

**Delta Independent Science Board review
of the Final EIR/EIS for California Waterfix**

Public Review Draft

9 June 2017

SUMMARY

The Delta Reform Act of 2009 directs the Delta Independent Science Board to review environmental impact assessments of the Bay Delta Conservation Plan. Here, in our fifth such review, we note improvements and shortcomings in the Final EIR/EIS for the BDCP and California Water Fix. We also comment on the gap between the impact assessments and the intent of legislation that requires them.

The Final EIR/EIS improves on its predecessors while retaining some key flaws. New content on adaptive management is short on detail about how adaptive management would be implemented under changing and uncertain conditions. Summaries and comparisons, more abundant than before, lack insightful syntheses and graphics that ease comprehension of the vast amount of material presented. Expanded discussion of Delta levees stops short of evaluating interactions with water supply reliability and neglects changing views of earthquake hazards. Long-term effects are better addressed in several ways, but with insufficient attention to uncertainties in defining the No Action Alternative and to the interplay between California groundwater sustainability and Delta water supplies. Other content missing includes evaluation of environmental effects of water use south of the Delta. Evaluation of ecosystem impacts, though extensive, retains gaps on using restoration as mitigation.

More broadly, the Final EIR/EIS and its predecessors illustrate tradeoffs between thoroughness and intelligibility that have become common in environmental impact assessment. The tendency is to overwhelm readers with content that addresses a wide range and large number of scientific issues related to a proposed project and its alternatives. The Final EIR/EIS contains a wealth of detail and considerable insight. But this important document is difficult at best as a comparative guide to the expected environmental and economic effects of the alternatives that it considers.

33

34

Contents

35 Summary 1
 36 Introduction..... 2
 37 Improvements and shortcomings in the Final EIR/EIS 2
 38 Adaptive management 2
 39 Informative summaries and comparisons 4
 40 Levee risk..... 6
 41 Long-term effects..... 7
 42 Missing content..... 8
 43 Restoration and mitigation..... 10
 44 Reflections: Paralysis by analysis, and an opportunity missed..... 12
 45 References cited 14

46

INTRODUCTION

48 The Delta Reform Act of 2009, in section 85320(c), directs the Delta Independent
 49 Science Board (Delta ISB) to review the environmental impact report of the Bay Delta
 50 Conservation Plan (BDCP) and to provide the review to the Delta Stewardship Council and the
 51 California Department of Fish and Wildlife. We provided brief reviews of the Administrative
 52 Draft EIR/EIS (Delta Independent Science Board, 2012, 2013), a fuller review of the Public
 53 Draft EIR/EIS (Delta Independent Science Board, 2014), and further comments on the
 54 Recirculated Draft EIR / Supplemental Draft EIS (Delta Independent Science Board, 2015). Here
 55 we provide a further review that has been occasioned by the Final EIR/EIS, which like the
 56 RDEIR/SDEIS identified the preferred alternative as California WaterFix.

57 Most of this review focuses on the adequacy of the scientific information presented in the
 58 Final EIR/EIS. We ask how well this document provides the technical basis for evaluation of
 59 California WaterFix and its alternatives. Revisiting the main concerns that we raised in
 60 reviewing the RDEIR/SDEIS (Delta Independent Science Board, 2015), we find welcome
 61 improvements but persistent shortcomings in the Final EIR/EIS.

62 The review concludes with broader commentary on the EIR/EIS process. Our concerns
 63 there include the challenge of producing environmental impact assessments that are both
 64 scientifically thorough and readily comprehended.

IMPROVEMENTS AND SHORTCOMINGS IN THE FINAL EIR/EIS

Adaptive management

Summary of Delta ISB comments on Recirculated EIR/EIS

68 Although the Recirculated Draft EIR/EIS clearly recognized the importance of adaptive
 69 management as a way to deal with uncertainties and adjust water-management practices as
 70 necessary, it did little to improve on the superficial treatment of adaptive management in the
 71 BDCP. As before, the adaptive management process was envisioned as something that would be
 72 developed during the course of project construction and operation, rather than being incorporated

73 into the proposed project plan. Potential impediments to implementing adaptive management
 74 were not acknowledged. No details on how adaptive management might be integrated into
 75 habitat restoration or flow management were provided. The focus was more on how adaptive
 76 management and monitoring might be organized in collaborative science programs (e.g., with the
 77 Delta Collaborative Science and Adaptive Management Program, CSAMP) than on how it might
 78 actually be done.

79 *Adaptive management in the Final WaterFix EIR/EIS*

80 The Final WaterFix EIR/EIS includes a new section 3.6.4.4 dealing specifically with
 81 adaptive management and monitoring. It proposes a framework for adaptive management based
 82 on the Comprehensive Everglades Restoration Plan. Drawing from similar experiences in
 83 another large, complex ecosystem is a good idea (Ebberts, et al, in press), although the
 84 shortcomings noted by Doremus et al. (2011) should be considered.

85 Section 3.6.4.4 describes the kinds of adaptive changes that might be made and goes
 86 through what will be done in the major phases of adaptive management. The emphasis is on the
 87 role of adaptive management in bounding uncertainties and enabling flexibility in decision-
 88 making (pages 3-287 to 3-288). For example, “[T]he Adaptive Management Program will
 89 evaluate the effects of water operations and habitat restoration on the delta smelt population,
 90 including adjustments as appropriate to improve water supply reliability” (p. 11-1201). The
 91 description of how adaptive management might be used in addressing uncertainty in the
 92 effectiveness of physical and nonphysical barriers in controlling predacious fish (p. 3-207, 11-
 93 2117) is another good example. Adaptive management is referenced throughout as a way to
 94 assess the effectiveness of Mitigation Measures.

95 Explicit consideration is given to establishing thresholds that might trigger the decision-
 96 making process and to the use of decision trees, pilot studies, and research to address critical
 97 unknowns (e.g., for Delta and longfin smelt, pages 11-1418, 11-3208). The Final version, like
 98 those before it, proposes an Adaptive Management and Monitoring Team that would oversee a
 99 comprehensive program, building on the model of CSAMP. Few details are offered about how
 100 this team would be formed, how its responsibilities would mesh with those of multiple agencies
 101 working in the Delta, or how it would function, although it would be responsible for developing
 102 monitoring protocols (p. 3-226) and oversee funding (p. 3-204).

103 Overall, the Final version provides a satisfactory explanation of why adaptive
 104 management is important and how it will be used, but not details of how it will actually be done.

105 *Remaining Delta ISB concerns*

106 Although the treatment of adaptive management and monitoring in the Final version is
 107 improved over earlier drafts, it remains weak on details, particularly in relation to the extensive
 108 and detailed coverage of other topics in the Final version. We are assured that an adaptive
 109 management and monitoring plan will be developed “during early years of project
 110 implementation” (Responses to comments on Draft EIR/EIS 2546-79). As we have noted
 111 previously, developing such a plan at the outset is essential if adaptive-management is to be used
 112 effectively. A plan and structure for adaptive management and monitoring should be in place
 113 *before* actions are initiated. We believe that the EIR/EIS should include a compelling case of
 114 adaptive management implementation to mitigate environmental impacts of the projects over the
 115 long term.

116 There also remains no mention of potential impediments or constraints on conducting
117 adaptive management; many of these can be anticipated (as discussed in the Delta Plan and the
118 Delta ISB review of adaptive management, Delta Independent Science Board, 2016).

119 The organization and use of adaptive management as proposed is closely tied to the
120 Biological Opinions (BiOps) required under the Endangered Species Act. Given the regulatory
121 context of an EIR/EIS, this is understandable; management of the Delta and its waters is
122 constrained to operate within relevant laws and regulations. Designing the adaptive management
123 and monitoring program more broadly, to consider actions, decisions, and their consequences for
124 the Delta and its inhabitants would be far more valuable. That said, the Final version does
125 describe (briefly) a procedure for considering the application of adaptive management to
126 management changes falling outside the purview of the BiOps and California Endangered
127 Species Act authorizations (section ES.3.2.3, page 3-287).

128 **Informative summaries and comparisons**

129 *Summary of Delta ISB comments on Recirculated EIR/EIS*

130 “Environmental impact statements shall be written in plain language and may use
131 appropriate graphics so that decision-makers and the public can readily understand them” (Code
132 of Federal Regulations, 40 CFR 1502.8). This guidance for project proponents applies all the
133 more to a project of the scope, complexity, and importance of California WaterFix. Far-reaching
134 decisions should not hinge on environmental documents that few can grasp. Decisions about
135 WaterFix should be guided by comparisons among alternatives in integrated tables, graphics, and
136 text. Summaries of impacts should state underlying assumptions clearly and highlight major
137 uncertainties. The presentation of alternatives should include, in addition, explicit comparisons
138 of water supply deliveries and reliabilities as well as environmental and local and regional
139 economic performance.

140 We stated these concerns in our first reviews of the Administrative Draft EIR/EIS of
141 BCDP (Delta Independent Science Board, 2012, 2013). We elaborated on them in our review of
142 the Public Draft (Delta Independent Science Board, 2014) and again in our review of the
143 Recirculated Draft EIR/EIS (Delta Independent Science Board, 2015). We repeatedly found need
144 for informative summaries—in words, tables, and graphs—that compare the proposed
145 alternatives and their principal environmental and economic impacts in each resource area. We
146 specifically requested such summaries and comparisons in each of our prior reviews (Delta
147 Independent Science Board, 2012, 2013, 2014, 2015). In 2014, for instance, we noted that the
148 Public Draft provided text-only summaries for just the two longest of its resource chapters
149 (Chapters 11 and 12), and that a fragmentary comparison of alternatives was buried in section
150 31.3. We asked that each resource chapter begin with an informative, analytical summary of how
151 the alternatives compare and how underlying assumptions and uncertainties play out. We also
152 called for graphics that offer informative summaries at a glance.

153 Clear, thoughtful text in the successive iterations of the EIR/EIS showed that the
154 preparers were fully capable of providing cogent summaries, clear comparisons, and informative
155 graphics. There was ample time to build these essential components into the Public Draft and the
156 Recirculated Draft. On August 14, 2015, representatives of California WaterFix assured us that
157 resource chapter summaries would appear in the Final EIR/EIS.

158 *Related changes in the Final EIR/EIS*

159 The Final EIR/EIS takes some steps in this direction. A summary text, supported by a
160 color-coded table that compares alternatives, begins each resource chapter in the Final EIR/EIS.
161 The Executive Summary brings these additions together.

162 *Remaining Delta ISB concerns*

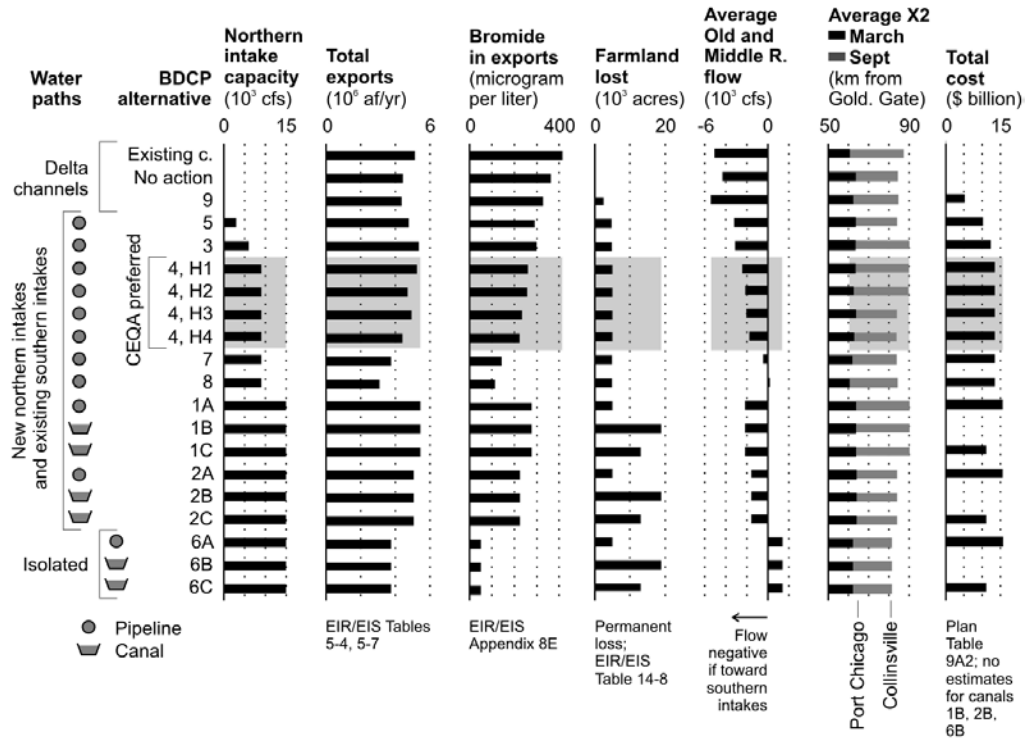
163 Despite these additions, the Final EIR/EIS resembles its predecessors in failing to
164 communicate clearly the principal findings and uncertainties of an enormous report. Three
165 examples:

166 1. The summaries give equal attention to all alternatives in BDCP and WaterFix. This
167 choice overwhelms the reader with information about options no longer considered seriously. It
168 would be more useful to focus each summary on the comparative strengths and weaknesses of
169 the proposed project, alternative 4A. This comparison, for each resource chapter, could follow
170 the example of section 31.3.

171 2. Most decision-makers and members of the public will struggle with jargon in the tabular
172 summaries. These encode each of the alternatives compared with cryptic names, instead of
173 providing the reader-friendly handles used in section 29.3.2.

174 3. The Final EIR/EIS, in its responses to comments, downplays the need for improved
175 graphical communication of WaterFix alternatives and their impact. Reproduced below is an
176 example we provided of the kind of graphic that could provide informative summaries at a
177 glance for comparing alternatives on some major performance objectives (Delta Independent
178 Science Board, 2015, 2014). In response, the Final EIR/EIS states that the graphic “does not
179 raise any additional issues related to the environmental analysis in the 2015 RDEIR/SDEIS or
180 the 2013 DEIR/EIS that are not already addressed in the Final EIR/EIS”¹. This response, like the
181 Final EIR/EIS itself, completely misses the point about using diagrams, integrated with text, to
182 make the report readily understood by decision-makers and the public, notwithstanding the
183 document’s length and complexity.

¹ Response to comment number 88, Recirculated Draft letter 2546, in Final EIR/EIS Volume II, part 2-2, Table 2-2, at http://baydeltaconservationplan.com/FinalEIREIS/FinalEIR-EIS_ResponseToComments.aspx



184

185 **Levee risk**

186 *Summary of Delta ISB comments on Recirculated EIR/EIS*

187 We found the Recirculated Draft EIR/EIS incomplete in its evaluation of how WaterFix
 188 would affect Delta levees. We saw Delta levees as important enough for impacts on them to be
 189 evaluated systematically in a “resource chapter” much like the chapters on water supply, fish and
 190 aquatic resources, agriculture, socioeconomics, and so on (chapters 5–30).

191 We further suggested that this evaluation include potential effects on State priorities in
 192 levee investments. The criteria in setting these priorities, the Board noted, include the role of a
 193 given levee in protecting water supplies (letter 2546, comment 71).

194 *Related changes in the Final EIR/EIS*

195 The Final EIR/EIS takes a step toward providing a resource chapter on Delta levees by
 196 adding Appendix 6A, “Coordination with flood management requirements.” Its content includes
 197 a section headed, “Potential impacts of the California WaterFix” (section 6A.6). The appendix
 198 states up front (p. 6A-1):

199 “The proposed project does not include a commitment to improve the current levee system
 200 except where the project explicitly includes levees in the project construction. However, it
 201 would provide additional adaptability to catastrophic failure of Delta levees by providing an
 202 alternative mechanism to continue making water deliveries . . . even if the Delta were
 203 temporarily disrupted.”

204 “Levees are an important public safety resource and the proposed project would not change
 205 levee policy or replace ongoing programs and grant projects aimed at facilitating and
 206 supporting levee improvements in or outside the Delta.”

207 Section 6A.6 further states that the proposed project would be “required to be flood
208 neutral as it relates to flood risk” from “construction and operations of the conveyance facilities
209 and restoration actions” (p. 6A-26).

210 Appendix 6A is clearly written, and it is apparently new for the most part. It recycles
211 parts of the longstanding Appendix 3E, “Potential seismic and climate change risks to SWP/CVP
212 water supplies” (p. 6A-26 and 6A-27), but it also contains informative summaries of policies and
213 legislation about Delta flood risk (section 6A.2), the existing programs for funding levee
214 maintenance (6A.3), response plans for emergencies that include disruption to water supply
215 (6A.4), and threats from climate change, sea level rise, and earthquakes (6A.5). Appendix 6A
216 goes beyond the Public Draft EIR/EIS, and the Recirculated version as well, in bringing together
217 these discussions of Delta levees.

218 *Remaining Delta ISB concerns*

219 Despite excellence in its Appendix 6A, the Final EIR/EIS still falls short in assessing
220 impacts to Delta levees, and it has also become out of date on seismic threats to the levees.

221 1. Appendix 6A does not assess levee impacts systematically across the broad range of
222 BDCP alternatives, nor among the three WaterFix alternatives.

223 2. Absent as well is assessment of potential impacts of State priorities in levee investments.
224 We did not notice any reference to the asset estimates included in the Delta Levees Investment
225 Strategy (Ellis et al., 2016).

226 3. Estimates of seismic risk in Appendices 6A and 3E, and in Chapter 9 (“Geology”), rely
227 mainly on findings that are a decade or more old. Recent advances neglected include the
228 UCERF3 estimates of California fault-rupture probabilities (Field et al., 2013), lowered estimates
229 of average slip on the Southern Midland fault (Unruh et al., 2016), and revised estimates of Delta
230 ground motions (Fletcher and Boatwright, 2013; Eberhart-Phillips et al., 2014; Baltay and
231 Boatwright, 2015; Erdem et al., 2016; Eberhart-Phillips, 2016; Fletcher et al., 2016).

232 The Final EIR/EIS provides, in chapter 29, an example of how further assessment of
233 potential impacts to levees could have been presented (concerns 1 and 2). Section 29.3.2
234 systematically analyzes an aspect of climate-change impacts on the WaterFix options 4A, 2D,
235 and 5A, and on the no-action alternative.

236 Keeping the Final EIR/EIS current with respect to Delta seismology (concern 3) is more
237 than a matter of citing incremental advances of purely academic interest. Evolving views of
238 Delta seismic hazards are important because the EIR/EIS describes earthquake-induced failure of
239 Delta levees as a justification for the proposed project (p. ES-1, 6A-1).

240 **Long-term effects**

241 *Summary of Delta ISB comments on Recirculated EIR/EIS*

242 Several potential long-term impacts of or on the proposed project no longer received
243 attention in the Recirculated draft. These effects may not be problematic during the initial permit
244 period, but some are likely to affect project benefits and impacts over the long operational life of
245 the proposed conveyance facilities. The major areas identified included:

246 More detailed assessment is needed of the No-Action alternative baseline for evaluating
247 impacts and benefits. Climate change, for example, is considered under the No-Action
248 alternative in the Draft and Final EIR/EIS, as is sea-level rise. Failure to consider how climate
249 change and sea-level rise could affect the outcomes of the proposed project is a concern that
250 carries over from our 2014 review and is accentuated by the recent drought.

251 Groundwater regulation under the recently enacted Sustainable Groundwater
252 Management Act (SGMA) will have long-term effects on the proposed project, which are not
253 assessed. Ending one to two million acre-feet per year of overdraft in the southern Central Valley
254 under the SGMA will likely increase demand for water exports from the Delta in the coming
255 decades. The implications of prolonged droughts and of the consequences of SGMA receive too
256 little attention in the Current Draft.

257 Consideration of these long-term effects should be part of the scientific foundation of the
258 proposed project.

259 *Related changes in the Final EIR/EIS*

260 Some clarifications have been made on the inclusion of climate change in the No Action
261 condition. As summarized in Chapter 3 Appendix 3D, p. 24, “The No Action Alternatives also
262 include assumptions for climate change related to sea level rise and 3 changes in precipitation
263 patterns, including changes in ratios between snow and rainfall.” This is supported by profuse
264 amounts of modeling in the many Appendix 5As. However, “The No Action Alternatives do not
265 include future changes in facilities operations, land use, or policies by agencies in response to
266 climate change.” Chapter 29 and its appendices provide some useful information regarding
267 climate change assumptions, modeling, and discussion, but do not provide particularly insightful
268 or strategic discussions of how climate change issues affect the relative performance of
269 alternatives.

270 The Groundwater chapter (Chapter 7) briefly discusses the Sustainable Groundwater
271 Management Act (SGMA), but the Final EIR/EIS does not appear to have a systematic
272 discussion of the interaction of these large and uncertain sources of water statewide, and
273 particularly as it affects long-term demands and management for the Delta.

274 *Remaining Delta ISB concerns*

275 Given the considerable uncertainty in the degree and timing of sea level rise and other
276 aspects of climate change, it remains surprising that there is not a more targeted discussion and
277 analysis of the sensitivity of the relative long-term performance of alternatives with respect to
278 various aspects of climate change. This is a critical omission.

279 Reductions in groundwater overdraft as part of the Sustainable Groundwater
280 Management Act (SGMA) will likely increase demand for water from the Delta, the primary and
281 historical source of supplemental water for the southern Central Valley, the state’s primary
282 overdraft area. Uncertainties in the interaction of SGMA implementation with Delta alternatives
283 are likely to significantly affect the relative implementation, water supply, and environmental
284 performance of alternatives.

285 Climate change: Even though Alternatives 4A, 2D, and 5A do not do not seek 50-year
286 incidental take permits (p. 11), there will be long-term impacts and effects of climate change.
287 “Too much uncertainty” about such effects is not a reason to ignore the topic.

288 **Missing content**

289 *Comments on the previous versions of the EIR/EIS*

290 In our 2015 review, we noted that the Recirculated Draft EIR continued to neglect
291 potential effects of changes in operations of the State Water Project (SWP) and Central Valley
292 Project (CVP), or other changes in water availability, on agricultural practices in the San Joaquin
293 Valley.

294 In our 2014 review, on its pages 12-13, we had pointed to three overlooked impacts in the
295 Draft EIR:

- 296 1. Effects on San Pablo Bay and San Francisco Bay in relation to Delta tides, salinity, and
297 migratory fish;
- 298 2. Effects of levee failures on the proposed BDCP actions and effects of isolated
299 conveyance on incentives for levee investments; and
- 300 3. Effects of increased water reliability on crops planted, fertilizers and pesticides used, and
301 the quality of agricultural runoff.

302 The Recirculated Draft responded in part to point 1 (in 11.3.2.7) while neglecting points 2 and 3.

303 On point 3, the Recirculated Draft considered how the project might affect groundwater
304 levels south of the Delta (7.14 to 7.18), but continued to neglect the environmental effects of
305 water use south of the Delta. Section 4.3.26.4 of the recirculated draft described how increased
306 water-supply reliability could increase agricultural production, especially during dry years. A
307 separate benefit-cost analysis by ICF and the Battle Group² estimated the economic benefits of
308 increased water deliveries to agriculture in the Delta. The recirculated Draft did not fully
309 consider the consequences of these assumptions, or of the projections that the project may
310 enhance water-supply reliability but may or may not increase water deliveries to agriculture
311 (depending on a host of factors, such as SGMA implementation). We were told that such
312 possibilities are “too speculative” for an EIR/EIS. Yet such consequences bear directly on the
313 feasibility and effectiveness of the project, and sufficient information is available to bracket a
314 range of potential effects. Our concerns from 2014 were left undiminished.

315 *Related changes in the Final EIR/EIS*

316 A response to point 3 refers us to the response to 2546-66, which is:

317 “Please refer to Section 30.3.4.1, Agricultural Contractor Export Service Areas,
318 Chapter 30, of this Final EIR/EIS. This section describes potential indirect *effects of*
319 *reductions in SWP and CVP deliveries to Export Service Areas resulting from*
320 *implementation of the project*, including increases in cost of water, using empirical
321 evidence from past behavior of agricultural and M&I contractors to increases in
322 cost of water.

323 The issue of crops and water use is beyond the scope of the proposed project. For
324 more information please refer to the updated California Water Plan’s strategy for
325 agricultural water use efficiency, which describes the use and application of
326 scientific processes to control agricultural water delivery and use.” (*Italics added*
327 *for emphasis*)
328

329 This response denies the relevance of the concern in point 3. We found nothing in the Final
330 EIR/EIS that suggests point 3 was addressed.

331 *Remaining concerns of the Delta ISB*

332 The response cited above directs us to section (30.3.4.1) which addresses the economic
333 impacts of not having as much water as “before Delta environmental restrictions”, but never

² Seemingly unavailable in full from WaterFix. Available at: <http://www.restorethedelta.org/wp-content/uploads/2016/09/CA-WaterFix-Economic-Analysis-Sunding.pdf>

334 addresses the environmental benefits (if any) of not having water, i.e., the environmental costs of
335 having more.

336 The next section (30.3.4.2) on municipal and industrial water use discusses how water
337 agencies would adjust to lower supplies without the project in accordance with how they
338 managed during drought, but does not address potential environmental benefits and costs arising
339 from less urban water supplies.

340 The benefit-cost analysis finds economic benefits from the delivery of water that would
341 not otherwise have been delivered due to Delta environmental constraints, while the EIR argues
342 that there are no environmental impacts because this is water that would have been delivered
343 anyway. The economic and environmental analyses are not using the same baseline.

344 The impacts, particularly of project construction, on Delta residents and visitors are
345 substantively addressed, but not presented in a coherent and understandable way. Such impacts
346 are often well discussed in detail, but are scattered across a variety of chapters and un-
347 summarized for informing local Delta decision-makers and those concerned with Delta residents
348 and visitors.

349 **Restoration and mitigation**

350 *Summary of comments on the Recirculated EIR/EIS*

351 Our concerns included:

352 *Long-term commitment*—“...The missing details...include commitments and funding
353 needed for science-based adaptive management and restoration to be developed and, more
354 importantly, to be effective...”

355 *Landscape context*— “Restoration projects should not be planned and implemented as
356 single, stand-alone projects but must be considered in a broader, landscape context.”

357 *Wetland loss*—Although wetland restoration is a key element of mitigation, “We noticed
358 little attention to the sequencing that is required for assessing potential impacts to wetlands:
359 first, avoid wetland loss; second, ...minimize; and third, ...compensate.”

360 *Mitigation ratios*— “In view of inevitable failures and time delays in wetland
361 restorations, mitigation ratios should exceed 1:1 for restoration of existing wetlands. The ratios
362 should be presented, rather than making vague commitments...” “Also...clarify...out-of-kind
363 and...in-kind replacement of losses....and whether such areas will exist with future sea-level
364 rise.”

365 *Early action*— “To reduce uncertainty about outcomes, allow for beneficial and
366 economical adaptive management.... mitigation actions should be initiated as early as
367 possible....potential for landowners to develop mitigation banks could be encouraged so
368 restoration could begin immediately...”

369 *Related changes in the Final EIR/EIS*

370 *Long-term commitment*—In the final EIR/EIS we saw no call for or strategy to fund
371 restoration and mitigation in a holistic landscape approach. In chapter 11, funding of invasive
372 plant control was mentioned on p. 186 and 332. Funding for steelhead monitoring was mentioned
373 on p. 198. The word “funding” also appears on p. 176. That doesn’t add up to a strategy

374 *Landscape context*— Restoration is now set in the larger context of EcoRestore. Chapter
375 11 explains how each construction component would affect each species and how each of several
376 conservation measures will benefit affected species. The Executive Summary states “Mitigation
377 measures have also been developed to reduce significant impacts of each action alternative.

378 These measures are included in each EIR/EIS resource section and tabulated in Table ES-8 [90
 379 pages]. The Mitigation Monitoring and Reporting Plan for the California WaterFix (MMRP)
 380 provides a detailed description of the mitigation measures applicable to Alternative 4A, the
 381 preferred alternative. The MMRP describes how the lead agencies will implement each measure,
 382 the parties responsible for implementing each measure, the location for implementation of each
 383 measure, the timing of each measure, and monitoring procedures. Finally, the MMRP indicates
 384 the reporting requirement for each measure.” The alternatives evaluated, including the preferred
 385 4A, are not consistent with the science of restoration ecology, which indicates the need to restore
 386 historical hydroperiods to restore riparian vegetation and associated wildlife and fish. The field
 387 of ecohydrology is developing rapidly; we recommend obtaining and using the latest
 388 "understanding of complex interactions between vegetation, groundwater, river flows, channel
 389 morphology, and water quality to determine restoration outcome" (Moreno-Mateos and Palmer,
 390 2017).

391 *Wetland loss*—There remains little attention to the sequencing that is required for
 392 assessing potential impacts to wetlands: In the Executive Summary (p. 16, l. 21), sequencing
 393 steps 1-2 are combined as avoidance and mitigation measures (AMMs), and instead of calling
 394 the third step “compensatory mitigation,” it is called mitigation. The word “mitigation” simply
 395 means to lessen impacts. Then, later, on p. 32: “Additionally, pertinent elements previously
 396 included as AMMs and the proposed Adaptive Management and Monitoring Program would be
 397 applied to the activities proposed under Alternative 4A. These AMMs, too, would serve a
 398 mitigation function under CEQA. All of these components would function as de facto CEQA and
 399 NEPA mitigation measures for the impacts of constructing and operating Alternative 4A.
 400 Chapter 3, Section 3.6.3 describes the Alternative 4A Environmental Commitments.” How
 401 would avoidance and minimization satisfy requirements for compensatory mitigation?

402 *Mitigation ratios*—The need to prepare for some mitigation actions not being fully
 403 effective is apparently not addressed. The term ‘mitigation ratio’ does not appear in the index.
 404 Statements are that impacts will be mitigated. Since ‘mitigation’ means avoid, minimize or
 405 compensate, and because “significant effect” and “not significant” are subject to interpretation,
 406 specific outcomes are difficult to ascertain.

407 *Early action*— This concern for early and adaptive restoration is somewhat satisfied.
 408 Restoration via EcoRestore is mentioned and it says those experiences will inform later
 409 restoration. The term ‘mitigation bank’ is not listed in the index. The timing of projects is
 410 supposed to appear in Chapter 3.

411 *Remaining concerns*

412 We recommend field experimentation to restore wetlands, testing alternative methods in
 413 space and over time. An adaptive restoration approach can reduce uncertainty and explain why
 414 outcomes differ.

415 Chapter 11, p. 246 (of 4,191 pages) lists three reasons why detailed restoration plans are
 416 not available: (1) because the habitat restoration and enhancement would occur, if feasible, in
 417 areas with willing sellers, none of whom have been identified; (2) to maintain flexibility for
 418 adaptive management; and (3) because implementation has a long timeframe. So, for the
 419 EIR/EIS, the assessment of the effects for the habitat restoration and enhancement was
 420 programmatic and focused on restoration opportunity areas (ROAs) identified in the BDCP. The
 421 ROAs are large land areas centered on Suisun Marsh, the West and South Delta areas, Cache
 422 Slough and the Cosumnes/Mokelumne area in the east Delta (Figure 3-1 in Chapter 3,

423 Description of Alternatives). Individual project-level environmental review based on more
424 detailed plans will be required for these actions before implementation.

425 Vegetation, particularly native vegetation, is under-represented in discussions of habitat
426 restoration. The term “vegetation” nearly always occurs in reference to invasive plants, e.g., one
427 heading is “Vegetation Removal.” On p. 218 of chapter 11, there is one short note about
428 restoring vegetation: “Restoration would likely include pre-breach management of the restoration
429 site to promote desirable vegetation and elevations within the restoration area and levee
430 maintenance, improvement, or redesign.” There is great opportunity for experimentation and
431 adaptive restoration of native vegetation, since restoration of “riparian habitat” is considered a
432 mitigating factor for project impacts.

433 The literature is clear that restoration efforts have significant “recovery debts” even after
434 a decade or more (Moreno-Mateos et al., 2017). Expectations for ecological impacts of
435 construction and operations being temporary with rapid recovery seem overly optimistic.

436 **REFLECTIONS: PARALYSIS BY ANALYSIS, AND AN OPPORTUNITY MISSED**

437 Several overarching problems encumber the series of environmental documents that were
438 prepared for the Bay Delta Conservation Plan and California WaterFix. We note these problems
439 below in commentary intended to offer perspectives on the use and communication of science in
440 the Sacramento – San Joaquin Delta.

441 We live in a world where environmental documents often provide more eyestrain than
442 insight. The National Environmental Policy Act (NEPA) and California Environmental Quality Act
443 (CEQA) were enacted nearly 50 years ago with the intent of developing a clear scientific basis
444 for informing decision-makers and the public of the environmental impacts of projects and
445 policy decisions relative to their net economic benefits. To that end, both Acts required analyses
446 and documentation of environmental impacts, along with public hearings to facilitate citizen
447 engagement. Soon after impact analyses were required, however, concerns were raised that
448 adding steps to the decision-making process would delay or halt development—what was
449 described as “paralysis by analysis.”³

450 Almost from the beginning, projects were delayed through legal challenges over the
451 adequacy of the environmental analyses. And the Courts, by often favoring comprehensiveness
452 over comprehension, have promoted increasingly detailed documentation. Environmental impact
453 analyses have become longer and increasingly impenetrable, to the point where massive and
454 opaque environmental impact statements deter public comprehension and engagement, scientific
455 evaluation, and the participatory, democratic intentions of both NEPA and CEQA. Because
456 preparation of lengthy documents has often been turned over to contractors, the responsible
457 agencies and staff may also fail to fully understand the underlying analyses. By becoming
458 detached from the process, agencies may lose the opportunity to learn in ways that would lead to
459 better informed decisions or improved science.

460 Balancing the need for information against the imperative to make timely decisions is
461 always a challenge. Both extremes should be avoided—either assembling too much detailed
462 information before reaching decisions, or making large, irreversible decisions based on
463 inadequate information and analyses. There will always be uncertainty in environmental
464 analyses. The purpose of environmental impact assessment is to assemble information and

³ Example are: Langley, A. 1995. Between “Paralysis by Analysis” and “Extinction by Instinct”. *Sloan Management Review* 36(3)63-76. Lenz, R. T. and M.A. Lyles. 1985. Paralysis by Analysis: Is Your Planning System Becoming Too Rational? *Long Range Planning* 18(4)64-72. The [concept](#) dates back to the late 1960s and early 1970s.

465 conduct analyses to examine the anticipated environmental effects of a proposed project so that a
466 decision can be made (with public input) as to whether or not the project should proceed as
467 proposed.

468 The challenge of balancing comprehensiveness with comprehension is evident in the
469 EIR/EIS documents for BDCP and WaterFix. These documents were prepared to support
470 permitting needed to comply with various state and federal regulations and statutes as well as
471 Court orders. The purpose was to identify potential environmental impacts and address how
472 these impacts would be mitigated in accordance with the legal requirements of NEPA, CEQA,
473 and Biological Opinions. We understand this. Yet, as members of the Delta Independent Science
474 Board, we are charged with evaluating how science is being used to support adaptive
475 management for the Delta and, ultimately, scientifically informed decision processes intended to
476 enhance the Delta ecosystem and ensure water supply reliability while preserving the human
477 values of the Delta as an evolving place. These objectives go well beyond the narrow legal
478 mandate of an EIR/EIS, but they are consistent with the underlying intent of these laws.

479 In our judgment, what the Courts now require to be included in an EIS/EIR can make
480 them so massive as to be incomprehensible for practical use either by decision-makers, the
481 public, or scientists interested in understanding a project. Furthermore, by sticking solely to what
482 the Courts require, the agencies are not presenting information critical for public and scientific
483 analysis. Until legislatures amend NEPA and CEQA and set a new course, we recommend that
484 the agencies prepare a separate document for each project laying out the critical issues for public
485 and scientific review. The elaboration of this recommendation would take some time and such an
486 approach would no doubt evolve with experience. However, we believe it has the potential to be
487 far more informative for the agencies themselves, as well as for public engagement and scientific
488 advancement.

489 We were asked to assess the scientific adequacy of over 50,000 pages of BDCP and
490 WaterFix draft and final reports. We repeatedly requested intelligible summaries of chapters and
491 summary evaluation tables to help us—as well as decision-makers and stakeholders—better
492 understand how the information might help in evaluating proposed actions and decisions. Most
493 chapter summaries were deferred to the Final WaterFix EIR/EIS, and most of those provided fall
494 short, as elaborated in persistent concerns above.

495 We also expressed concern that important recent scientific work was not included in the
496 massive compilations. In an instance regarding climate-change science, we were told that the
497 information used in the EIR/EIS was current enough, and that an EIR/EIS kept up to date would
498 never get finished⁴.

499 When we asked about information we considered important for rational decision-making,
500 we were frequently told that the law does not require such information—that the guidance for
501 CEQA and NEPA requires lead agencies “to assess the potential for environmental effects based
502 on the best available information and tools and *avoid speculation*” (italics ours). Reasoned
503 speculation, however, is an important part of science and public policy discussions. This is
504 especially important in a system as complex and dynamic as the Delta, where one meets
505 uncertainty at every turn. Preparation for contingencies emerge from speculations about what
506 might follow from an action and are the essence of adaptive management. Rather than avoiding
507 speculations, an impact assessment should clearly identify major contingencies, describe the
508 ideas or observations behind them, and frame them as testable hypotheses as part of the adaptive

⁴ Response to comment number 88, Recirculated Draft letter 2546, in Final EIR/EIS Volume II, part 2-2, Table 2-2, at http://baydeltaconservationplan.com/FinalEIREIS/FinalEIR-EIS_ResponseToComments.aspx

509 management process. This is an important tool for managing expectations, limiting surprises, and
 510 realistic preparation. The field of risk analysis offers ample guidance for such problems.
 511 Reasoned speculation is a legitimate part of the “best available science” that informs decision
 512 making.

513 These comments should not be taken as criticism of those who have assembled the
 514 information, carried out the analyses, and prepared the BDCP and WaterFix environmental
 515 documents. They followed what the laws, regulations, and permitting processes require. They
 516 faced enormous challenges from such a large and complex system. Yet the Delta’s problems are
 517 so important that project proponents should go far beyond the norm when providing and
 518 synthesizing scientific information. Making this material readily comprehensible is fundamental
 519 to rational evaluation of the potential environmental impacts by policy-makers and the public.
 520 Environmental impact assessments for BDCP and WaterFix have missed opportunities to
 521 increase understanding of the Delta as an ecosystem, a water supply, and as a place where people
 522 live and work.

523 REFERENCES CITED

- 524 Baltay, A.S., and Boatwright, J., 2015, Ground-motion observations of the 2014 South Napa
 525 Earthquake: *Seismological Research Letters*, v. 86, p. 355-360, doi:10.1785/0220140232.
- 526 Delta Independent Science Board, 2012, Initial recommendations for integrating BDCP science
 527 and for improving the reviewability of draft BDCP documents,
 528 [http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta Independent Science](http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta%20Independent%20Science%20Board,_draft_BDCP_memo_060712.pdf)
 529 [Board,_draft_BDCP_memo_060712.pdf](http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta%20Independent%20Science%20Board,_draft_BDCP_memo_060712.pdf)
- 530 Delta Independent Science Board, 2013, *Delta Independent Science Board, comments on current*
 531 *administrative draft of BDCP documents*, letter to Stewardship Council, Sacramento, CA, 3
 532 pp., July 2013, [http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta](http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta%20Independent%20Science%20Board,_Comments_on_Draft_BDCP_Document.doc_.pdf)
 533 [Independent Science Board,_Comments_on_Draft_BDCP_Document.doc_.pdf](http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta%20Independent%20Science%20Board,_Comments_on_Draft_BDCP_Document.doc_.pdf)
- 534 Delta Independent Science Board, 2014, *Review of the Draft EIR/EIS for the Bay Delta*
 535 *Conservation Plan*, report to Delta Stewardship Council, Sacramento, CA, 133 pp., May 2014.
- 536 Delta Independent Science Board, 2015, Review by the Delta Independent Science Board of the
 537 Bay Delta Conservation Plan/California WaterFix Partially Recirculated Draft Environmental
 538 Impact Report/ Supplemental Draft Environmental Impact Statement: Report to the Delta
 539 Stewardship Council, September 2015, 20 p. [http://deltacouncil.ca.gov/docs/final-delta-isb-](http://deltacouncil.ca.gov/docs/final-delta-isb-comments-partially-recirculated-draft-environmental-impact-reportsupplemental)
 540 [comments-partially-recirculated-draft-environmental-impact-reportsupplemental](http://deltacouncil.ca.gov/docs/final-delta-isb-comments-partially-recirculated-draft-environmental-impact-reportsupplemental)
- 541 Delta Independent Science Board, 2016, Improving adaptive management in the Sacramento-San
 542 Joaquin Delta: Report of the Delta Independent Science Board, Sacramento, CA, 66 pp.,
 543 February 2016, [http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta](http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta%20Independent%20Science%20Board,_draft_BDCP_memo_060712.pdf)
 544 [Independent Science Board,_draft_BDCP_memo_060712.pdf](http://deltacouncil.ca.gov/sites/default/files/documents/files/Delta%20Independent%20Science%20Board,_draft_BDCP_memo_060712.pdf)
- 545 Doremus, H., W.L. Andreen, A Camacho, et al. 2011. Making good use of adaptive
 546 management. Center for Progressive Reform White Paper No. 1104.
 547 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1808106.
- 548 Ebberts et al. (in press), “Estuary ecosystem restoration: Implementing and institutionalizing
 549 adaptive management,” *Restoration Ecology*.
- 550 Eberhart-Phillips, D., 2016, Northern California seismic attenuation; 3D Q (sub P) and Q (sub S)
 551 models: *Bulletin of the Seismological Society of America*, v. 106, p. 2558-2573,
 552 doi:10.1785/0120160060.

- 553 Eberhart-Phillips, D., Thurber, C., and Fletcher, J.B., 2014, Imaging P and S attenuation in the
554 Sacramento-San Joaquin Delta region, northern California: *Bulletin of the Seismological*
555 *Society of America*, v. 104, p. 2322-2336, doi:10.1785/0120130336.
- 556 Ellis, H.L., Gardiner, C., Groves, D., Henricksen, D., Kaira, N., Ludy, J., Roth, L.H., Slattery,
557 G., Smith, T.W., Swenson, R., and Trahan, A., 2016, *Risk analysis methodology* [July 2016
558 final]: Delta Stewardship Council, Delta Levees Investment Strategy, 191 + appendices p.,
559 last accessed July 27, 2016, [http://deltacouncil.ca.gov/docs/delta-levees-investment-strategy-](http://deltacouncil.ca.gov/docs/delta-levees-investment-strategy-dllis-risk-analysis-methodology-report-july-2016-37mb)
560 [dllis-risk-analysis-methodology-report-july-2016-37mb](http://deltacouncil.ca.gov/docs/delta-levees-investment-strategy-dllis-risk-analysis-methodology-report-july-2016-37mb).
- 561 Erdem, J.E., Boatwright, J., and Fletcher, J.B., 2016, Ground-motion attenuation for the South
562 Napa earthquake in the Sacramento-San Joaquin Delta, California [abstract]: *Seismological*
563 *Research Letters*, v. 87, no. 2B, p. 564, doi:10.1785/0220160046.,
564 <http://www.seismosoc.org/meetings/ssa2016/abstracts/>.
- 565 Field, E.H., Biasi, G.P., Bird, P., Dawson, T.E., Felzer, K.R., Jackson, D.R., Johnson, K.M.,
566 Jordan, T.H., Madden, C., Michael, A.J., Milner, K.R., Page, M.T., Parsons, T., Powers,
567 P.M., Shaw, B.E., Thatcher, W.R., Weldon II, R.J., and Zeng, Y., 2013, *Uniform California*
568 *Earthquake Rupture Forecast, version 3 (UCERF3)—The time-independent model*: U.S.
569 Geological Survey Open-File Report 2013-1165, California Geological Survey Special
570 Report 228, and Southern California Earthquake Center Publication 1792, 97 p.,
571 <http://pubs.usgs.gov/of/2013/1165/>.
- 572 Fletcher, J.B., and Boatwright, J., 2013, Site response and basin waves in the Sacramento–San
573 Joaquin Delta, California: *Bulletin of the Seismological Society of America*, v. 103, p. 196-
574 210, doi:10.1785/0120110347.
- 575 Fletcher, J.B., Erdem, J., Seats, K., and Lawrence, J., 2016, Tomographic Rayleigh wave group
576 velocities in the Central Valley, California, centered on the Sacramento/San Joaquin Delta:
577 *Journal of Geophysical Research: Solid Earth*, v. 121, p. 2429-2446,
578 doi:10.1002/2015JB012376.
- 579 Moreno-Mateos, D., and M. Palmer. 2017. Watershed processes as drivers for aquatic ecosystem
580 restoration. Chapter 14 in Palmer, Falk & Zedler, *Foundations of Restoration Ecology*. Island
581 Press, Washington, DC.
- 582 Unruh, J., Hitchcock, C., Blake, K., and Hector, S., 2016, Characterization of the southern
583 Midland fault in the Sacramento-San Joaquin Delta, in Anderson, R. and Ferriz, H., eds.,
584 *Applied geology in California*: Zanesville, Ohio, Association of Engineering and
585 Environmental Geologists, p. 957-976.
- 586
- 587