at certain times to prevent  
32 increases in chloride in the west Delta. Small increases in chloride concentrations may occur in some  
33 areas, but it is not expected that these increases would cause exceedance of Bay-Delta WQCP  
34 objectives of cause substantial long-term degradation that would impact municipal and industrial  
35 beneficial uses.

#### 36 *SWP/CVP Export Service Areas*

37 Under Alternative 4A in the ELT, long-term average chloride concentrations at the Banks and Jones  
38 pumping plants, based on the mass balance analysis of modeling results for the 16-year period,  
39 would decrease relative to Existing Conditions. Chloride concentrations would be reduced by 42–  
40 47% at Banks pumping plant, depending on operations scenario (Tables CI-6 and CI-8 in Appendix B  
41 of this RDEIR/SDEIS). At Jones pumping plant, chloride concentrations would be reduced 41–43%,  
42 depending on operations scenario (Tables CI-6 and CI-8 in Appendix B of this RDEIR/SDEIS). The  
43 frequency of exceedances of applicable water quality objectives would decrease relative to Existing

1 Conditions, for both the 16-year period and the drought period modeled (Table CI-2 in Appendix B  
2 of this RDEIR/SDEIS). The chloride concentration changes relative to the No Action Alternative  
3 (ELT) would be similar. Consequently, water exported into the SWP/CVP Export Service Areas  
4 would generally be of similar or better quality with regard to chloride relative to Existing Conditions  
5 and the No Action Alternative (ELT). Results of the modeling approach which utilized a EC-chloride  
6 relationship are consistent these results, and assessment of chloride using these modeling output  
7 results in the same conclusions as for the mass balance approach (Tables CI-3, CI-7, and CI-9 in  
8 Appendix B of this RDEIR/SDEIS).

9 Commensurate with the reduced chloride concentrations in water exported to the SWP/CVP Export  
10 Service Area, reduced chloride loading in the lower San Joaquin River would be anticipated which  
11 would likely reduce chloride concentrations at Vernalis.

12 The effects of Alternative 4A in the LLT in the SWP/CVP Export Service Areas, relative to Existing  
13 Conditions and the No Action Alternative (LLT), would be expected to be very similar to effects in  
14 the ELT.

15 Maintenance of SWP and CVP facilities would not be expected to create new sources of chloride or  
16 contribute towards a substantial change in existing sources of chloride in the affected environment.  
17 Maintenance activities would not be expected to cause any substantial change in chloride such that  
18 any long-term water quality degradation would occur, thus, beneficial uses would not be adversely  
19 affected anywhere in the affected environment.

20 *NEPA Effects:* In summary, relative to the No Action Alternative (ELT and LLT), Alternative 4A  
21 would not result in substantially increased chloride concentrations upstream of the Delta, in the  
22 Delta, or in the SWP/CVP Export Service Area on a long-term average basis that would result in  
23 adverse effects on the municipal and industrial water supply beneficial use, or any other beneficial  
24 use. Additional exceedance of the 150 mg/L and 250 mg/L objectives is not expected, and  
25 substantial long-term degradation is not expected that would result in adverse effects on the  
26 municipal and industrial water supply beneficial use, or any other beneficial use. Based on these  
27 findings, this effect is determined to not be adverse.

28 *CEQA Conclusion:* Chloride is not a constituent of concern in the Sacramento River watershed  
29 upstream of the Delta, thus river flow rate and reservoir storage reductions that would occur under  
30 Alternative 4A relative to Existing Conditions, would not be expected to result in a substantial  
31 adverse change in chloride levels. Additionally, relative to Existing Conditions, Alternative 4A would  
32 not result in reductions in river flow rates (i.e., less dilution) or increased chloride loading such that  
33 there would be any substantial increase in chloride concentrations upstream of the Delta in the San  
34 Joaquin River watershed.

35 Relative to Existing Conditions, Alternative 4A would not result in substantially increased chloride  
36 concentrations in the Delta on a long-term average basis that would result in adverse effects on the  
37 municipal and industrial water supply beneficial use. Additional exceedance of the 150 mg/L and  
38 250 mg/L objectives is not expected, and substantial long-term degradation is not expected that  
39 would result in adverse effects on the municipal and industrial water supply beneficial use.

40 Chloride concentrations would be reduced under Alternative 4A in water exported from the Delta to  
41 the SWP/CVP Export Service Areas thus reflecting a potential improvement to chloride loading in  
42 the lower San Joaquin River.

1 Chloride is not a bioaccumulative constituent, thus any increased concentrations under the  
2 Alternative 4A would not result in substantial chloride bioaccumulation impacts on aquatic life or  
3 humans. Alternative 4A maintenance would not result in any substantial changes in chloride  
4 concentration upstream of the Delta or in the SWP/CVP Export Service Areas

5 Based on these findings, this impact is determined to be less than significant. No mitigation is  
6 required.

7 Impact WQ-8: Effects on Chloride Concentrations Resulting from Implementation of  
8 Environmental Commitments 3, 4, 6–12, 15, and 16

9 *NEPA Effects:* The implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 under  
10 Alternative 4A would present no new direct sources of chloride to the affected environment,  
11 including areas Upstream of the Delta, within the Plan Area, and the SWP/CVP Export Service Areas.  
12 Consequently, as they pertain to chloride, implementation of these environmental commitments  
13 would not be expected to adversely affect any of the beneficial uses of the affected environment.  
14 Moreover, some habitat restoration activities would occur on lands within the Delta currently used  
15 for irrigated agriculture. The potential reduction in irrigated lands within the Delta may result in  
16 reduced discharges of agricultural field drainage with elevated chloride concentrations, which  
17 would be considered an improvement relative to the No Action Alternative (ELT and LLT).  
18 Therefore, the effects on chloride from implementing Environmental Commitments 3, 4, 6–12, 15,  
19 and 16 are considered to be not adverse.

20 *CEQA Conclusion:* Implementation of the Environmental Commitments 3, 4, 6–12, 15, and 16 under  
21 Alternative 4A would not present new or substantially changed sources of chloride to the affected  
22 environment upstream of the Delta, within Delta, or in the SWP/CVP Export Service Areas.  
23 Replacement of irrigated agricultural land uses in the Delta with habitat restoration may result in  
24 some reduction in discharge of agricultural field drainage with elevated chloride concentrations,  
25 thus resulting in improved water quality conditions. Based on these findings, this impact is  
26 considered to be less than significant. No mitigation is required.

27 Impact WQ-9: Effects on Dissolved Oxygen Resulting from Facilities Operations and  
28 Maintenance

29 As described in detail for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the  
30 RDEIR/SDEIS), DO levels are primarily affected by water temperature, flow velocity, turbulence,  
31 amounts of oxygen demanding substances present (e.g., ammonia, organics), and rates of  
32 photosynthesis (which is influenced by nutrient levels), respiration, and decomposition. Water  
33 temperature and salinity affect the maximum DO saturation level (i.e., the highest amount of oxygen  
34 the water can dissolve). Flow velocity affects the turbulence and re-aeration of the water (i.e., the  
35 rate at which oxygen from the atmosphere can be dissolved in water). High nutrient content can  
36 support aquatic plant and algae growth, which in turn generates oxygen through photosynthesis and  
37 consumes oxygen through respiration and decomposition.

38 As described for Alternative 4, amounts of oxygen demanding substances present (e.g., ammonia,  
39 organics) in the reservoirs and rivers upstream of the Delta, rates of photosynthesis (which is  
40 influenced by nutrient levels/loading), and respiration and decomposition of aquatic life is not  
41 expected to change sufficiently under Alternative 4A to substantially alter DO levels relative to  
42 Existing Conditions or the No Action Alternative (ELT and LLT). Further, the rivers upstream of the  
43 Delta are well oxygenated and experience periods of supersaturation (i.e., when DO level exceeds

1 the saturation concentration). Because these are large, turbulent rivers, any reduced DO saturation  
2 level that would be caused by an increase in temperature under Alternative 4A would not be  
3 expected to cause DO levels to be outside of the range seen historically. Flow changes that would  
4 occur under Alternative 4A would not be expected to have substantial effects on river DO levels;  
5 likely, the changes would be immeasurable. This is because sufficient turbulence and interaction of  
6 river water with the atmosphere would continue to occur to maintain water saturation levels (due  
7 to these factors) at levels similar to that of Existing Conditions and the No Action Alternative (ELT  
8 and LLT).

9 Also as described for Alternative 4, salinity changes would generally have relatively minor effects on  
10 Delta DO levels. Further, the relative degree of tidal exchange of flows and turbulence, which  
11 contributes to exposure of Delta waters to the atmosphere for reaeration, would not be expected to  
12 substantially change relative to Existing Conditions or the No Action Alternative (ELT and LLT), such  
13 that these factors would reduce Delta DO levels below objectives or levels that protect beneficial  
14 uses. Similarly, increased temperature under Alternative 4A would generally have relatively minor  
15 effects on Delta DO levels, relative to Existing Conditions.

16 Similar to Alternative 4, flows in the San Joaquin River at Stockton were evaluated, and are shown in  
17 Figure DO-1 in Appendix B of this RDEIR/SDEIS. The figure shows that while flows would change  
18 somewhat, they would generally be within the range of flows seen under Existing Conditions and the  
19 No Action Alternative. Reports indicate that the aeration facility performs adequately under the  
20 range of flows from 250-1,000 cfs (ICF International 2010). Based on the above, the expected  
21 changes in flows in the San Joaquin River at Stockton are not expected to substantially move the  
22 point of minimum DO, and therefore the aeration facility would likely still be located appropriately  
23 to keep DO levels above Basin Plan objectives. Overall, assuming continued operation of the  
24 aerators, the alternative is not expected to have a substantial adverse effect on DO in the Deep Water  
25 Ship Channel. It is expected that DO levels in the Deep Water Ship Channel, which is CWA Section  
26 303(d) listed as impaired due to low DO, would remain similar to those under Existing Conditions  
27 and the No Action Alternative (ELT and LLT) or improve as TMDL-required studies are completed  
28 and actions are implemented to improve DO levels. DO levels in other Clean Water Act Section  
29 303(d)-listed waterways would not be expected to change relative to Existing Conditions or the No  
30 Action Alternative (ELT and LLT), as the circulation of flows, tidal flow exchange, and re-aeration  
31 would continue to occur.

32 In the SWP/CVP Export Service Areas, the primary factor that would affect DO in the conveyance  
33 channels and ultimately the receiving reservoirs would be changes in the levels of nutrients and  
34 oxygen-demanding substances and DO levels in the exported water. As described above and for  
35 Alternative 4, exported water could potentially be warmer and have higher salinity relative to  
36 Existing Conditions and the No Action Alternative (ELT and LLT). Nevertheless, because the  
37 biochemical oxygen demand of the exported water would not be expected to substantially differ  
38 from that under Existing Conditions or the No Action Alternative (ELT and LLT) due to water quality  
39 regulations, canal turbulence, exposure of the water to the atmosphere, and the algal communities  
40 that exist within the canals that would establish an equilibrium for DO levels within the canals. The  
41 same would occur in downstream reservoirs.

42 *NEPA Effects:* Because DO levels are not expected to change substantially relative to the No Action  
43 Alternative (ELT and LLT), the effects on DO from implementing Alternative 4A are determined to  
44 not be adverse.

1 *CEQA Conclusion:* The effects of Alternative 4A on DO levels in surface waters upstream of the Delta,  
2 in the Delta, and in the SWP/CVP Export Service Areas relative to Existing Conditions would be  
3 similar to those described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the  
4 RDEIR/SDEIS). Reservoir storage reductions that would occur under Alternative 4A, relative to  
5 Existing Conditions, would not be expected to result in a substantial adverse change in DO levels in  
6 the reservoirs, because oxygen sources (surface water aeration, aerated inflows, vertical mixing)  
7 would remain. Similarly, river flow rate reductions would not be expected to result in a substantial  
8 adverse change in DO levels in the rivers upstream of the Delta, given that mean monthly flows  
9 would remain within the ranges historically seen under Existing Conditions and the affected river  
10 are large and turbulent. Any reduced DO saturation level that may be caused by increased water  
11 temperature would not be expected to cause DO levels to be outside of the range seen historically.  
12 Finally, amounts of oxygen demanding substances and salinity would not be expected to change  
13 sufficiently to affect DO levels.

14 It is expected there would be no substantial change in Delta DO levels in response to a shift in the  
15 Delta source water percentages under this alternative or substantial degradation of these water  
16 bodies, with regard to DO. DO levels would be affected by nutrient loading, which the state regulates  
17 the discharges of, and this loading would not be expected to lower DO levels relative to Existing  
18 Conditions based on historical DO levels. Further, the anticipated changes in salinity would have  
19 relatively minor effects on DO levels, and tidal exchange, which contribute to the reaeration of Delta  
20 waters would not be expected to change substantially.

21 There is not expected to be substantial, if even measurable, changes in DO levels in the SWP/CVP  
22 Export Service Areas waters, relative to Existing Conditions, because the biochemical oxygen  
23 demand of the exported water would not be expected to substantially differ from that under Existing  
24 Conditions (due to water quality regulations), canal turbulence and exposure of the water to the  
25 atmosphere and the algal communities that exist within the canals that would establish an  
26 equilibrium for DO levels within the canals. The same would occur in downstream reservoirs.

27 Therefore, this alternative is not expected to cause additional exceedance of applicable water quality  
28 objectives by frequency, magnitude, and geographic extent that would result in significant impacts  
29 on any beneficial uses within affected water bodies. Because no substantial changes in DO levels are  
30 expected, long-term water quality degradation would not be expected to occur, and, thus, beneficial  
31 uses would not be adversely affected. Various Delta waterways are CWA Section 303(d)-listed for  
32 low DO, but because no substantial decreases in DO levels would be expected, greater degradation  
33 and DO-related impairment of these areas would not be expected. Based on these findings, this  
34 impact would be less than significant. No mitigation is required.

35 Impact WQ-10: Effects on Dissolved Oxygen Resulting from Implementation of Environmental  
36 Commitments 3, 4, 6–12, 15, and 16

37 *NEPA Effects:* Environmental Commitments 3, 4, and 6–11 would involve habitat restoration  
38 actions. The increased habitat provided by these environmental commitments could contribute to  
39 an increased biochemical or sediment demand, through contribution of organic carbon and plants  
40 decaying, though the areal extent of the effects would be less than under Alternative 4, because less  
41 land would be converted under Alternative 4A. The areal extent of new habitat implemented for the  
42 Environmental Commitments would be small relative to the existing and No Action Alternative tidal  
43 area, and similar habitat exists currently in the Delta and is not identified as contributing to adverse  
44 DO conditions. Although additional DOC loading to the Delta may occur (see impact WQ-18), the

1 amount expected would be minimal and only a fraction of the DOC is available to microorganisms  
2 that would consume oxygen as part of the decay and mineralization process. Since decreases in  
3 dissolved organic carbon are not typically observed in Delta waterways due to these processes, any  
4 increase in DOC is unlikely to contribute to adverse DO levels in the Delta.

5 CM14, which under Alternative 4 would fund improvements to the oxygen aeration facility in the  
6 Stockton Deep Water Ship Channel to meet TMDL objectives established by the Central Valley Water  
7 Board, would not be implemented under Alternative 4A. However, the existing aeration facility  
8 would continue to be operated to enhance DO levels in the channel. Thus, DO levels would be  
9 expected similar those under the No Action Alternative (ELT and LLT).

10 CM19, which under Alternative 4 would fund projects to contribute to reducing pollutant discharges  
11 in stormwater, also would not be implemented under Alternative 4A. Thus, the potential for reduced  
12 biochemical oxygen demand load described for Alternative 4 would not occur in the near-term and  
13 loading of these constituents and, thus DO levels, would be expected to be similar to that which  
14 would occur under the No Action Alternative (ELT and LLT).

15 The remaining environmental commitments would not affect DO levels because they are actions that  
16 do not affect the presence of oxygen-demanding substances.

17 Based on the above findings, the effects on DO from implementing Environmental Commitments 3,  
18 4, 6–12, 15, and 16 are determined to not be adverse.

19 *CEQA Conclusion:* It is expected that DO levels in the Upstream of the Delta Region, in the Plan Area,  
20 or in the SWP/CVP Export Service Areas following implementation of Environmental Commitments  
21 3, 4, 6–12, 15, and 16 under Alternative 4A would not be substantially different from existing DO  
22 conditions, because these would contribute to a minimal, localized change in oxygen-demanding  
23 substances associated with habitat restoration, if at all. Therefore, these environmental  
24 commitments are not expected to cause additional exceedance of applicable water quality objectives  
25 by frequency, magnitude, and geographic extent that would result in significant impacts on any  
26 beneficial uses within affected water bodies. Because no substantial changes in DO levels would be  
27 expected, long-term water quality degradation would not be expected, and, thus, beneficial uses  
28 would not be adversely affected. Various Delta waterways are CWA Section 303(d)-listed for low  
29 DO, but because no substantial decreases in DO levels would be expected, greater degradation and  
30 impairment of these areas would not be expected. Based on these findings, this impact would be less  
31 than significant. No mitigation is required.

32 Impact WQ-11: Effects on Electrical Conductivity Concentrations Resulting from Facilities  
33 Operations and Maintenance

#### 34 *Upstream of the Delta*

35 The effects of Alternative 4A on EC levels in reservoirs and rivers upstream of the Delta would be  
36 similar to those effects described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of  
37 the RDEIR/SDEIS). The extent of new urban growth would be less in the ELT, thus discharges of EC-  
38 elevating parameters in runoff and wastewater discharges to water bodies upstream of the Delta  
39 would be expected to be less than in the LLT. However, the state is regulating point source  
40 discharges of EC-related parameters and implementing a program to further decrease loading of EC-  
41 related parameters to tributaries. Based on these considerations, and those described in Chapter 8,  
42 Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS, EC levels (highs, lows, typical conditions) in the

1 Sacramento River and its tributaries, the eastside tributaries, or their associated reservoirs  
2 upstream of the Delta would not be expected to be outside the ranges occurring under Existing  
3 Conditions.

4 For the San Joaquin River, increases in EC levels under Alternative 4A could occur, but would be  
5 slightly less than those described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of  
6 the RDEIR/SDEIS). This is because the effects of climate change and increase water demands on  
7 flows, which could effect dilution of high EC discharges, would be less in the ELT. The  
8 implementation of the adopted TMDL for the San Joaquin River at Vernalis and the ongoing  
9 development of the TMDL for the San Joaquin River upstream of Vernalis are expected to contribute  
10 to improved EC levels. Based on these considerations, substantial changes in EC levels in the San  
11 Joaquin River relative to Existing Conditions would not be expected to be of sufficient magnitude  
12 and geographic extent that would result in adverse effects on any beneficial uses, or substantially  
13 degrade the quality of these water bodies, with regard to EC.

#### 14 *Delta*

15 As mentioned at the beginning of Section 4.3.4, the analysis of EC under Alternative 4A is based on  
16 modeling conducted for Alternative 4 in the ELT, which assumes implementation of Yolo Bypass  
17 Improvements and 25,000 acres of tidal natural communities restoration. Also, the modeling was  
18 originally performed assuming the Emmaton compliance point shifted to Threemile Slough.  
19 However, Yolo Bypass Improvements are not a component of Alternative 4A and the amount of tidal  
20 habitat restoration (i.e., Environmental Commitment 4) would be significantly less than that  
21 represented in the Alternative 4A modeling. Also, Alternative 4A does not include a change in  
22 compliance point from Emmaton to Threemile Slough. Furthermore, there are several factors  
23 related to the modeling approach that may result in modeling artifacts that show objective  
24 exceedance, when in reality no such exceedance would occur. The result of all of these factors is that  
25 the quantitative modeling results presented in this assessment is not entirely predictive of actual  
26 effects under Alternative 4A, and the results should be interpreted with caution. In order to  
27 understand the significance of all of these factors on the results, sensitivity analyses and other  
28 analyses were performed to evaluate the impact of maintaining the compliance point at Emmaton,  
29 the impact of having substantially less restoration than included in the modeling that was analyzed,  
30 and whether exceedances were indeed modeling artifacts or were potential alternative-related  
31 effects that may actually occur. For more information on these sensitivity analyses, refer to Chapter  
32 8, Section 8.3.1.7, *Electrical Conductivity*, and Appendix 8H Attachment 1, both in Appendix A of the  
33 RDEIR/SDEIS.

34 In this assessment, the modeling results are described and then in most cases are qualified in light of  
35 findings from the sensitivity analyses. Conclusions thus represent assessment of the combination of  
36 the modeling results and sensitivity analysis findings.

37 The modeling of EC under Alternative 4A included assumptions regarding how certain habitat  
38 restoration activities would affect Delta hydrodynamics. The amount of habitat restoration  
39 completed under Alternative 4A would be substantially less than under Alternative 4. To the extent  
40 that restoration actions would alter hydrodynamics within the Delta region, which affects mixing of  
41 source waters, these effects are included in this assessment of operations-related water quality  
42 changes (i.e., water conveyance facilities). Other effects of environmental commitments not  
43 attributable to hydrodynamics are discussed within Impact WQ-12. See Chapter 8, Section 8.3.1.3,

1 *Plan Area*, in Appendix A of the RDEIR/SDEIS for more information regarding the hydrodynamic  
2 modeling methodology.

3 Relative to Existing Conditions and the No Action Alternative (ELT), initial review of modeling  
4 results indicated that Alternative 4A would potentially result in an increase in the number of days  
5 the Bay-Delta WQCP EC objectives would be exceeded in the Sacramento River at Emmaton, and San  
6 Joaquin River at San Andreas Landing and Prisoners Point (Table EC-1 in Appendix B of this  
7 RDEIR/SDEIS). Additionally, the modeling results indicated potentially large increases in EC in  
8 Suisun Marsh. However, to understand and interpret these results, considerations must be made  
9 regarding uncertainty in the modeling, differing assumptions between the modeling and the  
10 alternative, and sensitivity analyses. These objectives and locations are addressed in the context of  
11 these considerations in detail below. At all other locations, the level of exceedance and EC in the  
12 modeling results was approximately equivalent or lower than under Existing Conditions and the No  
13 Action Alternative (ELT).

#### 14 *Sacramento River at Emmaton*

15 Modeling results indicated that the Emmaton EC objective would be exceeded more often under  
16 Alternative 4A than under Existing Conditions and the No Action Alternative (ELT), and that  
17 increases in EC could cause substantial water quality degradation in summer months of dry and  
18 critical water years. However, sensitivity analyses have shown that the level of effect would be less  
19 than presented in the modeling. Remaining increases in exceedance of the objective and degradation  
20 are expected to be addressed via real-time operations, including real time management of the north  
21 Delta and south Delta intakes, as well as Delta Cross Channel operation. Further discussion is  
22 provided below.

23 Modeling results indicated that the percent of days the Emmaton EC objective would be exceeded  
24 for the entire period modeled (1976–1991) would increase from 6% under Existing Conditions, or  
25 13% under the No Action Alternative (ELT), to 17–18% and the percent of days out of compliance  
26 would increase from 11% under Existing Conditions, or 21% under the No Action Alternative (ELT),  
27 to 26–28%, depending on the operations scenario. Although these results are for modeling that was  
28 originally performed for Alternative 4 at the ELT assuming the Emmaton compliance point shifted to  
29 Threemile Slough, Alternative 4A does not include a change in compliance point from Emmaton to  
30 Threemile Slough.

31 Sensitivity analyses were performed that modeled Alternative 4 scenario H3 at the LLT with  
32 Emmaton as the compliance point. These sensitivity analyses were only run at the LLT, but it is  
33 expected that the findings can generally be extended to the ELT, because the factors affecting  
34 salinity findings in the sensitivity analysis (e.g., modeling assumptions, physical hydrodynamic  
35 mechanisms) are similar between the ELT and LLT (see Appendix 8H Attachment 1, in Appendix A  
36 of the RDEIR/SDEIS). Assuming the compliance location at Emmaton instead of Threemile Slough in  
37 the CALSIM II modeling decreased exceedances at Emmaton from 28% to 15% under Alternative 4,  
38 operations scenario H3 at the LLT (see Appendix 8H, Attachment 1, of the RDEIR/SDEIS for more  
39 discussion of these sensitivity analyses), which would still be greater than Existing Conditions, but is  
40 very close to the No Action Alternative (ELT). Table 2 of Appendix 8H, Attachment 1, in Appendix A  
41 of the RDEIR/SDEIS indicates that most of these exceedances are a result of modeling artifacts, but  
42 some exceedances are due to deadpool conditions that occurred in 1977, 1981, and 1990 under  
43 Alternative 4 scenario H3 at the LLT and not under Existing Conditions. As discussed in Chapter 5,  
44 *Water Supply*, Section 5.3.1, *Methods for Analysis*, of this RDEIR/SDEIS, under extreme hydrologic



1 and operational conditions where there is not enough water supply to meet all requirements,  
2 CALSIM II uses a series of operating rules to reach a solution that is a simplified version of the very  
3 complex decision processes that SWP and CVP operators would use in actual extreme conditions.  
4 Thus, it is unlikely that the Emmaton objective would actually be violated due to dead pool  
5 conditions. However, these results indicate that water supply could be either under greater stress or  
6 under stress earlier in the year, and EC levels at Emmaton and in the western Delta may increase as  
7 a result, leading to EC degradation and increased possibility of adverse effects to agricultural  
8 beneficial uses.

9 This is evidenced in the modeling results, which indicated that long-term monthly average EC levels  
10 at Emmaton would increase 1–22% for the entire period modeled (1976–1991) and 4–44% during  
11 the drought period modeled (1987–1991), relative to the No Action Alternative (ELT) (Tables EC-8A  
12 and EC-8B in Appendix B of this RDEIR/SDEIS). The largest increases in EC would occur during the  
13 summer months of the drought period, and more generally in dry and critical water year types.  
14 During these periods, additional flow in the Sacramento River at Emmaton would reduce or  
15 eliminate increases in EC. It is expected that for May–September of dry and critical water years, less  
16 pumping from the north Delta intakes and greater reliance on south Delta intakes would allow for  
17 enough flow in the Sacramento River at Emmaton to reduce water quality degradation to levels  
18 closer to the No Action Alternative that would be considered not adverse.

#### 19 *San Joaquin River at San Andreas Landing*

20 Alternative 4A is not expected to have adverse effects on EC in the San Joaquin River at San Andreas  
21 Landing, relative to Existing Conditions and the No Action Alternative (ELT). Modeling results  
22 estimated that the percent of days the San Andreas Landing EC objective would be exceeded would  
23 increase from 1% under Existing Conditions to 2% under operations scenario H3, and would  
24 decrease to 0% under operations scenario H4 (Table EC-1 in Appendix B of this RDEIR/SDEIS). The  
25 percent of days out of compliance with the EC objective for San Andreas Landing would increase  
26 from 1% under Existing Conditions to 4% for operations scenario H3, and would decrease to 0%  
27 under operations scenario H4. San Andreas Landing average EC would decrease 6% for the entire  
28 period modeled, but would increase 1–3% during the drought period modeled, relative to Existing  
29 Conditions (Tables EC-8A and EC-8B in Appendix B of this RDEIR/SDEIS). Results relative to the No  
30 Action Alternative (ELT) were similar (Tables EC-8A and EC-8B in Appendix B of this RDEIR/SDEIS).  
31 However, sensitivity analyses performed for Alternative 4 scenario H3 at the LLT indicate that many  
32 of these exceedances are likely modeling artifacts, and the small number of remaining exceedances  
33 would be small in magnitude, lasting only a few days, and could be addressed with real time  
34 operations of the SWP and CVP (see Chapter 8, Section 8.3.1.1, *Models Used and Their Linkages*, in  
35 Appendix A of this RDEIR/SDEIS for a description of real time operations of the SWP and CVP).  
36 These sensitivity analyses were only run at the LLT, but it is expected that the findings can generally  
37 be extended to the ELT, because the factors affecting salinity findings in the sensitivity analysis (e.g.,  
38 modeling assumptions, physical hydrodynamic mechanisms) are similar between the ELT and LLT  
39 (see Appendix 8H Attachment 1, in Appendix A of the RDEIR/SDEIS).

#### 40 *San Joaquin River at Prisoners Point*

41 Modeling results indicated that the EC objective that applies between the San Joaquin River at Jersey  
42 Point and Prisoners Point would be exceeded at Prisoners Point more often under Alternative 4A  
43 than under Existing Conditions and the No Action Alternative (ELT). However, modeling results  
44 without restoration areas would be expected to show a lesser effect, and remaining exceedances are

1 expected to be able to be addressed via real-time operations, including real time management of the  
2 north Delta and south Delta intakes, as well as Head of Old River Barrier management. Further  
3 discussion is provided below.

4 Modeling results estimated that the percent of days the Prisoners Point EC objective would be  
5 exceeded would increase from 6% under Existing Conditions, or 1% under the No Action Alternative  
6 (ELT), to 17–20% and the percent of days out of compliance with the EC objective would increase  
7 from 10% under Existing Conditions, or 1% under the No Action Alternative (ELT), to 20–23%,  
8 depending on the operations scenario (Table EC-1 in Appendix B of this RDEIR/SDEIS). The  
9 magnitude of the exceedances is estimated to be very small—the objective is 440  $\mu\text{mhos/cm}$ , and  
10 the EC during times of exceedance was generally between 440 and 550  $\mu\text{mhos/cm}$ . The exceedances  
11 generally occurred in drier water years, when flows are lower. During these times, the EC in the San  
12 Joaquin River at Vernalis is greater than in the Sacramento River entering the Delta, and is high  
13 enough on its own to cause an exceedance.

14 There are two main drivers of the increase in exceedances under the alternative: an increase in San  
15 Joaquin River flow at Prisoners Point during April and May under the alternative, relative to Existing  
16 Conditions and the No Action Alternative (ELT), and a reduction in the amount of Sacramento River  
17 water moving past Prisoners Point under the alternative. The result is increased San Joaquin River  
18 water at Prisoners Point, and a reduction in the dilution that the Sacramento River provides the  
19 higher EC San Joaquin River. The increase in San Joaquin River flow at Prisoners Point is due to a  
20 reduction in pumping from the south Delta under the alternative, as well as due to the presence of  
21 the Head of Old River Barrier, which increases flow in the San Joaquin River downstream of Old  
22 River by preventing flow from entering Old River. The reduction in Sacramento River water  
23 influence is due to less pumping at the south Delta pumping plants (i.e., greater pumping draws  
24 more Sacramento River water through the Delta).

25 Sensitivity analyses conducted for Alternative 4 scenario H3 at the LLT indicated that removing all  
26 tidal restoration areas (such as is largely the case in Alternative 4A at the ELT) would reduce the  
27 number of exceedances by about 9 percentage points, but there would still be more exceedances  
28 than under Existing Conditions or the No Action Alternative. Sensitivity analyses also indicated that  
29 if the Head of Old River Barrier was open in April and May, exceedances would be reduced by about  
30 5 percentage points. Both of these analyses also showed lower EC during April and May, including  
31 during times when modeling showed the objective to be exceeded. These sensitivity analyses were  
32 only run at the LLT, but it is expected that the findings can generally be extended to the ELT. Results  
33 of the sensitivity analyses indicate that the exceedances are partially a function of the restoration  
34 that was assumed in the Alternative 4A modeling, but partly due also to operations of the alternative  
35 itself, due to Head of Old River Barrier assumptions and south Delta export differences (see  
36 Appendix 8H, Attachment 1, in Appendix A of the RDEIR/SDEIS for more discussion of these  
37 sensitivity analyses). Appendix 8H, Attachment 2, in Appendix A of the RDEIS/SDEIS contains a  
38 more detailed assessment of the likelihood of exceedances estimated via modeling for Alternatives  
39 1–9 impacting aquatic life beneficial uses. Specifically, Appendix 8H, Attachment 2, in Appendix A of  
40 the RDEIR/SDEIS discusses whether these exceedances might have indirect effects on striped bass  
41 spawning in the Delta, and concludes that the high level of uncertainty precludes making a definitive  
42 determination for those alternatives. However, based on the sensitivity analyses conducted,  
43 modeling of Alternative 4A that did not contain restoration areas would likely show a lesser level of  
44 effects than presented herein (using the Alternative 4 ELT modeling), both in terms of frequency  
45 and magnitude of exceedance. Additionally, by adaptively managing the Head of Old River Barrier

1 and the fraction of south Delta versus north Delta diversions, EC levels at Prisoners Point would  
2 likely be decreased to a level that would not adversely affect aquatic life beneficial uses.

### 3 *Suisun Marsh*

4 For Suisun Marsh October–May is the period when Bay-Delta WQCP EC objectives for protection of  
5 fish and wildlife apply. Modeling results indicate that average EC for the entire period modeled  
6 would increase in the Sacramento River at Collinsville during the months of March through May  
7 relative to Existing Conditions, by 0.1–0.2 mS/cm (Table EC-3 in Appendix B of this RDEIR/SDEIS).  
8 In Montezuma Slough at National Steel, average EC levels would increase in December through  
9 March by 0.1–0.4 mS/cm (Table EC-4 in Appendix B of this RDEIR/SDEIS). The most substantial EC  
10 increase would occur in Montezuma Slough near Beldon Landing, with long-term average EC levels  
11 increasing by 1.1–5.3 mS/cm, depending on the month and operations scenario, at least doubling  
12 during some months the long-term average EC relative to Existing Conditions (Table EC-5 in  
13 Appendix B of this RDEIR/SDEIS). Sunrise Duck Club and Volanti Slough also would have long-term  
14 average EC increases during October–May ranging 0.7–3.1 mS/cm (Tables EC-6 and EC-7 in  
15 Appendix B of this RDEIR/SDEIS). Modeled long-term average EC increases in Suisun Marsh under  
16 Alternative 4A relative to the No Action Alternative (ELT) are similar to the increases relative to  
17 Existing Conditions.

18 However, modeling used in the assessment of Alternative 4A assumed no operation of the  
19 Montezuma Slough Salinity Control Gates, but the project description assumes continued operation  
20 of the Salinity Control Gates, consistent with assumptions included in the No Action Alternative. A  
21 sensitivity analysis modeling run conducted for Alternative 4 scenario H3 at the LLT with the gates  
22 operational consistent with the No Action Alternative resulted in substantially lower EC levels than  
23 indicated in the original Alternative 4 modeling results discussed above, but EC levels were still  
24 somewhat higher than EC levels under Existing Conditions and the No Action Alternative for several  
25 locations and months. Another modeling run with the gates operational and restoration areas  
26 removed resulted in EC levels nearly equivalent to Existing Conditions and the No Action Alternative  
27 (see Appendix 8H, Attachment 1, of the Draft EIR/EIS for more information on these sensitivity  
28 analyses). Since Alternative 4A at the ELT includes operation of the gates, and includes very little  
29 tidal restoration areas, it is anticipated that EC increases in Suisun Marsh predicted via the modeling  
30 would not occur, and that EC in Suisun Marsh under Alternative 4A would be very similar to Existing  
31 Conditions and No Action Alternative (ELT). Depending on where tidal restoration areas assumed to  
32 be included in the No Action Alternative are located, EC under Alternative 4A could be less than  
33 under the No Action Alternative (ELT). For these reasons, any changes in EC in Suisun Marsh are  
34 expected to have no adverse effect on marsh beneficial uses.

### 35 *SWP/CVP Export Service Areas*

36 Under Alternative 4A, at the Banks pumping plant, there would be no exceedance of the Bay-Delta  
37 WQCP's 1,000  $\mu$ mhos/cm EC objective for the entire period modeled under operations scenario H4  
38 (Table EC-2 in Appendix B of this RDEIR/SDEIS). However, under operations scenario H3, the  
39 frequency of exceedance of the EC objective would be 1% for the entire period modeled and 2% for  
40 the drought period modeled. This differs from Alternative 4, under which there would be no  
41 exceedance of the EC objective under either operations scenario. Relative to Existing Conditions,  
42 average EC levels under Alternative 4A would decrease 25–28% for the entire period modeled and  
43 21–27% during the drought period modeled, depending on the operations scenario. Relative to the  
44 No Action Alternative (ELT), average EC levels would similarly decrease, by 21–25% for the entire

1 period modeled and 18–25% during the drought period modeled (Tables EC-8A and EC-8B in  
2 Appendix B of this RDEIR/SDEIS).

3 At the Jones pumping plant, there would be no exceedance of the Bay-Delta WQCP s 1,000  
4 µmhos/cm EC objective for the entire period modeled under operations scenario H3 (Table EC-2 in  
5 Appendix B of this RDEIR/SDEIS). However, under operations scenario H4, the frequency of  
6 exceedance of the EC objective would be 1% for the entire period modeled and 0% for the drought  
7 period modeled. This differs from Alternative 4, under which there would be no exceedance of the  
8 EC objective under either operations scenario. Relative to Existing Conditions, average EC levels  
9 under Alternative 4A would decrease 25% for the entire period modeled and 22–23% during the  
10 drought period modeled, depending on the operations scenario. Relative to the No Action  
11 Alternative (ELT), average EC levels would similarly decrease, by 22% for the entire period modeled  
12 and 19–20% during the drought period modeled, depending on the operations scenario (Tables EC-  
13 8A and EC-8B in Appendix B of this RDEIR/SDEIS).

14 Based on the decreases in long-term average EC levels that would occur at the Banks and Jones  
15 pumping plants, Alternative 4A would not cause degradation of water quality with respect to EC in  
16 the SWP/CVP Export Service Areas rather, Alternative 4A would improve long-term average EC  
17 conditions in the SWP/CVP Export Service Areas.

18 Commensurate with the EC decrease in exported waters, an improvement in lower San Joaquin  
19 River average EC levels would be expected since EC in the lower San Joaquin River is, in part, related  
20 to irrigation water deliveries from the Delta. While the magnitude of this expected lower San  
21 Joaquin River improvement in EC is difficult to predict, the relative decrease in overall loading of EC-  
22 elevating constituents to the Export Service Areas would likely alleviate or lessen any expected  
23 increase in EC at Vernalis related to decreased annual average San Joaquin River flows.

24 The export area of the Delta is listed on the state’s CWA Section 303(d) list as impaired due to  
25 elevated EC Alternative 4A would result in lower average EC levels relative to Existing Conditions  
26 and the No Action Alternative (ELT) and, thus, would not contribute to additional beneficial use  
27 impairment related to elevated EC in the SWP/CVP Export Service Areas waters.

28 *NEPA Effects:* In summary, based on the results of the modeling and sensitivity analyses conducted,  
29 it is unlikely that there would be increased frequency of exceedance of agricultural EC objectives in  
30 the western, interior, or southern Delta. However, modeling results indicate that there could be  
31 increased long-term and drought period average EC levels during the summer months that would  
32 occur in the western Delta (i.e., in the Sacramento River at Emmaton) under Alternative 4A relative  
33 to the No Action Alternative (ELT), that could contribute to adverse effects on the agricultural  
34 beneficial uses. In addition, the increased frequency of exceedance of the San Joaquin River at  
35 Prisoners Point EC objective could contribute to adverse effects on fish and wildlife beneficial uses  
36 (specifically, indirect adverse effects on striped bass spawning), though there is a high degree of  
37 uncertainty associated with this impact. Suisun Marsh is CWA Section 303(d) listed as impaired due  
38 to elevated EC, but EC levels are not expected to change substantially under Alternative 4A, relative  
39 to the No Action Alternative (ELT), and thus it is not expected that they would contribute to  
40 additional beneficial use impairment. The increases in EC in the Sacramento River at Emmaton,  
41 particularly during summer months of dry and critical water years, and the additional exceedances  
42 of water quality objectives in the San Joaquin River at Prisoners Point constitute an adverse effect on  
43 water quality. Mitigation Measure WQ-11 would be available to reduce these effects.

1 *CEQA Conclusion:* River flow rate and reservoir storage reductions that would occur under  
2 Alternative 4A, relative to Existing Conditions, would not be expected to result in a substantial  
3 adverse change in EC levels in the reservoirs and rivers upstream of the Delta, given that: changes in  
4 the quality of watershed runoff and reservoir inflows would not be expected to occur in the future;  
5 the state's regulation of point-source discharge effects on Delta salinity-elevating parameters and  
6 the expected further regulation as salt management plans are developed; the salt-related TMDLs  
7 adopted and being developed for the San Joaquin River; and the expected improvement in lower San  
8 Joaquin River average EC levels commensurate with the lower EC of the irrigation water deliveries  
9 from the Delta.

10 Relative to Existing Conditions, Alternative 4A would not result in any substantial increases in long-  
11 term average EC levels in the SWP/CVP Export Service Areas, and exceedance of the Bay-Delta  
12 WQCP EC objective would be infrequent. Average EC levels for the entire period modeled would  
13 decrease at both the Banks and Jones pumping plants and, thus, this alternative would not  
14 contribute to additional beneficial use impairment related to elevated EC in the SWP/CVP Export  
15 Service Areas waters. Rather, this alternative would improve long-term EC levels in the SWP/CVP  
16 Export Service Areas, relative to Existing Conditions.

17 Further, relative to Existing Conditions, Alternative 4A would not result in substantial increases in  
18 long-term average EC in Suisun Marsh. Thus, EC levels in Suisun Marsh are not expected to further  
19 degrade existing EC levels and thus would not contribute additionally to adverse effects on the fish  
20 and wildlife beneficial uses. Because EC is not bioaccumulative, any changes in long-term average EC  
21 levels would not directly cause bioaccumulative problems in fish and wildlife. Suisun Marsh is CWA  
22 Section 303(d) listed as impaired due to elevated EC, but EC levels are not expected to change  
23 substantially under Alternative 4A, relative to Existing Conditions, and thus it is not expected that  
24 they would contribute to additional beneficial use impairment.

25 In the Plan Area, Alternative 4A is not expected to result in an increase in the frequency with which  
26 Bay-Delta WQCP EC objectives are exceeded, except for at the San Joaquin River at Prisoners Point  
27 (fish and wildlife objective; 11–14% increase). The increased frequency of exceedance of the fish  
28 and wildlife objective at Prisoners Point could contribute to adverse effects on aquatic life  
29 (specifically, indirect adverse effects on striped bass spawning), though there is a high degree of  
30 uncertainty associated with this impact. However, modeling of Alternative 4A that did not contain  
31 restoration areas would likely show a lesser level of effects than presented herein (using the  
32 Alternative 4 ELT modeling), both in terms of frequency and magnitude of exceedance. Additionally,  
33 by adaptively managing the Head of Old River Barrier and the fraction of south Delta versus north  
34 Delta diversions, EC levels at Prisoners Point would likely be decreased to a level that would not  
35 adversely affect aquatic life beneficial uses.

36 Average EC levels at Emmaton would increase by 4–5% during the drought period modeled. The  
37 largest monthly average increases in EC would occur during the summer months of the drought  
38 period, and more generally in dry and critical water year types. The increases in drought period  
39 average EC levels could cause substantial water quality degradation that would potentially  
40 contribute to adverse effects on the agricultural beneficial uses in the western Delta. The  
41 comparison to Existing Conditions reflects changes in EC due to both Alternative 4A operations and  
42 climate change/sea level rise. The adverse effects expected to occur at Emmaton would be due in  
43 part to the effects of climate change/sea level rise, and in part due to Alternative 4A operations. This  
44 is evidenced by the significant effects expected in the No Action Alternative (ELT) at Emmaton  
45 relative to Existing Conditions, as well as the fact that a lesser level of adverse effects is expected at

1 Emmaton under Alternative 4A relative to the No Action Alternative (ELT). During summer of dry  
2 and critical water years, additional flow in the Sacramento River at Emmaton would reduce or  
3 eliminate increases in EC. It is expected that for May–September of dry and critical water years, less  
4 pumping from the north Delta intakes and greater reliance on south Delta intakes would allow for  
5 enough flow in the Sacramento River at Emmaton to reduce water quality degradation to levels  
6 closer to the No Action Alternative that would not be expected to adversely affect beneficial uses.  
7 Because EC is not bioaccumulative, the increases in long-term average EC levels would not directly  
8 cause bioaccumulative problems in aquatic life or humans. The western Delta is CWA Section 303(d)  
9 listed for elevated EC and the increased EC degradation that could occur in the western Delta could  
10 make beneficial use impairment measurably worse.

11 Based on these findings, this impact in the Plan Area is considered to be significant. Implementation  
12 of Mitigation Measure WQ-11 would be expected to reduce these effects to a less-than-significant  
13 level.

#### 14 Mitigation Measure WQ-11: Avoid or Minimize Reduced Water Quality Conditions

15 The implementation of mitigation actions shall be focused on avoiding or minimizing those  
16 incremental effects attributable to implementation of Alternative 4A operations only. Mitigation  
17 actions to avoid or minimize the incremental EC effects attributable to climate change/sea level  
18 rise are not required because these changed conditions would occur with or without  
19 implementation of Alternative 4A. The goal of specific actions is to reduce/avoid additional  
20 exceedances of Delta EC objectives and reduce long-term average concentration increases to  
21 levels that would not adversely affect beneficial uses within the Delta. Implementation of  
22 Mitigation Measure WQ-11 would be expected to reduce effects on EC to a less-than-significant  
23 level.

#### 24 Mitigation Measure WQ-11a: Adaptively Manage Diversions at the North and South Delta 25 Intakes to Reduce or Eliminate Water Quality Degradation in Western Delta

26 Modeling results for Alternative 4A indicated water quality degradation in the Sacramento River  
27 at Emmaton during May-September of dry and critical water year types, relative to the No  
28 Action Alternative (ELT). Additional flow in the Sacramento River at Emmaton would be  
29 expected to reduce EC levels under Alternative 4A to levels closer to the No Action Alternative  
30 (ELT) that would not be expected to adversely affect beneficial uses. By reducing diversions  
31 from the north Delta intakes during these periods (and consequently increasing diversions from  
32 the south Delta intakes), additional flow would be available in the Sacramento River to reduce  
33 water quality degradation with respect to EC. The BDCP proponents shall adaptively manage the  
34 split between north and south Delta diversions during May-September of dry and critical water  
35 years to limit EC in the Sacramento River at Emmaton to levels consistent with the No Action  
36 Alternative.

#### 37 Mitigation Measure WQ-11b: Adaptively Manage Head of Old River Barrier and 38 Diversions at the North and South Delta Intakes to Reduce or Eliminate Exceedances of 39 the Bay-Delta WQCP Objective at Prisoners Point

40 Modeling results for Alternative 4A indicated additional exceedances of the Bay-Delta WQCP  
41 objective for protection of striped bass between Jersey Point and Prisoners Point at Prisoners  
42 Point. It is expected that by adaptively managing the Head of Old River Barrier and the fraction

1 of south Delta versus north Delta diversions, exceedances of the EC objective at Prisoners Point  
2 could be avoided, and EC levels at Prisoners Point would be decreased to a level that would not  
3 adversely affect aquatic life beneficial uses. The BDCP proponents shall adaptively manage the  
4 Head of Old River Barrier and the split between north and south Delta diversions during April-  
5 May to avoid exceedances of the objective at Prisoners Point. These actions would not be  
6 required in critical water years, when the objective does not apply. The BDCP proponents will  
7 consult with CDFW, USFWS, and NMFS to ensure that such actions are warranted to avoid  
8 adverse impacts of salinity on striped bass spawning in the San Joaquin River, and to minimize  
9 adverse effects these mitigation actions may have on other species.

10 Impact WQ-12: Effects on Electrical Conductivity Resulting from Implementation of  
11 Environmental Commitments 3, 4, 6–12, 15 and 16.

12 *NEPA Effects:* The implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 would  
13 present no new direct sources of EC to the affected environment, including areas upstream of the  
14 Delta, within the Delta region, and in the SWP/CVP Export Service Areas. As they pertain to EC,  
15 implementation of these environmental commitments would not be expected to adversely affect any  
16 of the beneficial uses of the affected environment. Moreover, some habitat restoration activities  
17 would occur on lands within the Delta currently used for irrigated agriculture. Such replacement or  
18 substitution of land use activity is not expected to result in new or increased sources of EC to the  
19 Delta and, in fact, could decrease EC through elimination of high EC agricultural runoff.

20 Environmental Commitment 4 would result in some tidal habitat restoration, however, the areal  
21 extent would be small relative to the existing and No Action Alternative tidal area and, thus not  
22 expected to appreciably affect the magnitude of daily tidal water exchange at the restoration areas  
23 or alter other hydrodynamic conditions in adjacent Delta channels that would result in measurable  
24 EC changes.

25 In summary, implementation of the environmental commitments would not be expected to  
26 adversely affect EC levels in the affected environment and thus would not adversely affect beneficial  
27 uses or substantially degrade water quality with regard to EC within the affected environment.  
28 Therefore, the effects on EC from implementing Environmental Commitments 3, 4, 6–12, 15, and 16  
29 are determined to not be adverse.

30 *CEQA Conclusion:* Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 under  
31 Alternative 4A would not present new or substantially changed sources of EC to the affected  
32 environment. Some environmental commitments may replace or substitute for existing irrigated  
33 agriculture in the Delta. This replacement or substitution is not expected to substantially increase or  
34 present new sources of EC, and could actually decrease EC loads to Delta waters, because  
35 agricultural drainage can be a source of elevated EC. Thus, implementation of Environmental  
36 Commitments 3, 4, 6–12, 15, and 16 would have negligible, if any, adverse effects on EC levels  
37 throughout the affected environment and would not cause exceedance of applicable state or federal  
38 numeric or narrative water quality objectives/criteria that would result in adverse effects on any  
39 beneficial uses within affected water bodies. Further, implementation of Environmental  
40 Commitments 3, 4, 6–12, 15, and 16 would not cause significant long-term water quality  
41 degradation such that there would be greater risk of adverse effects on beneficial uses. Based on  
42 these findings, this impact is considered to be less than significant. No mitigation is required.

1 Impact WQ-13: Effects on Mercury Concentrations Resulting from Facilities Operations and  
2 Maintenance

3 *Upstream of the Delta*

4 The effects of the Alternative 4A on mercury levels in surface waters upstream of the Delta relative  
5 to Existing Conditions and the No Action Alternative (ELT) would be similar to those described for  
6 Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS). This is because  
7 factors which affect mercury concentrations in surface waters upstream of the Delta are similar  
8 under Alternatives 4 and 4A. The changes in flow in the Sacramento River under Alternative 4A  
9 relative to Existing Conditions and the No Action Alternative (ELT) would not be of the magnitude of  
10 storm flows, in which substantial sediment-associated mercury is mobilized. Therefore, mercury  
11 loading should not be substantially different due to changes in flow. In addition, even though it may  
12 be flow-affected, total mercury concentrations remain well below criteria at upstream locations. Any  
13 negligible changes in mercury concentrations that may occur in the water bodies of the affected  
14 environment located upstream of the Delta would not be of frequency, magnitude, and geographic  
15 extent that would adversely affect any beneficial uses or substantially degrade the quality of these  
16 water bodies as related to mercury. Both waterborne methylmercury concentrations and  
17 largemouth bass fillet mercury concentrations are expected to remain above guidance levels at  
18 upstream of Delta locations, but would not change substantially because the anticipated changes in  
19 flow are not expected to substantially change mercury loading relative to Existing Conditions or the  
20 No Action Alternative (ELT).

21 The upstream of Delta areas in the north will benefit from the implementation of the Cache Creek,  
22 Sulfur Creek, Harley Gulch, and Clear Lake Mercury TMDLs and the American River methylmercury  
23 TMDL. These projects will target specific sources of mercury and methylation upstream of the Delta  
24 and could result in net improvement to Delta mercury loading in the future. The implementation of  
25 these projects could help to ensure that upstream of Delta environments will not be substantially  
26 degraded for water quality with respect to mercury or methylmercury.

27 In the LLT, the primary difference will be changes in flow regime due to hydrologic effects from  
28 climate change and higher water demands. These effects would occur regardless of the  
29 implementation of the alternative and, thus, at the LLT the effects of the alternative on mercury are  
30 expected to be similar to those described above.

31 *Delta*

32 Modeling scenarios included assumptions regarding how certain habitat restoration activities would  
33 affect Delta hydrodynamics. The amount of habitat restoration completed under Alternative 4A  
34 would be substantially less than under Alternative 4. To the extent that restoration actions would  
35 alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are  
36 included in this assessment of water quality changes due to water conveyance facilities operations  
37 and maintenance. Other effects of environmental commitments not attributable to hydrodynamics  
38 are discussed within Impact WQ-14. See Chapter 8, Section 8.3.1.3, *Plan Area*, in Appendix A of the  
39 RDEIR/SDEIS for more information regarding the hydrodynamic modeling methodology.

40 The effects of Alternative 4A on waterborne concentrations of mercury (Table Hg-1 in Appendix B of  
41 this RDEIR/SDEIS) and methylmercury (Table Hg-2 in Appendix B of this RDEIR/SDEIS), and fish  
42 tissue mercury concentrations for largemouth bass fillet (Tables Hg-3 through Hg-8 in Appendix B of  
43 this RDEIR/SDEIS) were evaluated for nine Delta locations.



1 Similar to Alternative 4, increases in long-term average mercury concentrations relative to Existing  
2 Conditions and the No Action Alternative (ELT) would be very small, 0.4 ng/L or less. Also, use of  
3 assimilative capacity for mercury relative to the 25 ng/L ecological threshold under Alternative 4A,  
4 relative to Existing Conditions and the No Action Alternative (ELT), would be very low,  
5 approximately 2% or less for all Delta locations (Tables Hg-9 and Hg-10 in Appendix B of this  
6 RDEIR/SDEIS). These concentration changes and small changes in assimilative capacity for mercury  
7 are not expected to result in adverse (or positive) effects to beneficial uses.

8 Changes in methylmercury concentrations in water also are expected to be very small. The greatest  
9 annual average methylmercury concentration under Alternative 4A would be 0.166 ng/L for the San  
10 Joaquin River at Buckley Cove (all scenarios), for the drought period modeled, which would be  
11 slightly higher than Existing Conditions (0.161 ng/L) and slightly lower than the No Action  
12 Alternative (ELT) (0.168 ng/L) (Table Hg-2 in Appendix B of this RDEIR/SDEIS). All methylmercury  
13 concentrations in water were estimated to exceed the TMDL guidance objective of 0.06 ng/L under  
14 Existing Conditions and, therefore, no assimilative capacity exists.

15 Fish tissue estimates for largemouth bass fillet show small or no increases in mercury  
16 concentrations under Alternative 4A relative to Existing Conditions and the No Action Alternative  
17 (ELT) based on long-term annual average concentrations for mercury at the Delta locations (Tables  
18 Hg-5 and Hg-8 in Appendix B of this RDEIR/SDEIS). Concentrations expected for scenario H3 with  
19 Equation 2 would increase by 10 percent to 12 percent in Mokelumne River (South Fork) at Staten  
20 Island, Franks Tract, Old River at Rock Slough, and San Joaquin River at Antioch relative to Existing  
21 Conditions in all years and by 11 percent to 12 percent at Staten Island and Rock Slough relative to  
22 the No Action Alternative (ELT) in all years (Table Hg-6 in Appendix B of this RDEIR/SDEIS).  
23 Concentrations expected for scenario H4 show decreases (11%) with Equation 2 in the North Bay  
24 Aqueduct at Barker Slough relative to Existing Conditions in all years and for the drought period  
25 modeled, and a decrease of 11 percent relative to the No Action Alternative (ELT) for the drought  
26 period (Table Hg-8 in Appendix B of this RDEIR/SDEIS). Because the increases are relatively small,  
27 and it is not evident that substantive increases are expected at numerous locations throughout the  
28 Delta, these changes are expected to be within the uncertainty inherent in the modeling approach,  
29 and would likely not be measurable in the environment. See Appendix 8I, *Mercury*, of the Draft  
30 EIR/EIS for a complete discussion of the uncertainty associated with the fish tissue estimates.

31 Briefly, the bioaccumulation models contain multiple sources of uncertainty associated with their  
32 development. These are related to: analytical variability; temporal and/or seasonal variability in  
33 Delta source water concentrations of methylmercury; interconversion of mercury species (i.e., the  
34 non-conservative nature of methylmercury as a modeled constituent); and limited sample size (both  
35 in number of fish and time span over which the measurements were made), among others. Although  
36 there is considerable uncertainty in the models used, the results serve as a reasonable  
37 approximations of a very complex process. Considering the uncertainty, small (i.e., < 20–25%)  
38 increases or decreases in modeled fish tissue mercury concentrations at a low number of Delta  
39 locations (i.e., 2–3) should be interpreted to be within the uncertainty of the overall approach, and  
40 not predictive of actual adverse effects. Larger increases, or increases evident throughout the Delta,  
41 can be interpreted as more reliable indicators of potential adverse effects.

42 In the LLT, the primary difference will be changes in the Delta source water fractions due to  
43 hydrologic effects from climate change and higher water demands. These effects would occur  
44 regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative  
45 on mercury are expected to be similar to those described above.

1 *SWP/CVP Export Service Areas*

2 The analysis of mercury and methylmercury in the SWP/CVP Export Service Areas was based on  
3 concentrations estimated at the Banks and Jones pumping plants. Both waterborne total and  
4 methylmercury concentrations for Alternative 4A, all scenarios, at the Jones and Banks pumping  
5 plants, would be lower than Existing Conditions and the No Action Alternative (ELT) (Tables Hg-1  
6 and Hg-2 in Appendix B of this RDEIR/SDEIS). Therefore, mercury shows an increased assimilative  
7 capacity at these locations (Tables Hg-9 and Hg-10 in Appendix B of this RDEIR/SDEIS).

8 The largest improvements in bass tissue mercury concentrations and exceedance quotients ([EQs];  
9 modeled tissue divided by TMDL guidance concentration) for Alternative 4A, relative to Existing  
10 Conditions and the No Action Alternative (ELT) at any location within the Delta are expected for the  
11 Banks and Jones pumping plant export pump locations. The greatest improvement in largemouth  
12 bass tissue mercury concentration are expected for scenario H4 at the Banks and Jones pumping  
13 plants (-14% and -16%, respectively) relative to the No Action Alternative (ELT) (Tables Hg-5  
14 through Hg-8 in Appendix B of this RDEIR/SDEIS).

15 In the LLT, the primary difference will be changes in the Delta source water fractions to hydrologic  
16 effects from climate change and higher water demands. These effects would occur regardless of the  
17 implementation of the alternative and, thus, at the LLT the effects of the alternative on mercury are  
18 expected to be similar to those described above.

19 *NEPA Effects:* Based on the above discussion, Alternative 4A would not cause concentrations of  
20 mercury and methylmercury in water and fish tissue in the affected environment to be substantially  
21 different from the No Action Alternative (ELT and LLT) and, thus, would not cause additional  
22 exceedance of applicable water quality objectives/criteria by frequency, magnitude, and geographic  
23 extent that would cause adverse effects on any beneficial uses of waters in the affected environment.  
24 Because mercury concentrations are not expected to increase substantially, no long-term water  
25 quality degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur.  
26 Because any increases in mercury or methylmercury concentrations are not likely to be measurable,  
27 changes in mercury concentrations or fish tissue mercury concentrations would not make any  
28 existing mercury-related impairment measurably worse. In comparison to the No Action Alternative  
29 (ELT and LLT), Alternative 4A would not be expected to increase levels of mercury by frequency,  
30 magnitude, and geographic extent such that the affected environment would be expected to have  
31 measurably higher body burdens of mercury in aquatic organisms, thereby substantially increasing  
32 the health risks to wildlife (including fish) or humans consuming those organisms. Based on these  
33 findings, the effects of Alternative 4A on mercury in the affected environment are considered to be  
34 not adverse.

35 *CEQA Conclusion:* Under Alternative 4A, greater water demands and climate change would alter the  
36 magnitude and timing of reservoir releases and river flows upstream of the Delta in the Sacramento  
37 River watershed and east-side tributaries, relative to Existing Conditions. Concentrations of mercury  
38 and methylmercury upstream of the Delta would not be substantially different relative to Existing  
39 Conditions due to the lack of important relationships between mercury/methylmercury  
40 concentrations and flow for the major rivers.

41 Methylmercury concentrations exceed criteria at all locations in the Delta and no assimilative  
42 capacity exists. However, monthly average waterborne concentrations of total and methylmercury,  
43 over the period of record, under Alternative 4A would be very similar to Existing Conditions.

1 Similarly, estimates of fish tissue mercury concentrations show small differences would occur  
2 among sites for Alternative 4A as compared to Existing Conditions for Delta sites.

3 Assessment of effects of mercury in the SWP/CVP Export Service Areas were based on effects on  
4 mercury concentrations and fish tissue mercury concentrations at the Banks and Jones pumping  
5 plants. The Banks and Jones pumping plants are expected to show increased assimilative capacity  
6 for waterborne mercury and decreased fish tissue concentrations of mercury for Alternative 4A, all  
7 scenarios, as compared to Existing Conditions.

8 As such, Alternative 4A is expected to cause additional exceedance of applicable water quality  
9 objectives/criteria by frequency, magnitude, and geographic extent that would cause adverse effects  
10 on any beneficial uses of waters in the affected environment. Because mercury concentrations are  
11 not expected to increase substantially, no long-term water quality degradation is expected to occur  
12 and, thus, no adverse effects to beneficial uses would occur. Because any increases in mercury or  
13 methylmercury concentrations are not likely to be measurable, changes in mercury concentrations  
14 or fish tissue mercury concentrations would not make any existing mercury-related impairment  
15 measurably worse. In comparison to Existing Conditions, Alternative 4A would not increase levels of  
16 mercury by frequency, magnitude, and geographic extent such that the affected environment would  
17 be expected to have measurably higher body burdens of mercury in aquatic organisms, thereby  
18 substantially increasing the health risks to wildlife (including fish) or humans consuming those  
19 organisms. Based on these findings, this impact is considered to be less than significant. No  
20 mitigation is required.

21 Impact WQ-14: Effects on Mercury Concentrations Resulting from Implementation of  
22 Environmental Commitments 3, 4, 6–12, 15, and 16

23 *NEPA Effects:* The potential types of effects on mercury resulting from implementation of the  
24 environmental commitments under Alternative 4A would be generally similar to those described  
25 under Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of the RDEIR/SDEIS). However, the  
26 magnitude of effects on mercury and methylmercury at locations upstream of the Delta, in the Delta,  
27 and the SWP/CVP Export Service Areas related to habitat restoration would be considerably lower  
28 than described for Alternative 4. This is because the amount of habitat restoration to be  
29 implemented under Alternative 4A would be very low compared to the total proposed restoration  
30 area that would be implemented under Alternative 4. The small amount of habitat restoration to be  
31 implemented under Alternative 4A may occur on lands in the Delta formerly used for irrigated  
32 agriculture. Habitat restoration proposed under Alternative 4A has the potential to increase water  
33 residence times and increase accumulation of organic sediments that are known to enhance  
34 methylmercury bioaccumulation in biota in the vicinity of the restored habitat areas. Design of  
35 restoration sites would be guided by Environmental Commitment 12, which requires development  
36 of site-specific mercury management plans as restoration actions are implemented. The  
37 effectiveness of minimization and mitigation actions implemented according to the mercury  
38 management plans is not known at this time, although the potential to reduce methylmercury  
39 concentrations exists based on current research. Although Environmental Commitment 12 would be  
40 implemented with the goal to reduce this potential effect, there remain uncertainties related to site-  
41 specific restoration conditions and the potential for increases in methylmercury concentrations in  
42 the Delta in the vicinity of the restored areas. Therefore, the effect of Environmental Commitments  
43 3, 4, 6–12, 15, and 16 on mercury and methylmercury is considered to be adverse.

1 *CEQA Conclusion:* There would be no substantial, long-term increase in mercury or methylmercury  
2 concentrations or loads in the rivers and reservoirs upstream of the Delta or the waters exported to  
3 the SWP/CVP Export Service Areas due to implementation of Environmental Commitments 3, 4, 6–  
4 12, 15, and 16 relative to Existing Conditions. However, in the Delta, due to the small amount of tidal  
5 restoration areas proposed, relative to Existing Conditions, uptake of mercury from water and/or  
6 methylation of inorganic mercury may increase in localized areas as part of the creation of new,  
7 marshy, shallow, or organic-rich restoration areas. Although not quantifiable, on a local level,  
8 increases in methylmercury concentrations may be measurable. Methylmercury is CWA Section  
9 303(d)-listed within the affected environment, and therefore any potential measurable increase in  
10 methylmercury concentrations would make existing mercury-related impairment measurably  
11 worse. Because mercury is bioaccumulative, increases in water-borne mercury or methylmercury  
12 that could occur in some areas could bioaccumulate to somewhat greater levels in aquatic organisms  
13 and would, in turn, pose health risks to fish, wildlife, or humans. Design of restoration sites would be  
14 guided by Environmental Commitment 12, which requires development of site-specific mercury  
15 management plans as restoration actions are implemented. The effectiveness of minimization and  
16 mitigation actions implemented according to the mercury management plans is not known at this  
17 time, although the potential to reduce methylmercury concentrations exists based on current  
18 research. Although Environmental Commitment 12 would be implemented with the goal to reduce  
19 this potential effect, the uncertainties related to site specific restoration conditions and the potential  
20 for increases in methylmercury concentrations in the Delta result in this potential impact being  
21 considered significant because, as described above, any potential measurable increase in  
22 methylmercury concentrations would make existing mercury-related impairment measurably  
23 worse. No mitigation measures would be available until specific restoration actions are proposed.  
24 Therefore, this impact is considered significant and unavoidable.

25 Impact WQ-15: Effects on Nitrate Concentrations Resulting from Facilities Operations and  
26 Maintenance

27 *Upstream of the Delta*

28 As described for Alternative 4 (in Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS),  
29 nitrate levels in the major rivers (Sacramento, Feather, American) are low, generally due to ample  
30 dilution available in the reservoirs and rivers relative to the magnitude of the point and non-point  
31 source discharges, and there is no correlation between historical water year average nitrate  
32 concentrations and water year average flow in the Sacramento River at Freeport. Consequently, any  
33 modified reservoir operations and subsequent changes in river flows under Alternative 4A, relative  
34 to Existing Conditions or the No Action Alternative (ELT), are expected to have negligible, if any,  
35 effects on average reservoir and river nitrate-N concentrations in the Sacramento River watershed  
36 upstream of the Delta.

37 In the San Joaquin River watershed, nitrate concentrations are higher than in the Sacramento River  
38 watershed, owing to use of nitrate based fertilizers throughout the lower watershed. The correlation  
39 between historical water year average nitrate concentrations and water year average flow in the San  
40 Joaquin River at Vernalis is a weak inverse relationship—that is, generally higher flows result in  
41 lower nitrate concentrations, while low flows result in higher nitrate concentrations (linear  
42 regression  $r^2=0.49$ ; Figure 2 in Appendix 8J, *Nitrate*, of the Draft EIR/EIS). Under Alternative 4A,  
43 long-term average flows at Vernalis would decrease an estimated 1% relative to Existing Conditions  
44 and would remain virtually the same relative to the No Action Alternative (ELT). Given the relatively  
45 small decreases in flows and the weak correlation between nitrate and flows in the San Joaquin

1 River, it is expected that nitrate concentrations in the San Joaquin River would be minimally  
2 affected, if at all, by anticipated changes in flow rates under the No Action Alternative (ELT).

3 In the LLT, the primary difference will be changes in flow regime due to hydrologic effects from  
4 climate change and higher water demands. These effects would occur regardless of the  
5 implementation of the alternative and, thus, at the LLT the effects of the alternative on nitrate are  
6 expected to be similar to those described above.

7 Any negligible changes in nitrate concentrations that may occur under Alternative 4A in the water  
8 bodies of the affected environment located upstream of the Delta would not be of frequency,  
9 magnitude and geographic extent that would adversely affect any beneficial uses or substantially  
10 degrade the quality of these water bodies, with regard to nitrate.

### 11 *Delta*

12 Modeling scenarios included assumptions regarding how certain habitat restoration activities would  
13 affect Delta hydrodynamics. To the extent that restoration actions would alter hydrodynamics  
14 within the Delta region, which affects mixing of source waters, these effects are included in this  
15 assessment of water quality changes due to water conveyance facilities operations and maintenance.  
16 Effects of environmental commitments not attributable to hydrodynamics are discussed within  
17 Impact WQ-16. See section 8.3.1.3, *Plan Area*, in Appendix A of the RDEIR/SDEIS for more  
18 information regarding the hydrodynamic modeling methodology.

19 Mass balance calculations indicate that under Alternative 4A relative to Existing Conditions and the  
20 No Action Alternative (ELT), nitrate concentrations throughout the Delta are anticipated to remain  
21 low (<1.4 mg/L-N) relative to adopted objectives (Table N-1 in Appendix B of this RDEIR/SDEIS).  
22 Although changes at specific Delta locations and for specific months may be substantial on a relative  
23 basis (Tables N-4 and N-5 in Appendix B of this RDEIR/SDEIS), the absolute concentration of nitrate  
24 in Delta waters would remain low (<1.4 mg/L-N) in relation to the drinking water MCL of 10 mg/L-  
25 N, as well as all other thresholds (see *Nitrate* within Chapter 8, Section 8.3.17, *Constituent-Specific*  
26 *Considerations Used in the Assessment*, in Appendix A of the RDEIR/SDEIS). Long-term average  
27 nitrate concentrations are anticipated to remain below 1 mg/L-N at all 11 Delta assessment  
28 locations except the San Joaquin River at Buckley Cove, where long-term average concentrations  
29 would be somewhat above 1 mg/L-N. Nevertheless, at this location, long-term average nitrate  
30 concentrations would be somewhat reduced under Alternative 4A relative to Existing Conditions,  
31 and slightly increased relative to the No Action Alternative (ELT). Overall, the difference in long-  
32 term average nitrate concentrations at various locations throughout the Delta under Alternative 4A  
33 compared to Alternative 4 would be negligible (i.e., <0.1 mg/L). As was similarly concluded for  
34 Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS), no additional  
35 exceedances of the MCL are anticipated at any location under Alternative 4A, regardless of  
36 operations scenario (Table N-1 in Appendix B of this RDEIR/SDEIS).

37 Use of assimilative capacity relative to the drinking water MCL of 10 mg/L-N under Alternative 4A  
38 would be low or negligible (i.e., <4%) in comparison to both Existing Conditions and the No Action  
39 Alternative (ELT), for all locations and months, for all modeled years (1976–1991), and for the  
40 drought period (1987–1991) (Tables N-6 and N-7 in Appendix B of this RDEIR/SDEIS). One  
41 exception is for Buckley Cove on the San Joaquin River in August, where use of assimilative capacity  
42 available during the drought period relative to the No Action Alternative (ELT) would range from  
43 6.3% to 6.5%. Changes in use of assimilative capacity relative to Existing Conditions and the No

1 Action Alternative (ELT) under Alternative 4A would be approximately the same as described for  
2 Alternative 4.

3 As described for Alternative 4, actual nitrate concentrations would likely be higher than the  
4 modeling results indicate in certain locations under Alternative 4A. This is the mass balance  
5 modeling does not account for contributions from the SRWTP, which would be implementing  
6 nitrification/partial denitrification, or Delta wastewater treatment plant dischargers that practice  
7 nitrification, but not denitrification. However, as described for Alternative 4, any increases in nitrate  
8 concentrations that may occur at certain locations within the Delta under Alternative 4A would not  
9 be of frequency, magnitude and geographic extent that would adversely affect any beneficial uses or  
10 substantially degrade the water quality at these locations, with regard to nitrate.

11 In the LLT, the primary difference will be changes in the Delta source water fractions due to  
12 hydrologic effects from climate change and higher water demands. These effects would occur  
13 regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative  
14 on nitrate are expected to be similar to those described above.

#### 15 *SWP/CVP Export Service Areas*

16 Assessment of effects of Alternative 4A on nitrate in the SWP/CVP Export Service Areas is based on  
17 effects on nitrate at the Banks and Jones pumping plants.

18 Results of the mass balance calculations indicate that the change in nitrate concentrations and use of  
19 assimilative capacity would be similar for the two operations scenarios of Alternative 4A (Tables N-  
20 4 through N-7 in Appendix B of this RDEIR/SDEIS). Relative to Existing Conditions and the No Action  
21 Alternative (ELT), nitrate concentrations at Banks and Jones pumping plants under Alternative 4A  
22 are anticipated to decrease on a long-term average annual basis (Tables N-4 and N-5 in Appendix B  
23 of this RDEIR/SDEIS). During the late summer, particularly in the drought period assessed,  
24 concentrations are expected to increase substantially on a relative basis (i.e., >50%), but the  
25 absolute value of these changes (i.e., in mg/L-N) would be small. Additionally, given the many  
26 factors that contribute to potential algal blooms in the SWP and CVP canals within the Export  
27 Service Areas, and the lack of studies that have shown a direct relationship between nutrient  
28 concentrations in the canals and reservoirs and problematic algal blooms in these water bodies,  
29 there is no basis to conclude that these small (i.e., generally <0.3 mg/L-N), seasonal increases in  
30 nitrate concentrations would increase the potential for problem algal blooms in the SWP/CVP  
31 Export Service Areas. Overall, the difference in long-term average nitrate concentrations at Banks  
32 and Jones pumping plants under Alternative 4A compared to Alternative 4 would be negligible (i.e.,  
33 <0.1 mg/L). As was similarly concluded for Alternative 4, no additional exceedances of the MCL are  
34 anticipated under Alternative 4A (Table N-1 in Appendix B of this RDEIR/SDEIS). On a monthly  
35 average basis and on a long-term annual average basis, for all modeled years and for the drought  
36 period only, use of assimilative capacity available under Existing Conditions and the No Action  
37 Alternative (ELT), relative to the 10 mg/L-N MCL, would be negligible (<3%) for both Banks and  
38 Jones pumping plants (Tables N-4 and N-5 in Appendix B of this RDEIR/SDEIS). Use of assimilative  
39 capacity relative to Existing Conditions and the No Action Alternative (ELT) for Alternative 4A  
40 would be slightly less than expected to occur under Alternative 4 (see Chapter 8, Section 8.3.3.9, in  
41 Appendix A of the RDEIR/SDEIS).

42 In the LLT, the primary difference will be changes in the Delta source water fractions to hydrologic  
43 effects from climate change and higher water demands. These effects would occur regardless of the

1 implementation of the alternative and, thus, at the LLT the effects of the alternative on nitrate are  
2 expected to be similar to those described above.

3 Any increases in nitrate concentrations that may occur in water exported via Banks and Jones  
4 pumping plants are not expected to result in adverse effects to beneficial uses or substantially  
5 degrade the quality of exported water, with regard to nitrate.

6 *NEPA Effects:* Modified reservoir operations and subsequent changes in river flows under  
7 Alternative 4A, relative to the No Action Alternative (ELT and LLT), are expected to have negligible,  
8 if any, effects on reservoir and river nitrate concentrations upstream of Freeport in the Sacramento  
9 River watershed and upstream of the Delta in the San Joaquin River watershed. In the Delta, nitrate  
10 concentrations throughout the Delta are anticipated to remain low (<1.4 mg/L-N) relative to  
11 adopted objectives. No additional exceedances of the 10 mg/L-N MCL are anticipated at any Delta  
12 location, and use of assimilative capacity available under the No Action Alternative, relative to the  
13 drinking water MCL of 10 mg/L-N, would be low. Long-term average nitrate concentrations at Banks  
14 and Jones pumping plants are anticipated to differ negligibly relative to the No Action Alternative  
15 (ELT and LLT) and no additional exceedances of the 10 mg/L-N MCL are anticipated. Therefore, the  
16 effects on nitrate from implementing water conveyance facilities are considered to be not adverse.

17 *CEQA Conclusion:* Nitrate concentrations are generally low in the reservoirs and rivers of the  
18 watersheds, owing to substantial dilution available for point sources and the lack of substantial  
19 nonpoint sources of nitrate upstream of the SRWTP in the Sacramento River watershed, and in the  
20 watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers). Although  
21 higher in the San Joaquin River watershed, nitrate concentrations are not well-correlated with flow  
22 rates. Consequently, any modified reservoir operations and subsequent changes in river flows under  
23 Alternative 4A, relative to Existing Conditions, are expected to have negligible, if any, effects on  
24 reservoir and river nitrate concentrations upstream of Freeport in the Sacramento River watershed  
25 and upstream of the Delta in the San Joaquin River watershed.

26 In the Delta, results of the mass balance calculations indicate that under Alternative 4A, relative to  
27 Existing Conditions, nitrate concentrations throughout the Delta are anticipated to remain low (<1.4  
28 mg/L-N) relative to adopted objectives. No additional exceedances of the 10 mg/L-N MCL are  
29 anticipated at any location, and use of assimilative capacity available under Existing Conditions,  
30 relative to the drinking water MCL of 10 mg/L-N, would be low or negligible (i.e., <4%) for all for  
31 virtually all locations and months.

32 Assessment of effects of nitrate in the SWP/CVP Export Service Areas is based on effects on nitrate  
33 concentrations at the Banks and Jones pumping plants. Results of the mass balance calculations  
34 indicate that under Alternative 4A relative to Existing Conditions, long-term average nitrate  
35 concentrations at Banks and Jones pumping plants are anticipated to change negligibly. No  
36 additional exceedances of the 10 mg/L-N MCL are anticipated, and use of assimilative capacity  
37 available under Existing Conditions, relative to the MCL would be negligible (i.e., <3%) for both  
38 Banks and Jones pumping plants for all months.

39 Based on the above, there would be no substantial, long-term increase in nitrate concentrations in  
40 the rivers and reservoirs upstream of the Delta, in the Plan Area, or the SWP/CVP Export Service  
41 Areas under Alternative 4A relative to Existing Conditions. As such, this alternative is not expected  
42 to cause additional exceedance of applicable water quality objectives/criteria by frequency,  
43 magnitude, and geographic extent that would cause adverse effects on any beneficial uses of waters  
44 in the affected environment. Because nitrate concentrations are not expected to increase

1 substantially, no long-term water quality degradation is expected to occur and, thus, no adverse  
2 effects to beneficial uses would occur. Nitrate is not CWA Section 303(d) listed within the affected  
3 environment and thus any increases that may occur in some areas and months would not make any  
4 existing nitrate-related impairment measurably worse because no such impairments currently exist.  
5 Because nitrate is not bioaccumulative, increases that may occur in some areas and months would  
6 not bioaccumulate to greater levels in aquatic organisms that would, in turn, pose substantial health  
7 risks to fish, wildlife, or humans. Based on these findings, this impact is considered to be less than  
8 significant. No mitigation is required.

9 Impact WQ-16: Effects on Nitrate Concentrations Resulting from Implementation of  
10 Environmental Commitments 3, 4, 6–12, 15, and 16

11 *NEPA Effects:* Some habitat restoration activities included in Environmental Commitments 3, 4, and  
12 6–11 would occur on lands within the Delta formerly used for agriculture. As discussed for Impact  
13 WQ-2, increased biota that may result in those areas may increase ammonia, which in turn may be  
14 converted to nitrate by established microbial communities. However, the areal extent of new habitat  
15 implemented for the Environmental Commitments would be less than the existing and No Action  
16 Alternative habitat areas, and similar habitat exists currently in the Delta and is not identified as  
17 contributing to adverse nitrate conditions. Thus, these land use changes would not be expected to  
18 substantially increase nitrate concentrations in the Delta. Implementation of Environmental  
19 Commitments 12, 15, and 16 do not include actions that would affect nitrate sources or loading.  
20 Based on these findings, the effects on nitrate from implementing Environmental Commitments 3, 4,  
21 6–12, 15, and 16 are considered to be not adverse.

22 *CEQA Conclusion:* Land use changes that would occur from the environmental commitments are not  
23 expected to substantially increase nitrate concentrations, because the amount of area to be  
24 converted would be small relative to existing habitat, and existing habitats are not known for  
25 contributing to adverse nitrate conditions. Thus, it is expected that implementation of  
26 Environmental Commitments 3, 4, 6–12, 15, and 16 would not cause additional exceedance of  
27 applicable water quality objectives/criteria by frequency, magnitude, and geographic extent that  
28 would cause adverse effects on any beneficial uses of waters in the affected environment. Because  
29 nitrate concentrations are not expected to increase substantially due to these environmental  
30 commitments, no long-term water quality degradation is expected to occur and, thus, no adverse  
31 effects to beneficial uses would occur. Nitrate is not CWA Section 303(d) listed within the affected  
32 environment and thus any minor increases that may occur in some areas would not make any  
33 existing nitrate-related impairment measurably worse because no such impairments currently exist.  
34 Because nitrate is not bioaccumulative, minor increases that may occur in some areas would not  
35 bioaccumulate to greater levels in aquatic organisms that would, in turn, pose substantial health  
36 risks to fish, wildlife, or humans. Based on these findings, this impact is considered to be less than  
37 significant. No mitigation is required.

38 Impact WQ-17: Effects on Dissolved Organic Carbon Concentrations Resulting from Facilities  
39 Operations and Maintenance

40 *Upstream of the Delta*

41 The effects of Alternative 4A on DOC concentrations in reservoirs and rivers upstream of the Delta  
42 would be similar to those effects described for Alternative 4 because factors affecting DOC  
43 concentrations (e.g., source and non-point source inputs) in these water bodies would be similar.



1 Moreover, long-term average flow and DOC levels in the Sacramento River at Hood and San Joaquin  
2 River at Vernalis are poorly correlated. Thus changes in system operations and resulting reservoir  
3 storage levels and river flows under Alternative 4A would not be expected to cause substantial long-  
4 term changes in DOC concentrations in the water bodies upstream of the Delta. Any changes in DOC  
5 levels in water bodies upstream of the Delta under Alternative 4A, relative to Existing Conditions  
6 and the No Action Alternative (ELT and LLT), would not be of sufficient frequency, magnitude and  
7 geographic extent that would adversely affect any beneficial uses or substantially degrade the  
8 quality of these water bodies.

### 9 *Delta*

10 Effects of water conveyance facilities on long-term average DOC concentrations under Alternative  
11 4A in the Delta would be similar to the effects discussed for Alternative 4. To the extent that habitat  
12 restoration actions would alter hydrodynamics within the Delta region, which affects mixing of  
13 source waters, these effects are included in this assessment of water quality changes due to water  
14 conveyance facilities operations and maintenance. However, there would be less potential for  
15 increased DOC concentrations at western Delta locations associated with habitat restoration under  
16 Alternative 4A because very little would occur relative to Alternative 4. Other effects of  
17 environmental commitments not attributable to hydrodynamics are discussed within Impact WQ-  
18 18. See Chapter 8, Section 8.3.1.3, *Plan Area*, in Appendix A of the RDEIR/SDEIS for more  
19 information regarding the hydrodynamic modeling methodology.

20 Under Alternative 4A, the geographic extent of effects pertaining to long-term average DOC  
21 concentrations in the Delta would be similar to that described for Alternative 4, although the  
22 magnitude of predicted long-term change and relative frequency of concentration threshold  
23 exceedances would be lower. The effects of Alternative 4A relative to Existing Conditions and the No  
24 Action Alternative (ELT) are discussed together because the direction and magnitude of predicted  
25 change are similar. Relative to the Existing Conditions and No Action Alternative (ELT), Alternative  
26 4A would result in small increases in long-term average DOC concentrations for both the modeled  
27 16-year period (1976–1991) and drought period (1987–1991) at several interior Delta locations  
28 (increases up to 0.3 mg/L at the S. Fork Mokelumne River at Staten Island, Franks Tract, Old River at  
29 Rock Slough, and Contra Costa Pumping Plant #1) (Table DOC-1 in Appendix B of this  
30 RDEIR/SDEIS). The increases in average DOC concentrations would correspond to more frequent  
31 concentration threshold exceedances, with the greatest change occurring at the Contra Costa  
32 Pumping Plant #1 locations exceeding the 3 mg/L (i.e., increase from 52% under Existing Conditions  
33 to 72% under Alternative 4A for the modeled 16-year period). The change in frequency of threshold  
34 concentration exceedances at other assessment locations would be similar or lower.

35 While Alternative 4A would lead to slightly higher long-term average DOC concentrations at some  
36 municipal water intakes and Delta interior locations, the predicted change would not be expected to  
37 adversely affect MUN beneficial uses, or any other beneficial use. As discussed for Alternative 4,  
38 substantial changes in ambient DOC concentrations would need to occur before significant changes  
39 in drinking water treatment plant design or operations are triggered. The increases in long-term  
40 average DOC concentrations estimated to occur at various Delta locations under Alternative 4A are  
41 of sufficiently small magnitude that they would not require existing drinking water treatment plants  
42 to substantially upgrade treatment for DOC removal above levels currently employed.

43 In the LLT, the primary difference will be changes in the Delta source water fractions due to  
44 hydrologic effects from climate change and higher water demands. These effects would occur

1 regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative  
2 on DOC are expected to be similar to those described above.

3 Relative to Existing Conditions and the No Action Alternative (ELT and LLT), Alternative 4A would  
4 lead to predicted improvements in long-term average DOC concentrations at Barker Slough, as well  
5 as Banks and Jones pumping plants (discussed below).

#### 6 *SWP/CVP Export Service Areas*

7 Under the Alternative 4A, long-term average DOC concentrations would decrease at Barker Slough  
8 (as much as 0.1–0.2 mg/L) and at both the Banks and Jones pumping plants (as much as 0.4 mg/L)  
9 relative to Existing Conditions and depending on operational scenario, and the reductions would be  
10 similar compared to No Action Alternative (ELT) (Table DOC-1 in Appendix B of this RDEIR/SDEIS).  
11 Decreases in long-term average DOC would result in generally lower exceedance frequencies for  
12 concentration thresholds, although the frequency of exceedances of the 3 mg/L threshold during the  
13 modeled drought period would increase at the Banks and Jones pumping plants (i.e., increase from  
14 57% under Existing Conditions to 77% under Alternative 4A). Comparisons to the No Action  
15 Alternative (ELT) yield similar trends, but with slightly smaller magnitude drought period changes.

16 In the LLT, the primary difference will be changes in the Delta source water fractions due to  
17 hydrologic effects from climate change and higher water demands. These effects would occur  
18 regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative  
19 on DOC are expected to be similar to those described above.

20 Maintenance of SWP and CVP facilities under Alternative 4A would not be expected to create new  
21 sources of DOC or contribute towards a substantial change in existing sources of DOC in the affected  
22 area.

23 *NEPA Effects:* In summary, the operations and maintenance activities under Alternative 4A, relative  
24 to the No Action Alternative (ELT and LLT), would not cause a substantial long-term change in DOC  
25 concentrations in the water bodies upstream of the Delta, in the Delta, or in the SWP/CVP Export  
26 Service Areas. The long-term average DOC concentrations at Banks and Jones pumping plants are  
27 predicted to decrease by about 0.4 mg/L, while long-term average DOC concentrations for some  
28 Delta interior locations are predicted to increase by as much as 0.3 mg/L. Regardless of operational  
29 scenario, the increase in long-term average DOC concentration that could occur within the Delta  
30 interior would not be of sufficient magnitude to adversely affect the MUN beneficial use, or any  
31 other beneficial uses, of Delta waters. Based on these findings, the effect of operations and  
32 maintenance activities on DOC under Alternative 4A is determined to be not adverse.

33 *CEQA Conclusion:* For the same reasons described for Alternative 4, the operations and  
34 maintenance activities under Alternative 4A, relative to the Existing Conditions, would not cause a  
35 substantial long-term change in DOC concentrations in the water bodies upstream of the Delta, in  
36 the Delta, or in the SWP/CVP Export Service Areas. Any modified reservoir operations and  
37 subsequent changes in river flows under Alternative 4A, relative to Existing Conditions, would not  
38 be expected to result in a substantial adverse change in DOC levels upstream of the Delta. Moreover,  
39 long-term average flow and DOC at Sacramento River at Hood and San Joaquin River at Vernalis are  
40 poorly correlated; therefore, changes in river flows would not be expected to cause a substantial  
41 long-term change in DOC concentrations upstream of the Delta.

42 Relative to Existing Conditions, the Alternative 4A would result in relatively small increases (i.e.,  
43 **≤0.3 mg/L**) in long-term average DOC concentrations at some interior Delta locations. The predicted

1 increases under the operational scenarios modeled would not substantially increase the frequency  
2 with which long-term average DOC concentrations exceeds 2, 3, or 4 mg/L. While the operational  
3 scenarios would lead to slightly higher long-term average DOC concentrations at the interior Delta  
4 locations and some municipal water intakes, the predicted changes would not be expected to  
5 adversely affect MUN beneficial uses, or any other beneficial use.

6 Relative to Existing Conditions, the Alternative 4A would result in reduced long-term average DOC  
7 concentrations at the Banks and Jones pumping plants and Barker Slough. However, Alternative 4A  
8 would result in slightly greater frequency of exceedance of the 3 mg/L DOC concentration threshold  
9 during the modeled drought period. Nevertheless, under any operational scenario, an overall  
10 improvement in DOC-related water quality would be predicted in the SWP/CVP Export Service  
11 Areas.

12 Based on the above, the operations and maintenance activities of Alternative 4A Scenarios H3–H4  
13 would not result in any substantial change in long-term average DOC concentration. The increases in  
14 long-term average DOC concentration that could occur within the Delta would not be of sufficient  
15 magnitude to adversely affect the MUN beneficial use, or any other beneficial uses, of Delta waters or  
16 waters of the SWP/CVP Service Area. Because DOC is not bioaccumulative, the increases in long-  
17 term average DOC concentrations would not directly cause bioaccumulative problems in aquatic life  
18 or humans. Finally, DOC is not causing beneficial use impairments and thus is not CWA Section  
19 303(d) listed for any water body within the affected environment. Because long-term average DOC  
20 concentrations are not expected to increase substantially, no long-term water quality degradation  
21 with respect to DOC is expected to occur and, thus, no adverse effects on beneficial uses would  
22 occur. Based on these findings, this impact is considered to be less than significant. No mitigation is  
23 required.

24 Impact WQ-18: Effects on Dissolved Organic Carbon Concentrations Resulting from  
25 Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16

26 The potential types of effects on DOC resulting from implementation of the environmental  
27 commitments under Alternative 4A would be generally similar to those described under Alternative  
28 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS). However, the magnitude of  
29 effects on DOC at locations upstream of the Delta, in the Delta, and the SWP/CVP export service  
30 areas would be considerably lower than described for Alternative 4.

31 As described for Alternative 4, Environmental Commitments 3, 9, 11, 12, 15, and 16 would present  
32 no major sources of DOC to the affected environment, including areas Upstream of the Delta, within  
33 the Plan Area, and the SWP/CVP Export Service Area that would adversely affect beneficial uses.  
34 Environmental Commitments 4, 6, 7, and 10 include habitat restoration activities known to be  
35 sources of DOC. However, the amount of new habitat restoration to be implemented would be very  
36 small compared to the areal extent of existing habitat and that proposed for the No Action  
37 Alternative. Based on the amount of habitat restoration proposed, DOC loading from these areas  
38 would be very low in these water bodies. Consequently, relative to the Existing Conditions and No  
39 Action Alternative (ELT and LLT), the potential DOC loading to the Delta would be minimal, and thus  
40 not contribute substantially to the amounts of DOC in raw drinking water supplies.

41 *NEPA Effects:* Relative to existing habitat and that to be developed under the No Action Alternative  
42 (ELT and LLT), the area of new habitat restoration implemented for the environmental  
43 commitments would be very small. Implementation of non-habitat restoration environmental  
44 commitments would not be expected to have substantial, if even measurable, effect on DOC

1 concentrations upstream of the Delta, within the Delta, and in the SWP/CVP Export Service Areas,  
2 because they would present no major sources of DOC to the affected environment. Consequently,  
3 any increases in average DOC levels in the affected environment are not expected to be of sufficient  
4 frequency, magnitude and geographic extent that would adversely affect the MUN beneficial use, or  
5 any other beneficial uses, of the affected environment, nor would potential increases substantially  
6 degrade water quality with regard to DOC. Based on these findings, the effect of the environmental  
7 commitments on DOC is determined to be not adverse.

8 *CEQA Conclusion:* Implementation of habitat restoration environmental commitments is not  
9 expected to cause a substantial long-term change in DOC concentrations in the water bodies  
10 upstream of the Delta, in the Delta, or in the SWP/CVP Export Service Areas, relative to the Existing  
11 Conditions, because the land area proposed for restoration would be relatively small compared to  
12 existing land area and sources of DOC. Implementation of other environmental commitments also  
13 would not be expected to have substantial, if even measurable, effect on DOC concentrations  
14 upstream of the Delta, within the Delta, and in the SWP/CVP Export Service Areas, because they  
15 would present no major sources of DOC to the affected environment. Consequently, increases in  
16 average DOC levels in the affected environment are not expected to be of sufficient frequency,  
17 magnitude and geographic extent that would adversely affect the MUN beneficial use, or any other  
18 beneficial uses, of the affected environment, nor would potential increases substantially degrade  
19 water quality with regard to DOC. Furthermore, DOC is not bioaccumulative, therefore changes in  
20 DOC concentrations would not cause bioaccumulative problems in aquatic life or humans. Finally,  
21 DOC is not causing beneficial use impairments and thus is not CWA Section 303(d) listed for any  
22 water body within the affected environment. Because long-term average DOC concentrations are not  
23 expected to increase substantially, no long-term water quality degradation with respect to DOC is  
24 expected to occur and, thus, no adverse effects on beneficial uses would occur. Based on these  
25 findings, this impact is considered to be less than significant. No mitigation is required.

#### 26 Impact WQ-19: Effects on Pathogens Resulting from Facilities Operations and Maintenance

27 The effects of operation of the water conveyance facilities under Alternative 4A on pathogen levels  
28 in surface waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Service Areas  
29 relative to Existing Conditions would be similar to those effects described for Alternative 4 (see  
30 Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS). As described for Alternative 4,  
31 pathogen concentrations in the Sacramento and San Joaquin Rivers have a minimal relationship to  
32 flow rate in these rivers. Further, urban runoff contributions during the dry season would be  
33 expected to be a relatively small fraction of the rivers' total flow rates. During wet weather events,  
34 when urban runoff contributions would be higher, the flows in the rivers also would be higher.  
35 Given the small magnitude of urban runoff contributions relative to the magnitude of river flows and  
36 that pathogen concentrations in the rivers have a minimal relationship to river flow rate, river flow  
37 rate and reservoir storage reductions that would occur under Alternative 4A, relative to Existing  
38 Conditions and the No Action Alternative (ELT and LLT), would not be expected to result in a  
39 substantial adverse change in pathogen concentrations in the reservoirs and rivers upstream of the  
40 Delta.

41 The effects of Alternative 4A relative to Existing Conditions and the No Action Alternative (ELT and  
42 LLT) would be changes in the relative percentage of water throughout the Delta being comprised of  
43 various source waters (i.e., water from the Sacramento River, San Joaquin River, Bay water, eastside  
44 tributaries, and agricultural return flow), due to potential changes in inflows particularly from the  
45 Sacramento River watershed. However, as described for Alternative 4, it is expected there would be

1 no substantial change in Delta pathogen concentrations in response to a shift in the Delta source  
2 water percentages under this alternative or substantial degradation of these water bodies, with  
3 regard to pathogens, because it is expected that pathogen sources in close proximity to Delta sites  
4 would have a greater influence on pathogen levels at the site, rather than the primary source(s) of  
5 water to the site. In-Delta potential pathogen sources, including water-based recreation, tidal  
6 habitat, wildlife, and livestock-related uses, would continue under this alternative. As such, there is  
7 not expected to be substantial, if even measurable, changes in pathogen concentrations in the  
8 SWP/CVP Export Service Area waters.

9 As such, Alternative 4A would not be expected to substantially increase the frequency with which  
10 applicable Basin Plan objectives or U.S. EPA-recommended pathogen criteria would be exceeded in  
11 water bodies of the affected environment located upstream of the Delta or substantially degrade the  
12 quality of these water bodies, with regard to pathogens.

13 *NEPA Effects:* Because pathogen levels are expected to be minimally affected relative to the No  
14 Action Alternative (ELT and LLT), the effects on pathogens from implementing Alternative 4A are  
15 determined to be not adverse.

16 *CEQA Conclusion:* The effects of Alternative 4A on pathogen levels in surface waters upstream of the  
17 Delta, in the Delta, and in the SWP/CVP Export Service Areas relative to Existing Conditions would  
18 be similar to those described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the  
19 RDEIR/SDEIS). This is because the factors that would affect pathogen levels in the surface waters of  
20 these areas would be similar. Therefore, this alternative is not expected to cause additional  
21 exceedance of applicable water quality objectives by frequency, magnitude, and geographic extent  
22 that would cause adverse effects on any beneficial uses of waters in the affected environment.  
23 Because pathogen concentrations are not expected to increase substantially, no long-term water  
24 quality degradation for pathogens is expected to occur and, thus, no adverse effects on beneficial  
25 uses would occur. The San Joaquin River in the Stockton Deep Water Ship Channel is CWA Section  
26 303(d) listed for pathogens. Because no measurable increase in Deep Water Ship Channel pathogen  
27 concentrations are expected to occur on a long-term basis, further degradation and impairment of  
28 this area is not expected to occur. Finally, pathogens are not bioaccumulative constituents. Based on  
29 these findings, this impact is considered to be less than significant. No mitigation is required.

30 Impact WQ-20: Effects on Pathogens Resulting from Implementation of Environmental  
31 Commitments 3, 4, 6–12, 15, and 16

32 *NEPA Effects:* Environmental Commitments 3, 4, and 6–11 would involve habitat restoration  
33 actions. Tidal wetlands are known to be sources of coliforms originating from aquatic, terrestrial,  
34 and avian wildlife that inhabit these areas (Desmarais et al. 2001, Grant et al. 2001, Evanson and  
35 Ambrose 2006, Tetra Tech 2007). Specific locations of restoration areas for this alternative have not  
36 yet been established. However, most low-lying land suitable for restoration is unsuitable for  
37 livestock. Therefore, it is likely that the majority of land to be converted to wetlands would be crop-  
38 based agriculture or fallow/idle land. Because of a great deal of scientific uncertainty in the loading  
39 of coliforms from these various sources, the resulting change in coliform loading is uncertain, but it  
40 is anticipated that coliform loading to Delta waters would increase. Based on findings from the  
41 Pathogens Conceptual Model that pathogen concentrations are greatly influenced by the proximity  
42 to the source, this could result in localized increases in wildlife-related coliforms relative to the No  
43 Action Alternative (ELT and LLT). The geographic extent of the potential increases would be less  
44 than under Alternative 4, because less land would be converted under Alternative 4A. The Delta

1 currently supports similar habitat types and, with the exception of the CWA Section 303(d) listing  
2 for the Stockton Deep Water Ship Channel, is not recognized as exhibiting pathogen concentrations  
3 that rise to the level of adversely affecting beneficial uses. As such, the potential increase in wildlife-  
4 related coliform concentrations due to tidal habitat creation is not expected to adversely affect  
5 beneficial uses.

6 The remaining environmental commitments would not be expected to affect pathogen levels,  
7 because they are actions that do not affect the presence of pathogen sources.

8 Based on these findings, the effects on pathogens from implementing Environmental Commitments  
9 3, 4, 6–12, 15, and 16 are determined to not be adverse.

10 *CEQA Conclusion:* Based on findings from the Pathogens Conceptual Model that pathogen  
11 concentrations are greatly influenced by the proximity to the source, implementation of  
12 Environmental Commitments 3, 4, and 6–11 could result in localized increases in wildlife-related  
13 coliforms relative to Existing Conditions. The geographic extent of the increase would be less than  
14 under Alternative 4, because less land would be converted under Alternative 4A. The Delta currently  
15 supports similar habitat types and, with the exception of the CWA Section 303(d) listing for the  
16 Stockton Deep Water Ship Channel, is not recognized as exhibiting pathogen concentrations that rise  
17 to the level of adversely affecting beneficial uses. As such, the potential increase in wildlife-related  
18 coliform concentrations due to tidal habitat creation is not expected to adversely affect beneficial  
19 uses. Therefore, this alternative is not expected to cause additional exceedance of applicable water  
20 quality objectives by frequency, magnitude, and geographic extent that would cause adverse effects  
21 on any beneficial uses of waters in the affected environment. Because pathogen concentrations are  
22 not expected to increase substantially, no long-term water quality degradation for pathogens is  
23 expected to occur and, thus, no adverse effects on beneficial uses would occur. The San Joaquin  
24 River in the Stockton Deep Water Ship Channel is CWA Section 303(d) listed for pathogens. Because  
25 no measurable increase in Deep Water Ship Channel pathogen concentrations are expected to occur  
26 on a long-term basis, further degradation and impairment of this area is not expected to occur.  
27 Finally, pathogens are not bioaccumulative constituents. Based on these findings, this impact is  
28 considered to be less than significant. No mitigation is required.

29 Impact WQ-21: Effects on Pesticide Concentrations Resulting from Facilities Operations and  
30 Maintenance

31 The effects of Alternative 4A on pesticide levels in surface waters upstream of the Delta, relative to  
32 Existing Conditions and the No Action Alternative (ELT), would be similar to those expected to occur  
33 under Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS). This is  
34 because under Alternative 4A, the primary factor that would influence pesticide concentrations in  
35 surface waters upstream of the Delta—the effect of timing and magnitude of reservoir releases on  
36 dilution capacity—is expected to change by a similar degree. As shown in Tables P-1 through P-4 in  
37 Appendix B of this RDEIR/SDEIS, changes in average winter and summer flow rates, relative to  
38 Existing Conditions and the No Action Alternative (ELT), are expected to be similar to or less than  
39 changes in flow rates expected under Alternative 4 in the Sacramento River at Freeport, American  
40 River at Nimbus, Feather River at Thermalito and the San Joaquin River at Vernalis (shown in Tables  
41 1–4 in Appendix 8L, *Pesticides*, of the Draft EIR/EIS). Similarly, the primary factor that would  
42 influence pesticide concentrations in surface waters of the Delta and in the SWP/CVP Export Service  
43 Areas (i.e., changes in San Joaquin River, Sacramento River and Delta Agriculture source water  
44 fractions at various Delta locations, including Banks and Jones pumping plants) is expected to

1 change by a similar degree. As shown for the two operational scenarios of Alternative 4A (Figures  
2 B.4-23 through B.4-66 in Appendix B of this RDEIR/SDEIS), the percent change in monthly average  
3 source water fractions would be similar to changes expected under Alternative 4 (Figures 133–175  
4 in Appendix 8D, *Source Water Fingerprinting Results*, of the Draft EIR/EIS).

5 It was concluded for Alternative 4, and thus for Alternative 4A based on similar flow changes, that  
6 the potential average summer flow reductions would not be of sufficient magnitude to substantially  
7 increase in-river pesticide concentrations or alter the long-term risk of pesticide-related effects on  
8 aquatic life beneficial uses upstream of the Delta. Greater long-term average flow reductions, and  
9 corresponding reductions in dilution/assimilative capacity, would be necessary before long-term  
10 risk of pesticide related effects on aquatic life beneficial uses would be adversely altered. Similarly,  
11 the modeled changes in the source water fractions of Sacramento River, San Joaquin River, and Delta  
12 agriculture water under Alternative 4A would not be of sufficient magnitude to substantially alter  
13 the long-term risk of pesticide-related toxicity to aquatic life, nor adversely affect other beneficial  
14 uses of the Delta. Based on the general observation that San Joaquin River, in comparison to the  
15 Sacramento River, is a greater contributor of organophosphate insecticides in terms of greater  
16 frequency of incidence and presence at concentrations exceeding water quality benchmarks,  
17 modeled increases in Sacramento River fraction at Banks and Jones would generally represent an  
18 improvement in export water quality respective to pesticides.

19 The flow changes in the LLT would be expected in the ranges of that described above for Alternative  
20 4A, relative to Existing Conditions and the No Action Alternative (ELT), and that described for  
21 Alternative 4 relative to the No Action Alternative (LLT) in Chapter 8, Section 8.3.3.9, in Appendix A  
22 of this RDEIR/SDEIS. Thus, similar to above and Alternative 4, the flow changes that would occur in  
23 the LLT under Alternative 4A, relative to Existing Conditions and the No Action Alternative (LLT),  
24 would not be expected to result in changes in dilution of pesticides of sufficient magnitude to  
25 substantially alter the long-term risk of pesticide-related toxicity to aquatic life, nor adversely affect  
26 other beneficial uses upstream of the Delta, in the Delta, or the SWP/CVP Export Service Areas.

27 *NEPA Effects:* In summary, the changes in long-term average flows on the Sacramento, Feather,  
28 American, and San Joaquin Rivers under Alternative 4A relative to the No Action Alternative (ELT  
29 and LLT) would be of insufficient magnitude to substantially increase the long-term risk of  
30 pesticide-related water quality degradation and related toxicity to aquatic life in these water bodies  
31 upstream of the Delta. Similarly, changes in source water fractions to the Delta would be of  
32 insufficient magnitude to substantially alter the long-term risk of pesticide-related water quality  
33 degradation and related toxicity to aquatic life in the Delta or CVP/SWP Export Service Areas.  
34 Therefore, the effects on pesticides from the water conveyance facilities are determined not to be  
35 adverse.

36 *CEQA Conclusion:* Based on the discussion above, the effects of Alternative 4A on pesticide levels in  
37 surface waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Service Areas relative  
38 to Existing Conditions would be similar to or slightly less than those described for the Alternative 4.  
39 The considered operational scenarios of Alternative 4A would not result in any substantial change in  
40 long-term average pesticide concentration or result in substantial increase in the anticipated  
41 frequency with which long-term average pesticide concentrations would exceed aquatic life toxicity  
42 thresholds or other beneficial use effect thresholds upstream of the Delta, at the 11 assessment  
43 locations analyzed for the Delta, or the SWP/CVP service area. Numerous pesticides are currently  
44 used throughout the affected environment, and while some of these pesticides may be  
45 bioaccumulative, those present-use pesticides for which there is sufficient evidence for their

1 presence in waters affected by SWP and CVP operations (i.e., diazinon, chlorpyrifos, diuron, and  
2 pyrethroids) are not considered bioaccumulative, and thus changes in their concentrations would  
3 not directly cause bioaccumulative problems in aquatic life or humans. Furthermore, while there are  
4 numerous CWA Section 303(d) listings throughout the affected environment that name pesticides as  
5 the cause for beneficial use impairment, the modeled changes in upstream river flows and Delta  
6 source water fractions under Scenarios H3–H4 would not be expected to make any of these  
7 beneficial use impairments measurably worse. Because long-term average pesticide concentrations  
8 are not expected to increase substantially, no long-term water quality degradation with respect to  
9 pesticides is expected to occur and, thus, no adverse effects on beneficial uses would occur. Based on  
10 these findings, this impact is considered to be less than significant. No mitigation is required.

11 Impact WQ-22: Effects on Pesticide Concentrations Resulting from Implementation of  
12 Environmental Commitments 3, 4, 6–12, 15, and 16

13 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS),  
14 Environmental Commitments 3, 4, and 6–11 could involve the conversion of active or fallow  
15 agricultural lands to natural landscapes, such as wetlands, grasslands, floodplains, and vernal pools.  
16 In the long-term, conversion of agricultural land to natural landscapes could possibly result in a  
17 limited reduction in pesticide use throughout the Delta. In the short-term, tidal and non-tidal  
18 wetland restoration over former agricultural lands may include the contamination of water with  
19 pesticide residues contained in the soils. Present use pesticides typically degrade fairly rapidly, and  
20 in such cases where pesticide containing soils are flooded, dissipation of those pesticides would be  
21 expected to occur rapidly. Environmental Commitments 12, 15, and 16 do not include actions that  
22 would affect pesticide sources or loading. Unlike under Alternative 4, *CM13 Invasive Aquatic*  
23 *Vegetation Control* and *CM19 Urban Stormwater Treatment* would not be implemented. Because of  
24 this, benefits to water quality from treatment measures that would reduce pesticide loading from  
25 urban land uses, as well as adverse impacts to water quality from application of herbicides directly  
26 to waters in the plan area that would occur under Alternative 4 would not occur under Alternative  
27 4A.

28 *NEPA Effects:* Environmental Commitments 3, 4, 6–12, 15, and 16 do not involve actions that would  
29 contribute long-term additional loading of pesticides, and the potential short-term loading from  
30 former agricultural lands would be expected to degrade and dissipate rapidly. Therefore, relative to  
31 the No Action Alternative (ELT and LLT), the effects on pesticides from implementing  
32 Environmental Commitments 3, 4, 6–12, 15, and 16 are determined to be not adverse.

33 *CEQA Conclusion:* Environmental Commitments 3, 4, 6–12, 15, and 16 do not involve actions that  
34 would contribute long-term additional loading of pesticides, and the potential short-term loading  
35 from former agricultural lands would be expected to degrade and dissipate rapidly, such that  
36 pesticide levels would differ little from Existing Conditions. Therefore, implementation of  
37 Environmental Commitments 3, 4, 6–12, 15, and 16 would not cause substantial long-term increases  
38 in pesticide concentrations in the rivers and reservoirs upstream of the Delta, in the Delta Region, or  
39 the SWP/CVP Export Service Areas. As such, these environmental commitments are not expected to  
40 cause additional exceedance of applicable water quality objectives by frequency, magnitude, and  
41 geographic extent that would cause adverse effects on any beneficial uses of waters in the affected  
42 environment. Because pesticide concentrations are not expected to increase substantially, no long-  
43 term water quality degradation for pesticides is expected to occur and, thus, no adverse effects to  
44 beneficial uses would occur. Furthermore, any negligible changes in long-term pesticide  
45 concentrations that may occur throughout the affected environment would not be expected to make



1 any existing beneficial use impairments measurably worse. Environmental Commitments 3, 4, 6–12,  
2 15, 16 do not include the use of pesticides known to be bioaccumulative in animals or humans, nor  
3 do the environmental commitments propose the use of any pesticide currently named in a CWA  
4 Section 303(d) listing of the affected environment. Based on these findings, this impact is considered  
5 to be less than significant. No mitigation is required.

6 Impact WQ-23: Effects on Phosphorus Concentrations Resulting from Facilities Operations  
7 and Maintenance

8 The effects of Alternative 4A on phosphorus concentrations in surface waters upstream of the Delta,  
9 in the Delta, and in the SWP/CVP Export Service Areas would be similar to those described for  
10 Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS). This is because  
11 factors which affect phosphorus concentrations in surface waters of these areas are the same under  
12 Alternative 4 and Alternative 4A. As described for Alternative 4, phosphorus loading to waters  
13 upstream of the Delta is not anticipated to change, and because changes in flows do not necessarily  
14 result in changes in concentrations or loading of phosphorus to these water bodies, substantial  
15 changes in phosphorus concentration are not anticipated under Alternative 4A, relative to Existing  
16 Conditions or the No Action Alternative (ELT and LLT), upstream of the Delta. Phosphorus  
17 concentrations may increase during January through March at locations in the Delta where the  
18 source fraction of San Joaquin River water increases, due to the higher concentration of phosphorus  
19 in the San Joaquin River during these months compared to Sacramento River water or San Francisco  
20 Bay water. However, based on the DSM2 fingerprinting results (Figures B.4-1 through B.4-66 in  
21 Appendix B of this RDEIR/SDEIS), together with source water concentrations (in Figure 8-56 in  
22 Appendix A of the RDEIR/SDEIS), the magnitude of increases during these months is expected to be  
23 negligible to low (i.e., <0.02 mg/L) at all Delta locations relative to Existing Conditions and the No  
24 Action Alternative (ELT and LLT). Thus, phosphorus concentrations in the Delta and waters  
25 exported from Banks and Jones pumping plants to the SWP/CVP Export Service Areas are expected  
26 to be similar to Existing Conditions and the No Action Alternative (ELT and LLT).

27 *NEPA Effects:* In summary, operation of the water conveyance facilities would have little to no effect  
28 on phosphorus concentrations in water bodies upstream of the Delta, in the Plan Area, and the  
29 waters exported to the SWP/CVP Export Service Areas, relative to the No Action Alternative (ELT  
30 and LLT). Thus, effects of the water conveyance facilities on phosphorus are considered to be not  
31 adverse.

32 *CEQA Conclusion:* The effects of Alternative 4A on phosphorus levels in surface waters upstream of  
33 the Delta, in the Delta, and in the SWP/CVP Export Service Areas relative to Existing Conditions  
34 would be similar to those described for the Alternative 4. There would be no substantial, long-term  
35 increase in phosphorus concentrations in the rivers and reservoirs upstream of the Delta, in the Plan  
36 Area, or the waters exported to the CVP and SWP service areas under Alternative 4A relative to  
37 Existing Conditions. As such, this alternative is not expected to cause additional exceedance of  
38 applicable water quality objectives/criteria by frequency, magnitude, and geographic extent that  
39 would cause adverse effects on any beneficial uses of waters in the affected environment. Because  
40 phosphorus concentrations are not expected to increase substantially, no long-term water quality  
41 degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur.  
42 Phosphorus is not CWA Section 303(d) listed within the affected environment and thus any minor  
43 increases that may occur in some areas would not make any existing phosphorus-related  
44 impairment measurably worse because no such impairments currently exist. Because phosphorus is  
45 not bioaccumulative, minor increases that may occur in some areas would not bioaccumulate to

1 greater levels in aquatic organisms that would, in turn, pose substantial health risks to fish, wildlife,  
2 or humans. Based on these findings, this impact is considered to be less than significant. No  
3 mitigation is required.

4 Impact WQ-24: Effects on Phosphorus Concentrations Resulting from Implementation of  
5 Environmental Commitments 3, 4, 6–12, 15, and 16

6 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS)  
7 Environmental Commitments 3, 4, and 6–11 would include activities that create additional aquatic  
8 habitat, which may affect phosphorus dynamics and speciation in localized areas where the  
9 restoration would occur, but would not contribute to additional phosphorus loading. Therefore,  
10 phosphorus concentrations are not expected to change substantially in the affected environment as  
11 a result of these restoration activities. Unlike under Alternative 4, *CM19 Urban Stormwater*  
12 *Treatment* would not be implemented under Alternative 4A. Because urban stormwater is a  
13 potential source of phosphorus in the affected environment, the slight decreases in phosphorus  
14 loading expected to occur as a result of implementation of CM19 under Alternative 4, relative to  
15 Existing Conditions and the No Action Alternative, would not occur under Alternative 4A.  
16 Environmental Commitments 12, 15, and 16 do not include actions that would affect phosphorus  
17 sources or loading.

18 *NEPA Effects:* Environmental Commitments 3, 4, 6–12, 15, and 16 do not involve actions that would  
19 contribute long-term additional loading of phosphorus. Therefore, relative to the No Action  
20 Alternative (ELT and LLT), the effects on phosphorus from implementing Environmental  
21 Commitments 3, 4, 6–12, 15, and 16 are considered to be not adverse.

22 *CEQA Conclusion:* Environmental Commitments 3, 4, 6–12, 15, and 16 do not involve actions that  
23 would contribute long-term additional loading of phosphorus. Therefore, there would be no  
24 substantial, long-term increase in phosphorus concentrations in the rivers and reservoirs upstream  
25 of the Delta, in the Delta Region, or the waters exported to the SWP/CVP Export Service Areas due to  
26 implementation of these environmental commitments relative to Existing Conditions. Because  
27 phosphorus concentrations are not expected to increase substantially due to these environmental  
28 commitments, no long-term water quality degradation is expected to occur and, thus, no adverse  
29 effects to beneficial uses would occur. Phosphorus is not CWA Section 303(d) listed within the  
30 affected environment and, thus, the environmental commitments would not make any existing  
31 phosphorus-related impairment measurably worse because no such impairments currently exist.  
32 Because phosphorus is not bioaccumulative, any increases that may occur in some areas would not  
33 bioaccumulate to greater levels in aquatic organisms that would, in turn, pose substantial health  
34 risks to fish, wildlife, or humans. Based on these findings, this impact is considered to be less than  
35 significant. No mitigation is required.

36 Impact WQ-25: Effects on Selenium Concentrations Resulting from Facilities Operations and  
37 Maintenance

### 38 *Upstream of the Delta*

39 The effects of Alternative 4A on selenium concentrations in reservoirs and rivers upstream of the  
40 Delta would be similar to those effects described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in  
41 Appendix A of the RDEIR/SDEIS), because factors affecting selenium concentrations in these water  
42 bodies would be similar. Substantial point sources of selenium do not exist upstream in the  
43 Sacramento River watershed, in the watersheds of the eastern tributaries (Cosumnes, Mokelumne,

1 and Calaveras Rivers), or upstream of the Delta in the San Joaquin River watershed. Nonpoint  
2 sources of selenium within the watersheds of the Sacramento River and the eastern tributaries also  
3 are relatively low, resulting in generally low selenium concentrations in the reservoirs and rivers of  
4 those watersheds. Consequently, any modified reservoir operations and subsequent changes in river  
5 flows under Alternative 4A, relative to Existing Conditions or the No Action Alternative (ELT and  
6 LLT), are expected to have negligible, if any, effects on reservoir and river selenium concentrations  
7 upstream of Freeport in the Sacramento River watershed or in the eastern tributaries upstream of  
8 the Delta. Similarly, it is expected that selenium concentrations in the San Joaquin River would be  
9 minimally affected, if at all, by anticipated changes in flow rates under Alternative 4A, given the  
10 relatively small decreases in flows and the considerable variability in the relationship between  
11 selenium concentrations and flows in the San Joaquin River. Any negligible changes in selenium  
12 concentrations that may occur in the water bodies of the affected environment located upstream of  
13 the Delta would not be of frequency, magnitude, and geographic extent that would adversely affect  
14 any beneficial uses or substantially degrade the quality of these water bodies as related to selenium.

### 15 *Delta*

16 Modeling scenarios included assumptions regarding how certain habitat restoration activities would  
17 affect Delta hydrodynamics. The amount of habitat restoration completed under Alternative 4A  
18 would be substantially less than under Alternative 4. To the extent that restoration actions would  
19 alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are  
20 included in this assessment of water quality changes due to water conveyance facilities operations  
21 and maintenance. Other effects of environmental commitments not attributable to hydrodynamics  
22 are discussed within Impact WQ-26. See Chapter 8, Section 8.3.1.3, *Plan Area*, in Appendix A of the  
23 RDEIR/SDEIS for more information regarding the hydrodynamic modeling methodology.

24 Alternative 4A would result in small changes in average selenium concentrations in water relative to  
25 Existing Conditions and No Action Alternative (ELT) at all modeled Delta assessment locations  
26 (Table Se-1 in Appendix B of this RDEIR/SDEIS). Long-term average concentrations at some interior  
27 and western Delta locations would increase by 0.01–0.04 µg/L for the entire period modeled (1976–  
28 1991), depending on operational scenario. These small increases in selenium concentrations in  
29 water would result in small reductions (4% or less) in available assimilative capacity for selenium,  
30 relative to USEPA’s draft water quality criterion of 1.3 µg/L (Tables Se-8a and Se-8b in Appendix B  
31 of this RDEIR/SDEIS). The long-term average selenium concentrations in water under Alternative  
32 4A (range 0.09–0.40 µg/L) would be similar to Existing Conditions (range 0.09–0.41 µg/L) and the  
33 No Action Alternative (ELT) (range 0.09–0.39 µg/L), and would be below the draft water quality  
34 criterion of 1.3 µg/L (Table Se-1 in Appendix B of this RDEIR/SDEIS). These changes would be  
35 nearly identical to those under Alternative 4.

36 Relative to Existing Conditions and the No Action Alternative (ELT), Alternative 4A would result in  
37 small changes (about 1% or less) in estimated selenium concentrations in most biota (whole-body  
38 fish, bird eggs [invertebrate diet or fish diet], and fish fillets) throughout the Delta, with little  
39 difference among locations (Tables Se-2a, Se-2b, Se-4a and Se-4b in Appendix B of this  
40 RDEIR/SDEIS). Level of Concern Exceedance Quotients (i.e., modeled tissue divided by Level of  
41 Concern benchmarks) for selenium concentrations in those biota for all years and for drought years  
42 are less than 1.0, indicating low probability of adverse effects. Similarly, Advisory Tissue Level  
43 Exceedance Quotients for selenium concentrations in fish fillets for all years and drought years are  
44 less than 1.0. Estimated selenium concentrations in sturgeon for the San Joaquin River at Antioch  
45 are predicted to increase by about 17 to 19 percent relative to Existing Conditions and to the No

1 Action Alternative (ELT) in all years (from about 4.7 to about 5.6 mg/kg dry weight [dw]), and those  
2 for sturgeon in the Sacramento River at Mallard Island are predicted to increase by about 12 percent  
3 in all years (from about 4.4 to 4.9 mg/kg dw) (Tables Se-5 and Se-6 in Appendix B of this  
4 RDEIR/SDEIS). Selenium concentrations in sturgeon during drought years are expected to increase  
5 by about 4 to 7 percent at those locations (Tables Se-5 and Se-6 in Appendix B of this RDEIR/SDEIS).  
6 Detection of small changes in whole-body sturgeon such as those estimated for the western Delta  
7 would require very large sample sizes because of the inherent variability in fish tissue selenium  
8 concentrations. Low Toxicity Threshold Exceedance Quotients for selenium concentrations in  
9 sturgeon in the western Delta would exceed 1.0 for drought years at both locations (as they do for  
10 Existing Conditions and the No Action Alternative (ELT) and for all years in the San Joaquin River at  
11 Antioch (where quotient increases from 0.94 to 1.1) (Table Se-7 in Appendix B of this  
12 RDEIR/SDEIS). The High Toxicity Threshold Quotient would be less than 1.0 at both locations for all  
13 years and drought years (Table Se-7 in Appendix B of this RDEIR/SDEIS).

14 The disparity between larger estimated changes for sturgeon and smaller changes for other biota is  
15 attributable largely to differences in modeling approaches, as described in Appendix 8M, *Selenium*,  
16 in Appendix A of this RDEIR/SDEIS. The model for most biota was calibrated to encompass the  
17 varying concentration-dependent uptake from waterborne selenium concentrations (expressed as  
18 the  $K_d$ , which is the ratio of selenium concentrations in particulates [as the lowest level of the food  
19 chain] relative to the waterborne concentration) that was exhibited in data for largemouth bass in  
20 2000, 2005, and 2007 at various locations across the Delta. In contrast, the modeling for sturgeon  
21 could not be similarly calibrated at the two western Delta locations and used literature-derived  
22 uptake factors and trophic transfer factors for the estuary from Presser and Luoma (2013). As noted  
23 in Appendix 8M, there was a significant negative log-log relationship of  $K_d$  to waterborne selenium  
24 concentration that reflected the greater bioaccumulation rates for bass at low waterborne selenium  
25 than at higher concentrations. There was no difference in bass selenium concentrations in the  
26 Sacramento River at Rio Vista in comparison to the San Joaquin River at Vernalis in 2000, 2005, and  
27 2007 [Foe 2010], despite a nearly 10-fold difference in waterborne selenium. Thus, there is more  
28 confidence in the site-specific modeling based on the Delta-wide model that was calibrated for bass  
29 data than in the estimates for sturgeon based on “fixed”  $K_d$ s for all years and for drought years  
30 without regard to waterborne selenium concentration at the two locations in different time periods.

31 Residence time of water in the Delta is expected to increase relative to Existing Conditions primarily  
32 as a result of habitat restoration (8,000 acres of tidal habitat restoration and enhancements to the  
33 Yolo Bypass) that is assumed to occur under the No Action Alternative (ELT) separate from  
34 Alternative 4A. Although estimates of the residence time increases are not available for Alternative  
35 4A, estimates for Alternative 4 Scenario H3 at the Late Long Term (presented in Table 8-60a in  
36 Section 8.3.1.7 of Appendix A in the *Microcystis* subsection) which contained 65,000 acres of tidal  
37 restoration are available, and is expected that residence time increases under Alternative 4A would  
38 be substantially less than identified for Alternative 4 in the table.

39 If increases in fish tissue or bird egg selenium were to occur as a result of increased residence time,  
40 the increases would likely be of concern only where fish tissues or bird eggs are already elevated in  
41 selenium to near or above thresholds of concern. That is, where biota concentrations are currently  
42 low and not approaching thresholds of concern (which, as discussed above, is the case throughout  
43 the Delta, except for sturgeon in the western Delta), changes in residence time alone would not be  
44 expected to cause them to then approach or exceed thresholds of concern. Thus, the most likely area  
45 in which biota tissues would be at levels high enough that additional bioaccumulation due to  
46 increased residence time from restoration areas would be a concern is the western Delta and Suisun

1 Bay for sturgeon. Based on the expected minor increases in residence time in the western Delta and  
2 Suisun Bay, any increases are not expected to be of sufficient magnitude to substantially affect  
3 selenium bioaccumulation.

4 Relative to Existing Conditions and the No Action Alternative (ELT), Alternative 4A would result in  
5 essentially no change in selenium concentrations throughout the Delta for most biota (about 1% or  
6 less), although larger increases in selenium concentrations are predicted for sturgeon in the western  
7 Delta. Concentrations of selenium in sturgeon would exceed only the lower benchmark, indicating a  
8 low potential for effects. The modeling of bioaccumulation for sturgeon is less calibrated to site-  
9 specific conditions than that for other biota, which was calibrated on a robust dataset for modeling  
10 of bioaccumulation in largemouth bass as a representative species for the Delta. Overall, Alternative  
11 4A would not be expected to substantially increase the frequency with which applicable water  
12 quality criterion, or toxicity and level of concern benchmarks would be exceeded in the Delta (there  
13 being only a small increase for sturgeon relative to the low benchmark and no exceedance of the  
14 high benchmark) or substantially degrade the quality of water in the Delta, with regard to selenium.  
15 These changes would be similar to those described for Alternative 4.

16 In the LLT, the primary difference will be changes in the Delta source water fractions due to  
17 hydrologic effects from climate change and higher water demands. These effects would occur  
18 regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative  
19 on selenium are expected to be similar to those described above.

#### 20 *SWP/CVP Export Service Areas*

21 Alternative 4 would result in small (0.05–0.09 µg/L) decreases in long-term average selenium  
22 concentrations in water at the Banks and Jones pumping plants, relative to Existing Conditions and  
23 the No Action Alternative (ELT), for the entire period modeled (Table Se-1 in Appendix B of this  
24 RDEIR/SDEIS). These decreases in long-term average selenium concentrations in water would  
25 result in increases in available assimilative capacity for selenium at these pumping plants, relative to  
26 the USEPA's draft water quality criterion of 1.3 µg/L (Tables Se-8a and Se-8b in Appendix B of this  
27 RDEIR/SDEIS). The long-term average selenium concentrations in water for Alternative 4A (range  
28 0.16–0.19 µg/L) would be well below the draft water quality criterion of 1.3 µg/L (Table Se-1 in  
29 Appendix B of this RDEIR/SDEIS).

30 Relative to Existing Conditions and the No Action Alternative (ELT), Alternative 4A would result in  
31 small changes (about 1% or less) in estimated selenium concentrations in biota (whole-body fish,  
32 bird eggs [invertebrate diet], bird eggs [fish diet], and fish fillets) (Tables Se-4a and Se-4b in  
33 Appendix B of this RDEIR/SDEIS). Concentrations in biota would not exceed any selenium toxicity or  
34 level of concern benchmarks for Alternative 4A (Tables Se-4a and Se-4b in Appendix B of this  
35 RDEIR/SDEIS).

36 In the LLT, the primary difference will be changes in the Delta source water fractions due to  
37 hydrologic effects from climate change and higher water demands. These effects would occur  
38 regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative  
39 on selenium are expected to be similar to those described above.

40 *NEPA Effects:* Relative to the No Action Alternative (ELT and LLT), Alternative 4A would result in  
41 essentially negligible changes in selenium concentrations in water upstream of the Delta. Similarly,  
42 there would be negligible changes in selenium water and most biota concentrations in the Delta,  
43 with no exceedances of benchmarks for biological effects. For sturgeon in the Delta, there would be

1 only a small increase of threshold exceedance relative to the low benchmark for sturgeon and no  
2 exceedance of the high benchmark. At the Banks and Jones pumping plants, Alternative 4A would  
3 cause no increases in the frequency with which applicable benchmarks would be exceeded and  
4 would slightly improve the quality of water in selenium concentrations. Therefore, the effects on  
5 selenium (both as waterborne and as bioaccumulated in biota) from Alternative 4A are considered  
6 to be not adverse.

7 *CEQA Conclusion:* There are no substantial point sources of selenium in watersheds upstream of the  
8 Delta, and no substantial nonpoint sources of selenium in the watersheds of the Sacramento River  
9 and the eastern tributaries. Nonpoint sources in the San Joaquin Valley that contribute selenium to  
10 the Delta will be controlled through a TMDL developed by the Central Valley Water Board (2001) for  
11 the lower San Joaquin River, established limits for the Grassland Bypass Project, and Basin Plan  
12 objectives (Central Valley Water Board [2010d] and State Water Board [2010b, 2010c]) that are  
13 expected to result in decreasing discharges of selenium from the San Joaquin River to the Delta.  
14 Consequently, any modified reservoir operations and subsequent changes in river flows under  
15 Alternative 4A, relative to Existing Conditions, are expected to cause negligible changes in selenium  
16 concentrations in water. Any negligible changes in selenium concentrations that may occur in the  
17 water bodies of the affected environment located upstream of the Delta would not be of frequency,  
18 magnitude, and geographic extent that would adversely affect any beneficial uses or substantially  
19 degrade the quality of these water bodies as related to selenium.

20 Relative to Existing Conditions, modeling estimates indicate Alternative 4A would result in  
21 essentially no change in selenium concentrations in water or most biota throughout the Delta, with  
22 no exceedances of benchmarks for biological effects. The Low Toxicity Threshold Exceedance  
23 Quotient for selenium concentrations in sturgeon for all years in the San Joaquin River at Antioch  
24 would increase slightly, from 0.94 for Existing Conditions to 1.1 for Alternative 4A. Concentrations  
25 of selenium in sturgeon would exceed only the lower benchmark, indicating a low potential for  
26 effects. Overall, Alternative 4A would not be expected to substantially increase the frequency with  
27 which applicable benchmarks would be exceeded in the Delta (there being only a small increase for  
28 sturgeon exceedance relative to the low benchmark for sturgeon and no exceedance of the high  
29 benchmark) or substantially degrade the quality of water in the Delta, with regard to selenium.

30 Assessment of effects of selenium in the SWP/CVP Export Service Areas is based on effects on  
31 selenium concentrations at the Banks and Jones pumping plants. Relative to Existing Conditions, all  
32 Alternative 4A would cause no increases in the frequency with which applicable benchmarks would  
33 be exceeded, and would slightly improve the quality of water in selenium concentrations at the  
34 Banks and Jones pumping plants.

35 Based on the above, selenium concentrations that would occur in water under Alternative 4A would  
36 not cause additional exceedances of applicable state or federal numeric or narrative water quality  
37 objectives/criteria, or other relevant water quality effects thresholds identified for this assessment,  
38 by frequency, magnitude, and geographic extent that would result in adverse effects to one or more  
39 beneficial uses within affected water bodies. In comparison to Existing Conditions, water quality  
40 conditions under Alternative 4A would not increase levels of selenium by frequency, magnitude, and  
41 geographic extent such that the affected environment would be expected to have measurably higher  
42 body burdens of selenium in aquatic organisms, thereby substantially increasing the health risks to  
43 wildlife (including fish) or humans consuming those organisms. Water quality conditions under  
44 these alternative scenarios with respect to selenium would not cause long-term degradation of  
45 water quality in the affected environment, and therefore would not result in use of available

1 assimilative capacity such that exceedances of water quality objectives/criteria would be likely and  
2 would result in substantially increased risk for adverse effects to one or more beneficial uses. This  
3 alternative would not further degrade water quality by measurable levels, on a long-term basis, for  
4 selenium and, thus, cause the CWA Section 303(d)-listed impairment of beneficial use to be made  
5 discernibly worse. Based on these findings, this impact is considered to be less than significant. No  
6 mitigation is required.

7 Impact WQ-26: Effects on Selenium Concentrations Resulting from Implementation of  
8 Environmental Commitments 3, 4, 6–12, 15, and 16

9 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS)  
10 Environmental Commitments 12, 15, and 16 do not involve actions that would increase selenium  
11 loading or otherwise alter selenium concentrations or residence time such that there would be a  
12 change in selenium concentrations in water or biota. Further, with the possible exception of changes  
13 in Delta hydrodynamics resulting from habitat restoration, Environmental Commitments 3, 4, and  
14 6–11 would not substantially increase selenium concentrations in the water bodies of the affected  
15 environment. Modeling scenarios included assumptions regarding how certain habitat restoration  
16 activities would affect Delta hydrodynamics, and thus such effects of these restoration measures  
17 were included in the assessment of facilities operations and maintenance (see Impact WQ-25).

18 While the implementation of Environmental Commitment 4 would create shallow backwater areas  
19 that could result in local increased water residence times, the extent of these areas would be  
20 minimal relative to the area of the Delta, and environmental changes associated with their  
21 development are unlikely to be of magnitude that would measurably change selenium  
22 concentrations in water or biota, relative to Existing Conditions. Further, although water residence  
23 times associated restoration could increase, they are not expected to increase without bound, and  
24 selenium concentrations in the water column would not continue to build up and be recycled in  
25 sediments and organisms as may be the case within a closed water system. However, because  
26 increases in bioavailable selenium in habitat restoration areas are uncertain, proposed avoidance  
27 and minimization measures would require evaluating risks of selenium exposure at a project level  
28 for each restoration area, minimizing to the extent practicable potential risk of additional  
29 bioaccumulation, and monitoring selenium levels in fish and/or wildlife to establish whether, or to  
30 what extent, additional bioaccumulation is occurring. See Appendix 3B, *Environmental*  
31 *Commitments*, of the Draft EIR/EIS for a description of the environmental commitment project  
32 proponents are making with respect to selenium management; and Appendix 3.C, *Avoidance and*  
33 *Minimization Measures*, of the Draft BDCP for additional detail on this avoidance and minimization  
34 measure (AMM27).

35 *NEPA Effects:* Environmental Commitments 3, 4, 6–12, 15, and 16 would not increase selenium  
36 loading, and the amount of restoration that would occur would be minimal relative to the area of the  
37 Delta and implemented such that any localized changes in residence time are unlikely to measurably  
38 change selenium concentrations in water or biota relative to the No Action Alternative (ELT and  
39 LLT), under which more restoration would occur. Therefore, the effects on selenium from  
40 implementing Environmental Commitments 3, 4, 6–12, 15, and 16 are determined to be not adverse.

41 *CEQA Conclusion:* Environmental Commitments 3, 4, 6–12, 15, and 16 would not increase selenium  
42 loading, and the amount of restoration that would occur would be minimal relative to the area of the  
43 Delta and implemented such that any localized changes in residence time are unlikely to measurably  
44 change selenium concentrations in water or biota relative to Existing Conditions. Therefore, it is

1 expected that with implementation of these environmental commitments there would be no  
2 substantial, long-term increase in selenium concentrations in water in the rivers and reservoirs  
3 upstream of the Delta, water in the Delta, or the waters exported to the SWP/CVP Export Service  
4 Areas, relative to Existing Conditions. As such, these environmental commitments would not cause  
5 additional exceedances of applicable water quality objectives/criteria by frequency, magnitude, and  
6 geographic extent that would cause adverse effects on any beneficial uses of waters in the affected  
7 environment. Given the factors discussed in the assessment above and for Alternative 4 (see Chapter  
8 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS), any increases in bioaccumulation rates from  
9 waterborne selenium that could occur in some areas as a result of increased water residence times  
10 would not be of sufficient magnitude and geographic extent that any portion of the Delta would be  
11 expected to have measurably higher body burdens of selenium in aquatic organisms, and therefore  
12 would not substantially increase risk for adverse effects to beneficial uses. Environmental  
13 Commitments 3, 4, 6–12, 15, and 16 would not cause long-term degradation of water quality  
14 resulting in sufficient use of available assimilative capacity such that occasionally exceeding water  
15 quality objectives/criteria would be likely. Also, these environmental commitments would not result  
16 in substantially increased risk for adverse effects to any beneficial uses. Furthermore, although the  
17 Delta is a CWA Section 303(d)-listed water body for selenium, given the discussion in the  
18 assessment above, it is unlikely that restoration areas would result in measurable increases in  
19 selenium in fish tissues or bird eggs such that the beneficial use impairment would be made  
20 discernibly worse.

21 Because it is unlikely that substantial increases in selenium in fish tissues or bird eggs would occur  
22 such that effects on aquatic life beneficial uses would be anticipated, and because of the avoidance  
23 and minimization measures that are designed to further minimize and evaluate the risk of such  
24 increases (see Appendix 3.C, *Avoidance and Minimization Measures*, of the Draft BDCP for more  
25 detail on AMM27) as well as the Selenium Management environmental commitment (see Appendix  
26 3B, *Environmental Commitments*, of the Draft EIR/EIS this impact is considered less than significant.  
27 No mitigation is required.

#### 28 Impact WQ-27: Effects on Trace Metal Concentrations Resulting from Facilities Operations 29 and Maintenance

30 The effects of operation of the water conveyance facilities under Alternative 4A on trace metal  
31 concentrations in surface waters upstream of the Delta, relative to Existing Conditions and the No  
32 Action Alternative (ELT and LLT) would be similar to those effects described for Alternative 4 (see  
33 Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS).

34 Given the poor association of dissolved trace metal concentrations with flow, river flow rate and  
35 reservoir storage reductions that would occur under Alternative 4A, relative to Existing Conditions  
36 and the No Action Alternative (ELT and LLT), would not be expected to result in a substantial  
37 adverse change in trace metal concentrations in the reservoirs and rivers upstream of the Delta.

38 In the Delta, for metals of primarily aquatic life concern (copper, cadmium, chromium, lead, nickel,  
39 silver, and zinc), average and 95<sup>th</sup> percentile trace metal concentrations of the primary source  
40 waters to the Delta are very similar, and very large changes in source water fraction would be  
41 necessary to effect a relatively small change in trace metal concentration at a particular Delta  
42 location. Moreover, average and 95<sup>th</sup> percentile trace metal concentrations for these primary source  
43 waters are all below their respective water quality criteria, including those that are hardness-based  
44 (see Tables 8-51 and 8-52 in Appendix A of this RDEIR/SDEIS). No mixing of these three source



1 waters could result in a metal concentration greater than the highest source water concentration,  
2 and given that the average and 95<sup>th</sup> percentile source water concentrations for copper, cadmium,  
3 chromium, lead, nickel, silver, and zinc do not exceed their respective criteria, more frequent  
4 exceedances of criteria in the Delta would not occur. For metals of primarily human health and  
5 drinking water concern (arsenic, iron, manganese), average and 95<sup>th</sup> percentile concentrations are  
6 also very similar (see Tables 8–10 in Appendix 8N, *Trace Metals*, of the Draft EIR/EIS) and average  
7 concentrations are below human health criteria. No mixing of these three source waters could result  
8 in a metal concentration greater than the highest source water concentration, and given that the  
9 average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria,  
10 more frequent exceedances of drinking water criteria in the Delta would not be expected to occur.

11 Because Alternative 4A would not result in substantial increases in trace metal concentrations in the  
12 water exported from the Delta or diverted from the Sacramento River through the proposed  
13 conveyance facilities, there is not expected to be substantial changes in trace metal concentrations  
14 in the SWP/CVP Export Service Areas, relative to Existing Conditions or the No Action Alternative  
15 (ELT and LLT).

16 As such, Alternative 4A would not be expected to substantially increase the frequency with which  
17 applicable Basin Plan objectives or CTR criteria would be exceeded in the water bodies of the  
18 affected environment or substantially degrade the quality of these water bodies, with regard to trace  
19 metals.

20 *NEPA Effects:* Alternative 4A would not be expected to substantially increase the frequency with  
21 which applicable Basin Plan objectives or CTR criteria would be exceeded in the water bodies of the  
22 affected environment or substantially degrade the quality of these water bodies, with regard to trace  
23 metals, relative to the No Action Alternative (ELT and LLT)., Therefore, the effects on trace metals  
24 from implementing Alternative 4A are determined to not be adverse.

25 *CEQA Conclusion:* While Alternative 4A would alter the magnitude and timing of reservoir releases  
26 north, south and east of the Delta, this would have no substantial effect on the various watershed  
27 sources of trace metals. Moreover, long-term average flow and trace metals at Sacramento River at  
28 Hood and San Joaquin River at Vernalis are poorly correlated; therefore, changes in river flows  
29 would not be expected to cause a substantial long-term change in trace metal concentrations  
30 upstream of the Delta.

31 Average and 95<sup>th</sup> percentile trace metal concentrations are very similar across the primary source  
32 waters to the Delta. Given this similarity, very large changes in source water fraction would be  
33 necessary to effect a relatively small change in trace metal concentration at a particular Delta  
34 location. Moreover, average and 95<sup>th</sup> percentile trace metal concentrations for these primary source  
35 waters are all below their respective water quality criteria. No mixing of these three source waters  
36 could result in a metal concentration greater than the highest source water concentration, and given  
37 that trace metals do not already exceed water quality criteria, more frequent exceedances of criteria  
38 in the Delta would not be expected to occur under Alternative 4A.

39 Because Alternative 4A is not expected to result in substantial changes in trace metal concentrations  
40 in Delta waters, which includes Banks and Jones pumping plants, effects on trace metal  
41 concentrations in the SWP/CVP Export Service Area are expected to be negligible.

42 As such, this alternative is not expected to cause additional exceedance of applicable water quality  
43 objectives by frequency, magnitude, and geographic extent that would cause adverse effects on any

1 beneficial uses of waters in the affected environment. Because trace metal concentrations are not  
2 expected to increase substantially, no long-term water quality degradation for trace metals is  
3 expected to occur and, thus, no adverse effects to beneficial uses would occur. Furthermore, any  
4 negligible changes in long-term trace metal concentrations that may occur in water bodies of the  
5 affected environment would not be expected to make any existing beneficial use impairments  
6 measurably worse. The trace metals discussed in this assessment are not considered  
7 bioaccumulative, and thus would not directly cause bioaccumulative problems in aquatic life or  
8 humans. Based on these findings, this impact is considered to be less than significant. No mitigation  
9 is required.

10 Impact WQ-28: Effects on Trace Metal Concentrations Resulting from Implementation of  
11 Environmental Commitments 3, 4, 6–12, 15, and 16

12 Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 present no new sources of  
13 trace metals to the affected environment, including areas upstream of the Delta, within the Delta, or  
14 in the SWP/CVP Export Service Areas. CM19, which under Alternative 4 would fund projects to  
15 contribute to reducing pollutant discharges in urban stormwater, would not be implemented under  
16 Alternative 4A, thus the associated trace metal reduction described for Alternative 4 would not  
17 occur under this alternative. However, stormwater discharges would continue to be regulated by the  
18 state and contributions would be expected to be similar to Existing Conditions and the No Action  
19 Alternative (ELT and LLT). The remaining environmental commitments would not be expected to  
20 affect trace metal levels, because they are actions that do not affect the presence of trace metal  
21 sources. As they pertain to trace metals, implementation of these environmental commitments  
22 would not be expected to adversely affect beneficial uses of the affected environment or  
23 substantially degrade water quality with respect to trace metals.

24 *NEPA Effects:* Because Environmental Commitments 3, 4, 6–12, 15, and 16 present no new sources  
25 of trace metals to the affected environment, the effects on trace metal concentrations from  
26 implementing these environmental commitments are determined to be not adverse.

27 *CEQA Conclusion:* Implementation of Environmental Commitments 3, 4, 6–12, 15, and 16 would not  
28 cause substantial long-term increase in trace metal concentrations in the rivers and reservoirs  
29 upstream of the Delta, in the Delta Region, or the SWP/CVP Export Service Areas, because they  
30 present no new sources of trace metals to the affected environment. As such, this alternative is not  
31 expected to cause additional exceedance of applicable water quality objectives by frequency,  
32 magnitude, and geographic extent that would cause adverse effects on any beneficial uses of waters  
33 in the affected environment. Because trace metal concentrations are not expected to increase  
34 substantially, no long-term water quality degradation for trace metals is expected to occur and, thus,  
35 no adverse effects to beneficial uses would occur. Furthermore, any negligible changes in long-term  
36 trace metal concentrations that may occur throughout the affected environment would not be  
37 expected to make any existing beneficial use impairments measurably worse. The trace metals  
38 discussed in this assessment are not considered bioaccumulative, and thus would not directly cause  
39 bioaccumulative problems in aquatic life or humans. Based on these findings, this impact is  
40 considered to be less than significant. No mitigation is required.

1 Impact WQ-29: Effects on TSS and Turbidity Resulting from Facilities Operations and  
2 Maintenance

3 As described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS),  
4 the operation of the water conveyance facilities under Alternative 4A is expected to have a minimal  
5 effect on TSS and turbidity levels in surface waters upstream of the Delta, in the Delta, and in the  
6 SWP/CVP Export Service Areas relative to Existing Conditions and the No Action Alternative (ELT  
7 and LLT). This is because the factors that would affect TSS and turbidity levels in the surface waters  
8 of these areas would be the same. TSS concentrations and turbidity levels in rivers upstream of the  
9 Delta are affected primarily by: 1) TSS concentrations and turbidity levels of the water released  
10 from the upstream reservoirs, 2) erosion occurring within the river channel beds, which is affected  
11 by river flow velocity and bank protection, 3) TSS concentrations and turbidity levels of tributary  
12 inflows, point-source inputs, and nonpoint runoff as influenced by surrounding land uses; and 4)  
13 phytoplankton, zooplankton and other biological material in the water. Within the Delta, TSS  
14 concentrations and turbidity levels in Delta waters are affected by TSS concentrations and turbidity  
15 levels of inflows (and associated sediment load), as well as fluctuation in flows within the channels  
16 due to the tides, with sediments depositing as flow velocities and turbulence are low at periods of  
17 slack tide, and sediments becoming suspended when flow velocities and turbulence increase when  
18 tides are near the maximum. TSS and turbidity variations can also be attributed to phytoplankton,  
19 zooplankton and other biological material in the water. These factors would be similar under  
20 Alternative 4A and Alternative 4, are expected to be minimally different from Existing Conditions  
21 and the No Action Alternative (ELT and LLT). Because Alternative 4A is expected to have minimal  
22 effect on TSS concentrations and turbidity levels in Delta waters, including water exported at the  
23 south Delta pumps, relative to Existing Conditions or the No Action Alternative (ELT and LLT),  
24 Alternative 4A also is expected to have minimal effect on TSS concentrations and turbidity levels in  
25 the SWP/CVP Export Service Areas waters.

26 *NEPA Effects:* Because TSS concentrations and turbidity levels are expected to be minimally affected  
27 relative to the No Action Alternative (ELT and LLT), the effects on TSS and turbidity from  
28 implementing Alternative 4A are determined to not be adverse.

29 *CEQA Conclusion:* As described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the  
30 RDEIR/SDEIS) changes in river flow rate and reservoir storage that would occur under Alternative  
31 4A, relative to Existing Conditions, would not be expected to result in a substantial adverse change  
32 in TSS concentrations and turbidity levels in the reservoirs and rivers upstream of the Delta, given  
33 that suspended sediment concentrations are more affected by season than flow. Within the Delta,  
34 geomorphic changes associated with sediment transport and deposition are usually gradual,  
35 occurring over years, and high storm event inflows would not be substantially affected. Thus, it is  
36 expected that the TSS concentrations and turbidity levels in the affected channels would not be  
37 substantially different from the levels under Existing Conditions. There is not expected to be  
38 substantial, if even measurable, changes in TSS concentrations and turbidity levels in the SWP/CVP  
39 Export Service Areas waters under Alternative 4A, relative to Existing Conditions, because this  
40 alternative is not expected to result in substantial changes in TSS concentrations and turbidity levels  
41 at the south Delta export pumps, relative to Existing Conditions. Therefore, this alternative is not  
42 expected to cause additional exceedance of applicable water quality objectives where such  
43 objectives are not exceeded under Existing Conditions. Because TSS concentrations and turbidity  
44 levels are not expected to be substantially different, long-term water quality degradation is not  
45 expected, and, thus, beneficial uses are not expected to be adversely affected. Finally, TSS and

1 turbidity are neither bioaccumulative nor CWA Section 303(d) listed constituents. Based on these  
2 findings, this impact is considered to be less than significant. No mitigation is required.

3 Impact WQ-30: Effects on TSS and Turbidity Resulting from Implementation of  
4 Environmental Commitments 3, 4, 6–12, 15, and 16

5 Environmental Commitments 3, 4, and 6–11 would involve habitat restoration actions. Creation of  
6 habitat and open water through implementation of these environmental commitments could affect  
7 Delta hydrodynamics and, thus, erosion and deposition potential in certain Delta channels, though  
8 the geographic extent of the effects would be substantially less than under Alternative 4, because  
9 less land would be converted under Alternative 4A. The magnitude of increases in TSS  
10 concentrations and turbidity levels in the affected channels due to higher potential of erosion cannot  
11 be readily quantified. The increases in TSS concentrations and turbidity levels in the affected  
12 channels could be substantial in localized areas, depending on how rapidly the channels equilibrate  
13 with the new tidal flux regime, after implementation of this alternative. However, geomorphic  
14 changes associated with sediment transport and deposition are usually gradual, occurring over  
15 years. Within the reconfigured channels there could be localized increases in TSS concentrations  
16 and turbidity levels, but within the greater Plan Area it is expected that the TSS concentrations and  
17 turbidity levels would not be substantially different from the levels under Existing Conditions or the  
18 No Action Alternative (ELT and LLT).

19 CM19, which under Alternative 4 would fund projects to contribute to reducing pollutant discharges  
20 in stormwater, would not be implemented under Alternative 4A, thus the associated TSS and  
21 turbidity reduction described for Alternative 4 would not occur under this alternative. Nevertheless,  
22 stormwater discharges would still be subject to the state's NPDES program requirements to  
23 implement control measures, which would contribute to controlling TSS and turbidity in discharges.

24 The remaining environmental commitments would not be expected to affect TSS concentrations and  
25 turbidity levels, because they are actions that do not affect the presence of TSS and turbidity  
26 sources.

27 *NEPA Effects:* Localized, temporary changes in TSS and turbidity could occur associated with the  
28 restoration actions of Environmental Commitments 3, 4, 6–12, 15, and 16. However, these changes  
29 would be gradual and not expected to substantially differ from No Action Alternative (ELT and LLT)  
30 conditions. Therefore, the effects on TSS and turbidity from implementing these environmental  
31 commitments are determined to be not adverse.

32 *CEQA Conclusion:* It is expected that the TSS concentrations and turbidity levels Upstream of the  
33 Delta, in the Plan Area, and the SWP/CVP Export Service Areas due to implementation of  
34 Environmental Commitments 3, 4, 6–12, 15, and 16 would not be substantially different relative to  
35 Existing Conditions, except within localized areas of the Delta modified through creation of habitat  
36 and open water. Therefore, this alternative is not expected to cause additional exceedance of  
37 applicable water quality objectives where such objectives are not exceeded under Existing  
38 Conditions. Because TSS concentrations and turbidity levels Upstream of the Delta, in the greater  
39 Plan Area, and in the SWP/CVP Export Service Areas are not expected to be substantially different,  
40 long-term water quality degradation is not expected relative to TSS and turbidity, and, thus,  
41 beneficial uses are not expected to be adversely affected. Finally, TSS and turbidity are neither  
42 bioaccumulative nor CWA Section 303(d) listed constituents. Based on these findings, this impact is  
43 considered to be less than significant. No mitigation is required.

1 Impact WQ-31: Water Quality Effects Resulting from Construction-Related Activities for the  
2 Water Conveyance Facilities and Environmental Commitments

3 The potential construction-related water quality effects that would occur under Alternative 4A  
4 would be of a lower magnitude compared to the effects described for Alternative 4 (see Chapter 8,  
5 Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS). This is because the size and number of  
6 construction activities for some environmental commitments under Alternative 4A would be  
7 reduced, or not occur, compared to Alternative 4. The construction-related activities for the water  
8 conveyance facilities under Alternative 4A would be the same as described for Alternative 4.  
9 However, there would be substantially less area of in-water habitat restoration activities  
10 implemented under Alternative 4A compared to Alternative 4. Therefore, the amount of  
11 construction activity under Alternative 4A would be lower than described for Alternative 4, thus  
12 resulting in less potential for construction-related disturbances and contaminant discharges to  
13 surface waters.

14 The construction-related activities for Alternative 4A would be most extensive for the new water  
15 conveyance facilities. Construction of water conveyance facilities would involve vegetation removal,  
16 material storage and handling, excavation, overexcavation for facility foundations, surface grading,  
17 trenching, road construction, levee construction, construction site dewatering, soil stockpiling,  
18 reusable tunnel material (RTM) dewatering basin construction and storage operations, and other  
19 general facility construction activities (i.e., concrete, steel, carpentry, and other building trades) over  
20 approximately 7,500 acres during the course of constructing the facilities. Vegetation would be  
21 removed (via grubbing and clearing) and grading and other earthwork would be conducted at the  
22 intakes, pumping plants, the intermediate forebay, the Byron Tract Forebay, canal and gates  
23 between the Byron Tract Forebay tunnel shafts and the approach canal to the Banks Pumping Plant,  
24 borrow areas, RTM and spoil storage areas, setback and transition levees, sedimentation basins,  
25 solids handling facilities, transition structures, surge shafts and towers, substations, transmission  
26 line footings, access roads, concrete batch plants, fuel stations, bridge abutments, barge unloading  
27 facilities, and laydown areas. Construction of each intake would take nearly four years to complete.

28 Habitat restoration environmental commitments in the Delta, including restored tidal wetlands,  
29 floodplain, and related channel margin and off-channel habitats, also would involve substantial in-  
30 water construction-related activities in localized areas of the Delta. Other non-habitat restoration  
31 environmental commitments are not anticipated to involve construction activities that would result  
32 in substantial discharges of any constituents of concern.

33 *NEPA Effects:* Potential construction-related water quality effects may include discharges of  
34 turbidity/TSS due to the erosion of disturbed soils and associated sedimentation entering surface  
35 water bodies or other construction-related wastes (e.g., concrete, asphalt, cleaning agents, paint, and  
36 trash). Construction activities also may result in temporary or permanent changes in stormwater  
37 generation or drainage and runoff patterns (i.e., velocity, volume, and direction) that may cause or  
38 contribute to soil erosion and offsite sedimentation, such as creation of additional impervious  
39 surfaces (e.g., pavement, buildings, compacted soils), blockage or restriction of existing drainage  
40 channels, or general surface drainage changes from grading and excavation activity. Additionally,  
41 the use of heavy earthmoving equipment may result in spills and leakage of oils, gasoline, diesel fuel,  
42 and related petroleum contaminants used in the fueling and operation of such construction  
43 equipment.

1 Land surface grading and excavation activities, or exposure of disturbed sites immediately following  
2 construction and prior to stabilization, could result in rainfall- and stormwater-related soil erosion,  
3 runoff, and offsite sedimentation in surface water bodies. The initial runoff following construction,  
4 or return of seasonal rains to previously disturbed sites, can result in runoff with peak pollutant  
5 levels and is referred to as “first flush” storm events. Soil erosion and runoff can also result in  
6 increased concentrations and loading of organic matter, nutrients (nitrogen and phosphorus), and  
7 other contaminants contained in the soil such as trace metals, pesticides, or animal-related  
8 pathogens. Graded and exposed soils also can be compacted by heavy machinery, resulting in  
9 reduced infiltration of rainfall and runoff, thus increasing the rate of runoff (and hence  
10 contaminants) to downstream water bodies.

11 Construction activities also would be anticipated to involve the transport, handling, and use of a  
12 variety of hazardous substances and non-hazardous materials that may adversely affect water  
13 quality if discharged inadvertently to construction sites or directly to water bodies. Typical  
14 construction-related contaminants include petroleum products for refueling and maintenance of  
15 machinery (e.g., fuel, oils, solvents), concrete, paints and other coatings, cleaning agents, debris and  
16 trash, and human wastes. Construction activities also would involve large material storage and  
17 laydown areas, and occasional accidental spills of hazardous materials stored and used for  
18 construction may occur. Contaminants released or spilled on bare soil also may result in  
19 groundwater contamination. Dewatering operations may contain elevated levels of suspended  
20 sediment or other constituents that may cause water quality degradation.

21 The intensity of construction activity along with the fate and transport characteristics of the  
22 chemicals used, would largely determine the magnitude, duration, and frequency of construction-  
23 related discharges and resulting concentrations and degradation associated with the specific  
24 constituents of concern. The potential water quality concerns associated with the major categories  
25 of contaminants that might be discharged as a result of construction activity include the following.

- 26 ● Suspended sediment: May increase turbidity (i.e., reduce water clarity) that can affect aquatic  
27 organisms and increase the costs and effort of removal in municipal/industrial water supplies.  
28 Downstream sedimentation can affect aquatic habitat, or cause a nuisance if it affects functions  
29 of agricultural or municipal intakes, or boat navigation.
- 30 ● Organic matter: May contribute turbidity and oxygen demanding substances (i.e., reduce  
31 dissolved oxygen levels) that can affect aquatic organisms. Organic carbon may increase the  
32 potential for disinfection byproduct formation in municipal drinking water supplies.
- 33 ● Nutrients: May contribute nitrogen, phosphorus, and other key nutrients that can contribute to  
34 nuisance biostimulation of algae and vascular aquatic plants, which may affect municipal water  
35 supplies, recreation, aquatic life, and aesthetics.
- 36 ● Petroleum hydrocarbons: May contribute toxic compounds to aquatic life, and oily sheens may  
37 reduce oxygen/gas transfer in water, foul aquatic habitats, and reduce water quality for  
38 municipal supplies, recreation, and aesthetics.
- 39 ● Trace constituents (metals, pesticides, synthetic organic compounds): Compounds in eroded soil  
40 or construction-related materials (e.g., paints, coatings, cleaning agents) may be toxic to aquatic  
41 life.
- 42 ● Pathogens: Bacteria, viruses, and protozoans may affect aquatic life and increase human health  
43 risks via municipal water supplies, reduced recreational water quality, or contaminated shellfish  
44 beds.

- 1 • Other inorganic compounds: Construction-related materials can contain inorganic compounds  
2 such as acidic/basic materials which can change pH and may adversely affect aquatic life and  
3 habitats. Concrete contains lime which can increase pH levels, and drilling fluids may alter pH.

4 Some construction-related contaminants, such as PAHs that may be in some fuel and oil petroleum  
5 byproducts, may be bioaccumulative in aquatic and terrestrial organisms. Construction activities  
6 also may disturb areas where bioaccumulative constituents are present in the soil (e.g., mercury,  
7 selenium, organochlorine pesticides, PCBs, and dioxin/furan compounds), or may disturb soils that  
8 contain constituents included on the Section 303(d) lists of impaired water bodies in the affected  
9 environment. While the 303(d)-listed Delta channels impaired by mercury are widespread,  
10 impairment by selenium, pesticides, PCBs, and dioxin/furan compounds is more limited, and there  
11 are no 303(d) listings for PAH impairment. Bioaccumulation of constituents in the aquatic  
12 foodchain, and 303(d)-related impaired water bodies, arise as a result of long-term loading of a  
13 constituent or a pervasive and widespread source of constituent discharge (e.g., mercury). However,  
14 as a result of the generally localized disturbances, and intermittent and temporary nature of  
15 construction-related activities, construction would not be anticipated to result in contaminant  
16 discharges of substantial magnitude or duration to contribute to long-term bioaccumulation  
17 processes, or cause measureable long-term degradation such that existing 303(d) impairments  
18 would be made discernibly worse or TMDL actions to reduce loading would be adversely affected.

19 The environmental commitments for construction-related water quality protection would be  
20 specifically designed as a part of the final design, included in construction contracts as a required  
21 element, and would be implemented to avoid, prevent, and minimize the potential discharges of  
22 constituents of concern to water bodies and associated adverse water quality effects and comply  
23 with state water quality regulations. Additionally, temporary and permanent changes in stormwater  
24 drainage and runoff would be minimized and avoided through construction of new or modified  
25 drainage facilities, as described in the Chapter 3, *Description of Alternatives*, in Appendix A of this  
26 RDEIR/SDEIS. This alternative would include installation of temporary drainage bypass facilities,  
27 long-term cross drainage, and replacement of existing drainage facilities that would be disrupted  
28 due to construction of new facilities.

29 Construction-related activities would be conducted in accordance with the environmental  
30 commitment to develop and implement BMPs for all activities that may result in discharge of soil,  
31 sediment, or other construction-related contaminants to surface water bodies, and obtain  
32 authorization for the construction activities under the State Water Board's NPDES Stormwater  
33 General Permit for Stormwater Discharges Associated with Construction and Land Disturbance  
34 Activities (Order No. 2009-0009-DWQ/NPDES Permit No. CAS000002). The General Construction  
35 NPDES Permit requires the preparation and implementation of SWPPPs, which are the principal  
36 plans within the required PRDs that identify the proposed erosion control and pollution prevention  
37 BMPs that would be used to avoid and minimize construction-related erosion and contaminant  
38 discharges. The development of the SWPPPs, and applicability of other provisions of this General  
39 Construction Permit depends on the "risk" classification for the construction which is determined  
40 based on the potential for erosion to occur as well as the susceptibility of the receiving water to  
41 potential adverse effects of construction. While the determination of project risk level, and planning  
42 and development of the SWPPPs and BMPs to be implemented, would be completed as a part of final  
43 design and contracting for the work, the responsibility for compliance with the provisions of the  
44 General Construction Permit necessitates that BMPs are applied to all disturbance activities. In  
45 addition to the BMPs, the SWPPPs would include BMP inspection and monitoring activities, and  
46 identify responsibilities of all parties, contingency measures, agency contacts, and training

1 requirements and documentation for those personnel responsible for installation, inspection,  
2 maintenance, and repair of BMPs. The General Construction Permit contains NALs and for pH and  
3 turbidity, and specifies storm event water quality monitoring to determine if construction is  
4 resulting in elevated discharges of these constituents, and monitoring for any non-visible  
5 contaminants determined to have been potentially released. If an NAL is determined to have been  
6 exceeded, the General Construction Permit requires the discharger to conduct a construction site  
7 and run-on evaluation to determine whether contaminant sources associated with the site's  
8 construction activity may have caused or contributed to the exceedance and immediately implement  
9 corrective actions if they are needed.

10 The BMPs that are routinely implemented in the construction industry and have proven successful  
11 at reducing adverse water quality effects include, but are not limited to, the following broad  
12 categories of actions (letters refer to categories of specific BMPs identified in Appendix 3B,  
13 *Environmental Commitments*), for which Appendix 3B identifies specific BMPs within these  
14 categories:

- 15 ● Waste Management and Spill Prevention and Response (BMP categories A.2 and A.3): Waste  
16 management BMPs are designed to minimize exposure of waste materials at all construction  
17 sites and staging areas such as waste collection and disposal practices, containment and  
18 protection of wastes from wind and rain, and equipment cleaning measures. Spill prevention  
19 and response BMPs involve planning, equipment, and training for personnel for emergency  
20 event response.
- 21 ● Erosion and Sedimentation Control (BMP categories A.4 and A.5): Erosion control BMPs are  
22 designed to prevent erosion processes or events including scheduling work to avoid rain events,  
23 stabilizing exposed soils; minimize offsite sediment runoff; remove sediment from onsite runoff  
24 before it leaves the site; and slow runoff rates across construction sites. Identification of  
25 appropriate temporary and long-term seeding, mulching, and other erosion control measures as  
26 necessary. Sedimentation BMPs are designed to minimize offsite sediment runoff once erosion  
27 has occurred involving drainage controls, perimeter controls, detention/sedimentation basins,  
28 or other containment features.
- 29 ● Good Housekeeping and Non-Stormwater Discharge Management (BMP category A.6 and A.7):  
30 Good housekeeping BMPs are designed to reduce exposure of construction sites and materials  
31 storage to stormwater runoff including truck tire tracking control facilities; equipment washing;  
32 litter and construction debris; and designated refueling and equipment inspection/maintenance  
33 practices Non-stormwater discharge management BMPs involve runoff measures for  
34 contaminants not directly associated with rain or wind including vehicle washing and street  
35 cleaning operations.
- 36 ● Construction Site Dewatering and Pipeline Testing (BMP category A.8).Dewatering BMPs  
37 involve actions to prevent discharge of contaminants present in dewatering of groundwater  
38 during construction, discharges of water from testing of pipelines or other facilities, or the  
39 indirect erosion that may be caused by dewatering discharges.
- 40 ● BMP Inspection and Monitoring (BMP category A.9): Identification of clear objectives for  
41 evaluating compliance with SWPPP provisions, and specific BMP inspection and monitoring  
42 procedures, environmental awareness training, contractor and agency roles and responsibilities,  
43 reporting procedures, and communication protocols.



1 In addition to the Category “A” BMPs for surface land disturbances identified in the environmental  
2 commitments (Appendix 3B, *Environmental Commitments*), BMPs implemented also would include  
3 the Category “B” BMPs for tunnel/pipeline construction that involves actions primarily to avoid and  
4 minimize sediment and contaminant discharges associated with RTM excavation, hauling, and RTM  
5 dewatering operations. Additionally, habitat restoration activities under CM2 and CM4–CM10 would  
6 be subject to implementation of the Category “C” BMPs (In-Water Construction BMPs) and Category  
7 “D” BMPs (Tidal and Wetland Restoration) designed to minimize disturbance and direct discharge of  
8 turbidity/suspended solids to the water during in-water construction activities. Category “E” BMPs  
9 identify general permanent post-construction actions that would be implemented for all terrestrial,  
10 in-water, and habitat restoration activities and would involve planning, design, and development of  
11 final site stabilization, revegetation, and drainage control features.

12 Finally, acquisition of applicable environmental permits may be required for specific conservation  
13 measures, which may include specific WDRs or CWA Section 401 water quality certifications from  
14 the appropriate Regional Water Boards, CDFW Streambed Alteration Agreements, and USACE CWA  
15 Section 404 dredge and fill permits. These other permit processes may include requirements to  
16 implement additional action-specific BMPs that may reduce potential adverse discharge effects of  
17 constituents of concern.

18 The potential construction-related contaminant discharges that could result from this alternative  
19 would not be anticipated to result in adverse water quality effects at a magnitude, frequency, or  
20 regional extent that would cause substantial adverse effects to aquatic life. Relative to Existing  
21 Conditions, this assessment indicates the following.

- 22 ● Projects would be managed under state water quality regulations and project-defined actions to  
23 avoid and minimize contaminant discharges.
- 24 ● Individual projects would generally be dispersed, and involve infrequent and temporary  
25 activities, thus not likely resulting in substantial exceedances of water quality standards or long-  
26 term degradation.
- 27 ● Potential construction-related contaminant discharges would not cause additional exceedance  
28 of applicable water quality objectives where such objectives are not exceeded under Existing  
29 Conditions. Long-term water quality degradation is not anticipated, and hence would not be  
30 expected to adversely affect beneficial uses.
- 31 ● By the intermittent and temporary frequency of construction-related activities and potential  
32 contaminant discharges, the constituent-specific effects would not be of substantial magnitude  
33 or duration to contribute to long-term bioaccumulation processes, or cause measureable long-  
34 term degradation such that existing 303(d) impairments would be made discernibly worse or  
35 TMDL actions to reduce loading would be adversely affected.

36 Consequently, because the construction-related activities for the conservation measures would be  
37 conducted with implementation of environmental commitments, including but not limited to those  
38 identified in Appendix 3B, with respect to the No Action Alternative conditions, this alternative  
39 would not be expected to cause constituent discharges of sufficient frequency and magnitude to  
40 result in a substantial increase of exceedances of water quality objectives/criteria, or substantially  
41 degrade water quality with respect to the constituents of concern, and thus would not adversely  
42 affect any beneficial uses in the Delta.

43 In summary, with implementation of environmental commitments in Appendix 3B, the potential  
44 construction-related water quality effects are considered to be not adverse.

1 *CEQA Conclusion:* As explained above, water quality effects resulting from construction-related  
2 activities would be less under Alternative 4A compared to Alternative 4, which was determined to  
3 be less than significant. Moreover, because environmental commitments would be implemented  
4 under Alternative 4A for construction-related activities along with agency-issued permits that also  
5 contain construction requirements to protect water quality, the construction-related effects, relative  
6 to Existing Conditions, would not be expected to cause or contribute to substantial alteration of  
7 existing drainage patterns which would result in substantial erosion or siltation on- or off-site,  
8 substantial increased frequency of exceedances of water quality objectives/criteria, or substantially  
9 degrade water quality with respect to the constituents of concern on a long-term average basis, and  
10 thus would not adversely affect any beneficial uses in water bodies upstream of the Delta, within the  
11 Delta, or in the SWP/CVP Export Service Areas. Moreover, because the construction-related  
12 activities would be temporary and intermittent in nature, the construction would involve negligible  
13 discharges, if any, of bioaccumulative or CWA Section 303(d) listed constituents to water bodies of  
14 the affected environment. As such, construction activities would not contribute measurably to  
15 bioaccumulation of contaminants in organisms or humans or cause CWA Section 303(d)  
16 impairments to be discernibly worse. Based on these findings, this impact is determined to be less  
17 than significant. No mitigation is required.

18 Impact WQ-32: Effects on *Microcystis* Bloom Formation Resulting from Facilities Operations  
19 and Maintenance

#### 20 *Upstream of the Delta*

21 Adverse effects from *Microcystis* upstream of the Delta have only been documented in lakes such as  
22 Clear Lake, where eutrophic levels of nutrients give cyanobacteria a competitive advantage over  
23 other phytoplankton during the bloom season. Large reservoirs upstream of the Delta are typically  
24 characterized by low nutrient concentrations, where other phytoplankton outcompete  
25 cyanobacteria, including *Microcystis*. In the rivers and streams of the Sacramento River watershed,  
26 watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San  
27 Joaquin River upstream of the Delta under Existing Conditions, bloom development is limited by  
28 high water velocity and low residence times. These conditions are not expected to change under  
29 Alternative 4A or the No Action Alternative (ELT and LLT). Consequently, any modified reservoir  
30 operations under Alternative 4A are not expected to promote *Microcystis* production upstream of  
31 the Delta, relative to Existing Conditions and the No Action Alternative (ELT and LLT).

#### 32 *Delta*

33 Modeling that adequately accounted for the effects of water conveyance facilities operations and  
34 maintenance and the hydrodynamic impacts of the environmental commitments on long-term  
35 average residence times in the six Delta sub-areas was not available for Alternative 4A, so the  
36 hydrodynamic effects of this alternative on *Microcystis* were determined qualitatively. For the  
37 assessment of Alternative 4, modeling scenarios included assumptions regarding how certain  
38 habitat restoration activities of the project alternative would affect Delta hydrodynamics, so the  
39 impacts due solely to operations and maintenance of the water conveyance facilities under  
40 Alternative 4 could not be determined. Because the assessment for Alternative 4A is qualitative, the  
41 effects discussed for the Delta under water conveyance facilities are related solely to operations and  
42 maintenance, not the hydrodynamic effects of restoration actions, which are discussed in Impact  
43 WQ-33.

1 The effects of Alternative 4A on *Microcystis* levels, and thus microcystin concentrations in the Delta,  
2 relative to Existing Conditions, would be less than those described for Alternative 4 in Chapter 8,  
3 Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS for the reasons discussed below.

4 Under the two operational scenarios of Alternative 4A, a portion of the Sacramento River water  
5 which would be conveyed through the Delta to the south Delta intakes under Existing Conditions  
6 would be replaced at various locations throughout the Delta by other source water due to diversion  
7 of Sacramento River water at the north Delta intake under Alternative 4A. The change in flow paths  
8 of water through the Delta that would occur under Alternative 4A could result in localized increases  
9 in residence time in various Delta sub-regions, and decreases in residence time in other areas. In  
10 general, there is substantial uncertainty regarding the extent that operations and maintenance of  
11 Alternative 4A would result in a net increase in water residence times at various locations  
12 throughout the Delta relative to Existing Conditions. In contrast to Alternative 4A, the combination  
13 of the habitat restoration and operations and maintenance assumptions included in the  
14 hydrodynamic modeling of Alternative 4 resulted in a substantial increase in water residence times,  
15 and thus a potential increase in *Microcystis* abundance, at numerous locations throughout the Delta  
16 at the late long-term timeframe relative to Existing Conditions.

17 Besides the effects of operations and maintenance described above, substantial increases in water  
18 residence times due to factors unrelated to the project alternative, including habitat restoration  
19 (8,000 acres of tidal habitat and enhancements to the Yolo Bypass), sea level rise and climate  
20 change, are expected to occur in the Delta, relative to Existing Conditions. Although there is  
21 uncertainty regarding the degree to which operations and maintenance of the project alternative  
22 would affect water residence times in the Delta, it is likely that such effects would be small in  
23 comparison to the combined effects of restoration activities, sea level rise and climate change. Slight  
24 increases in ambient water temperatures (1.3–2.5°F), due to climate change in the ELT, are expected  
25 to occur in the Delta under Alternative 4A, relative to Existing Conditions. However, due to the  
26 combination of the effects of restoration activities unrelated to the project alternative, climate  
27 change, and sea level rise on increased residence times, as well as the effects of climate change on  
28 increased ambient water temperatures, it is possible that increases in the frequency, magnitude, and  
29 geographic extent of *Microcystis* blooms in the Delta would occur, relative to Existing Conditions.  
30 The magnitude by which water temperatures and residence times would increase due to these  
31 factors would be less under Alternative 4A than under Alternative 4.

32 The effects of Alternative 4A on *Microcystis* levels, and thus microcystin concentrations in the Delta  
33 relative to the No Action Alternative (ELT and LLT) would be less than those described for  
34 Alternative 4 in Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS for the reasons  
35 discussed below.

36 As described relative to Existing Conditions, operations and maintenance of Alternative 4A could  
37 alter source water flow paths through the Delta, which could result in localized increases in  
38 residence time in various Delta sub-regions, and decreases in residence time in other areas. In  
39 general, there is substantial uncertainty regarding the extent that operations and maintenance of  
40 Alternative 4A would result in a net increase in water residence times at various locations  
41 throughout the Delta relative to the No Action Alternative (ELT and LLT).

42 The previously discussed influence of factors unrelated to implementation of the project alternative,  
43 including habitat restoration (8,000 acres of tidal habitat restoration and enhancements to the Yolo  
44 Bypass), climate change and sea level rise on increased water residence times, as well as the

1 influence of climate change on increased ambient water temperatures in the Delta, would occur  
2 under both Alternative 4A and No Action Alternative (ELT and LLT). In summary, operations and  
3 maintenance of Alternative 4A is not expected to increase water residence times or ambient water  
4 temperatures throughout the Delta, and thus result in adverse effects on *Microcystis*, relative to No  
5 Action Alternative (ELT and LLT).

#### 6 *SWP/CVP Export Service Area*

7 The effects of Alternative 4A on *Microcystis* levels, and thus microcystin concentrations, in the  
8 SWP/CVP Export Service Areas relative to Existing Conditions would be less than those described  
9 for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the RDEIR/SDEIS). As described  
10 above for the Delta, source waters to the south Delta intakes could be adversely affected relative to  
11 Existing Conditions by *Microcystis* both from an increase in Delta water temperatures associated  
12 with climate change and from an increase in water residence times. The impacts from increased  
13 Delta water residence times would be primarily related to habitat restoration (8,000 acres of tidal  
14 habitat restoration and enhancements to the Yolo Bypass) that is assumed to occur separate from  
15 Alternative 4A. The combined effect of these factors on *Microcystis* in source waters to the south  
16 Delta intakes would likely be much greater than the influence of operations and maintenance of  
17 Alternative 4A, the effects of which are uncertain. In contrast to Alternative 4A, the combination of  
18 the habitat restoration and operations and maintenance assumptions included in the hydrodynamic  
19 modeling of Alternative 4 resulted in a substantial increase in water residence times, and thus a  
20 potential increase in *Microcystis* abundance, at numerous locations throughout the Delta relative to  
21 Existing Conditions. Increases in ambient air temperatures due to climate change relative to Existing  
22 Conditions are expected under this alternative. Increases in ambient air temperatures are expected  
23 to result in warmer ambient water temperatures, and thus conditions more suitable to *Microcystis*  
24 growth, in the water bodies of the SWP/CVP Export Service Areas. The incremental increase in long-  
25 term average air temperatures would be less at the ELT (2.0°F), compared to the LLT (4.0°F).

26 The effects of Alternative 4A on *Microcystis* levels, and thus microcystin concentrations, in the  
27 SWP/CVP Export Service Areas, relative to the No Action Alternative (ELT and LLT), are expected to  
28 be less than effects described for Alternative 4 (see Chapter 8, Section 8.3.3.9, in Appendix A of the  
29 RDEIR/SDEIS). This is because effects of *Microcystis* on water exports from Banks and Jones  
30 pumping plants would be different between Alternative 4A and Alternative 4. Specifically, under  
31 Alternative 4A, the fraction of water flowing through the Delta that would reach the existing south  
32 Delta intakes is not expected to be adversely affected by *Microcystis* blooms, relative to the No  
33 Action Alternative (ELT and LLT), as discussed in the "Delta" section above; while under Alternative  
34 4 this fraction of water is expected to be adversely affected by *Microcystis* blooms, relative to the No  
35 Action Alternative (LLT). Additionally, conditions in the SWP/CVP Export Service Areas under  
36 Alternative 4A are not expected to become more conducive to *Microcystis* bloom formation, relative  
37 to the No Action Alternative (ELT and LLT), because neither water residence time nor water  
38 temperatures are projected to increase in the SWP/CVP Export Service Areas.

39 *NEPA Effects:* Modified reservoir operations under Alternative 4A are not expected to promote  
40 *Microcystis* production upstream of the Delta, relative to the No Action Alternative (ELT and LLT).  
41 Similarly, operations and maintenance of Alternative 4A is not expected to increase water residence  
42 times or ambient water temperatures throughout the Delta, including at the Banks and Jones  
43 pumping plants, and thus result in adverse effects on *Microcystis* in the Delta, relative to No Action  
44 Alternative (ELT and LLT). Thus, the effects on *Microcystis* in surface waters upstream of the Delta,

1 in the Delta, and in the SWP/CVP Export Service Areas from implementing water conveyance  
2 facilities are determined to be not adverse.

3 *CEQA Conclusion:* As with Alternative 4, modified reservoir operations under Alternative 4A are not  
4 expected to promote *Microcystis* production upstream of the Delta, relative to the Existing  
5 Conditions. The effects of operations and maintenance of water conveyance facilities under  
6 Alternative 4A on *Microcystis* in surface waters in the Delta and in the SWP/CVP Export Service  
7 Areas, relative to Existing Conditions, would be less than those described for the Alternative 4.  
8 Operations and maintenance of Alternative 4A is not expected to increase water residence times or  
9 ambient water temperatures throughout the Delta, including at the Banks and Jones pumping plants,  
10 and thus result in adverse effects on *Microcystis* in the Delta, relative to Existing Conditions. As such,  
11 this alternative would not be expected to cause additional exceedance of applicable water quality  
12 objectives/criteria by frequency, magnitude, and geographic extent that would cause significant  
13 impacts on any beneficial uses of waters in the affected environment. *Microcystis* and microcystins  
14 are not CWA Section 303(d) listed within the affected environment and thus any increases that  
15 could occur in some areas would not make any existing *Microcystis* impairment measurably worse  
16 because no such impairments currently exist. Because *Microcystis* and microcystins are not  
17 bioaccumulative, increases that could occur in some areas would not bioaccumulate to greater levels  
18 in aquatic organisms that would, in turn, pose substantial health risks to fish, wildlife, or humans.  
19 However, it is possible that increases in the frequency, magnitude, and geographic extent of  
20 *Microcystis* blooms in the Delta would occur under Alternative 4A for reasons unassociated with  
21 operations and maintenance of the project alternative, including tidal habitat restoration activities,  
22 climate change and sea level rise. While long-term water quality degradation may occur and, thus,  
23 impacts on beneficial uses could occur, these impacts are not related to implementation of  
24 Alternative 4A. Although there is considerable uncertainty regarding this impact, the effects on  
25 *Microcystis* from implementing water conveyance facilities are determined to be less than  
26 significant. No mitigation is required.

27 Impact WQ-33: Effects on *Microcystis* Bloom Formation Resulting from Environmental  
28 Commitments

29 Under Alternative 4A, Fisheries Enhancements to the Yolo Bypass would not be implemented, but  
30 under a plan separate and distinct from Alternative 4A, enhancements to the Yolo Bypass and 8,000  
31 acres of tidal habitat restoration would be implemented in the ELT. These activities are assumed to  
32 occur under both Alternative 4A and the No Action Alternative. Implementation of Environmental  
33 Commitment 4 under Alternative 4A would result in a very small amount of tidal restoration within  
34 the Delta. In contrast, under Alternative 4, full implementation of Yolo Bypass enhancements would  
35 occur and 65,000 acres of tidal restoration would be developed. The implementation of  
36 Environmental Commitment 4 under Alternative 4A would have negligible effects compared to the  
37 development of 8,000 acres of tidal habitat and enhancements to the Yolo Bypass in the ELT that are  
38 unrelated to implementation of the alternative. These activities would create shallow backwater  
39 areas that could result in local warmer water and increased water residence time of magnitude and  
40 extent that would result in measurable changes on *Microcystis* levels in the Delta, relative to Existing  
41 Conditions.

42 The implementation of fisheries enhancements to the Yolo Bypass and the development of 65,000  
43 acres of tidal restoration areas would be expected to result in widespread hydrodynamic effects that  
44 increase water residence times, and thus *Microcystis* levels, in the Delta under Alternative 4, relative  
45 to Existing Conditions and the No Action Alternative (LLT). Thus, the effects on *Microcystis* from

1 implementing Environmental Commitment 4 under Alternative 4A, relative to Existing Conditions,  
2 would be substantially lower than expected under Alternative 4.

3 *NEPA Effects:* Based on the discussion above, the effects on *Microcystis* from implementing  
4 Environmental Commitments 3, 4, 6–12, 15, and 16 are determined to be not adverse.

5 *CEQA Conclusions:* Based on the discussion above, Environmental Commitments 3, 4, 6–12, 15, and  
6 16 would not be expected to cause additional exceedance of applicable water quality  
7 objectives/criteria by frequency, magnitude, and geographic extent that would cause significant  
8 impacts on any beneficial uses of waters in the affected environment. *Microcystis* and microcystins  
9 are not CWA Section 303(d) listed within the affected environment and thus any increases that  
10 could occur in some areas would not make any existing *Microcystis* impairment measurably worse  
11 because no such impairments currently exist. Because *Microcystis* and microcystins are not  
12 bioaccumulative, increases that could occur in some areas would not bioaccumulate to greater levels  
13 in aquatic organisms that would, in turn, pose substantial health risks to fish, wildlife, or humans.  
14 However, it is possible that increases in the frequency, magnitude, and geographic extent of  
15 *Microcystis* blooms in the Delta would occur at the early long-term for reasons unassociated with  
16 implementation of the Environmental Commitments, including tidal habitat restoration and  
17 enhancements to the Yolo Bypass. While long-term water quality degradation may occur and, thus,  
18 significant impacts on beneficial uses could occur, these impacts are not related to implementation  
19 of the Environmental Commitments. Therefore, the effects on *Microcystis* from implementing the  
20 Environmental Commitments are determined to be less than significant. No mitigation is required.

21 Impact WQ-34: Effects on San Francisco Bay Water Quality Resulting from Facilities  
22 Operations and Maintenance and Environmental Commitments

23 The effects analysis presented in the preceding impacts (Impact WQ-1 through WQ-33) concluded  
24 that Alternative 4A would have a less-than-significant impact/no adverse effect on the following  
25 constituents in the Delta:

- 26 ● Boron
- 27 ● Bromide
- 28 ● Chloride
- 29 ● DOC
- 30 ● Dissolved oxygen
- 31 ● Pathogens
- 32 ● Pesticides
- 33 ● Trace metals
- 34 ● Turbidity and TSS
- 35 ● *Microcystis*

36 Elevated concentrations of boron are of concern in drinking and agricultural water supplies.  
37 Chloride, DOC, and bromide concentrations also are of concern in drinking water supplies. However,  
38 waters in the San Francisco Bay are not designated to support municipal water supply (MUN) and  
39 agricultural supply (AGR) beneficial uses. Changes in Delta dissolved oxygen, pathogens, pesticides,  
40 trace metals, and turbidity and TSS are not anticipated to be of a frequency, magnitude and

1 geographic extent that would adversely affect any beneficial uses or substantially degrade the  
2 quality of the Delta. Changes in *Microcystis* would be primarily due to factors unassociated with the  
3 project alternative. Thus, changes in boron, bromide, chloride, DOC, dissolved oxygen, pathogens,  
4 pesticides, trace metals, turbidity and TSS, and *Microcystis* in Delta outflow associated with  
5 implementation of Alternative 4A, relative to Existing Conditions and the No Action Alternative (ELT  
6 and LLT) are not anticipated to be of a frequency, magnitude and geographic extent that would  
7 adversely affect any beneficial uses or substantially degrade the quality of the of San Francisco Bay,  
8 as described for Alternative 4 (see Chapter 8, Section 8.3.3.9 in Appendix A of this RDEIR/SDEIS).

9 Elevated EC is of concern for its effects on the agricultural beneficial use (AGR) and fish and wildlife  
10 beneficial uses. San Francisco Bay does not have an AGR beneficial use designation. As described for  
11 Alternative 4, salinity throughout San Francisco Bay is largely a function of the tides, as well as to  
12 some extent the freshwater inflow from upstream. However, the changes in Delta outflow due to  
13 Alternative 4A, relative to Existing Conditions and the No Action Alternative (ELT and LLT), would  
14 be minor compared to tidal flows, and thus no substantial adverse effects on salinity, or fish and  
15 wildlife beneficial uses, downstream of the Delta are expected.

16 Also, as described for Alternative 4, changes in nutrient loading would not be expected to contribute  
17 to adverse effects to beneficial uses. Changes in nitrogen (ammonia and nitrate) loading to Suisun  
18 and San Pablo Bays under Alternative 4A, relative to Existing Conditions and the No Action  
19 Alternative (ELT and LLT), would not adversely impact primary productivity in these embayments  
20 because light limitation and grazing current limit algal production in these embayments. Nutrient  
21 levels and ratios are not considered a direct driver of *Microcystis* and cyanobacteria levels in the  
22 North Bay. The only postulated effect of changes in phosphorus loads to Suisun and San Pablo Bays  
23 is related to the influence of nutrient stoichiometry on primary productivity. However, there is  
24 uncertainty regarding the impact of nutrient ratios on phytoplankton community composition and  
25 abundance. As described for Alternative 4, any effect on phytoplankton community composition  
26 would likely be small compared to the effects of grazing from introduced clams and zooplankton in  
27 the estuary. Therefore, changes in total nitrogen and phosphorus loading that would occur in Delta  
28 outflow to San Francisco Bay, relative to Existing Conditions and the No Action Alternative (ELT and  
29 LLT), are not expected to result in degradation of water quality with regard to nutrients that would  
30 result in adverse effects to beneficial uses.

31 Similar to Alternative 4, loads of mercury, methylmercury, and selenium from the Delta to San  
32 Francisco Bay are estimated to change relatively little due to changes in source water fractions and  
33 net Delta outflow that would occur under Alternative 4A, relative to Existing Conditions and the No  
34 Action Alternative (ELT and LLT), because changes in Delta outflow would be similar.

35 *NEPA Effects:* Based on the discussion above, Alternative 4A, relative to the No Action Alternative  
36 (ELT and LLT), would not cause further degradation to water quality with respect to boron,  
37 bromide, chloride, dissolved oxygen, DOC, EC, mercury, pathogens, pesticides, selenium, nutrients  
38 (ammonia, nitrate, phosphorus), trace metals, turbidity and TSS, or *Microcystis* in the San Francisco  
39 Bay. Further, changes in these constituent concentrations in Delta outflow would not be expected to  
40 cause changes in Bay concentrations of frequency, magnitude, and geographic extent that would  
41 adversely affect any beneficial uses. In summary, effects on the San Francisco Bay from  
42 implementation of water conveyance facilities and Environmental Commitments 3, 4, 6–12, 15, and  
43 16 are considered to be not adverse.

1 *CEQA Conclusion:* As with Alternative 4, Alternative 4A would not be expected to cause long-term  
2 degradation of water quality in San Francisco Bay resulting in sufficient use of available assimilative  
3 capacity such that occasionally exceeding water quality objectives/criteria would be likely and  
4 would result in substantially increased risk for adverse effects to one or more beneficial uses.  
5 Further, this alternative would not be expected to cause additional exceedance of applicable water  
6 quality objectives/criteria in the San Francisco Bay by frequency, magnitude, and geographic extent  
7 that would cause significant impacts on any beneficial uses of waters in the affected environment.  
8 Any changes in boron, bromide, chloride, and DOC in the San Francisco Bay would not adversely  
9 affect beneficial uses, because the uses most affected by changes in these parameters, MUN and AGR,  
10 are not beneficial uses of the Bay. Further, no substantial changes in dissolved oxygen, pathogens,  
11 pesticides, trace metals, turbidity or TSS, and *Microcystis* are anticipated in the Delta due to the  
12 implementation of Alternative 4A, relative to Existing Conditions, therefore, no substantial changes  
13 to these constituents levels in the Bay are anticipated. Changes in Delta salinity would not contribute  
14 to measurable changes in Bay salinity, as the change in Delta outflow would be two to three orders  
15 of magnitude lower than (and thus minimal compared to) the Bay's tidal flow and thus, have  
16 minimal influence on salinity changes. Changes in nutrient load, relative to Existing Conditions, are  
17 expected to have minimal effect on water quality degradation, primary productivity, or  
18 phytoplankton community composition. As with Alternative 4, the change in mercury and  
19 methylmercury load (which is based on source water and Delta outflow), relative to Existing  
20 Conditions, would be within the level of uncertainty in the mass load estimate and not expected to  
21 contribute to water quality degradation, make the CWA Section 303(d) mercury impairment  
22 measurably worse or cause mercury/methylmercury to bioaccumulate to greater levels in aquatic  
23 organisms that would, in turn, pose substantial health risks to fish, wildlife, or humans. Similarly,  
24 based on Alternative 4 estimates, the increase in selenium load would be minimal, and total and  
25 dissolved selenium concentrations would be expected to be the same as Existing Conditions, and  
26 less than the target associated with white sturgeon whole-body fish tissue levels for the North Bay.  
27 Thus, the change in selenium load is not expected to contribute to water quality degradation, or  
28 make the CWA Section 303(d) selenium impairment measurably worse or cause selenium to  
29 bioaccumulate to greater levels in aquatic organisms that would, in turn, pose substantial health  
30 risks to fish, wildlife, or humans. Based on these findings, this impact is considered to be less than  
31 significant. No mitigation is required.