September 16, 2011

To: Phil Isenberg, Chair, Delta Stewardship Council
Members of the Delta Stewardship Council

From: Richard Norgaard, Chair
Delta Independent Science Board (DISB)

Re: **Final - Synthesis of Recommendations from the Delta Independent Science Board (DISB) on the Fifth Staff Draft Delta Plan**

The Fifth Staff Draft is a solid improvement over the earlier drafts on which the DISB has commented. The preface and introduction have come a long way toward an integrated description of the problem and possible solutions. Chapter 2 on adaptive management provides the key elements necessary to understand the shift toward more scientific management required in the initiating legislation and as further elaborated by the DISB. The governance chapter is developing fairly well. There have been important improvements in the water reliability and ecosystem restoration chapters. The earlier drafts the DISB commented on did not even have a water quality chapter, and we find this draft very good. Overall, the Fifth Staff Draft Delta Plan has improved significantly.

The DISB remains seriously concerned about the chapters on risk reduction and the Delta as an evolving place. The DISB is also concerned that the important principles of adaptive management layed out in Chapter 2 are not not applied in Chapters 4 – 8. And of course the effective use of science and the success of the plan as a whole depend on adequate financing.

The DISB had considerable difficulty in determining where the best science is being drawn upon and used appropriately. The Delta Plan lays out a process for coordinating, guiding, and to some extent enforcing on-going plans. Which portion of which plans are being drawn upon in the development of the plan and which portions are still to be approved by the DSC based on consistency with the Plan including the use of best available science and adaptive management, and what will happen if the plans are not approved by the DSC, leave many scientific questions open. Chapter 5, for example, leans very heavily on the multiagency Ecosystem Restoration Program that has not yet been reviewed and the Bay Delta Conservation Plan that is still in preparation.

Ambiguities aside, it is clear that the use of best available science and adaptive management, as stipulated in the founding legislation, will play a central role in the success of the Delta Plan. Thus stipulating and demonstrating what constitutes best available science and adaptive management in the Plan is critical. To this end, the DISB provides the following recommendations, both broad and detailed.

Four Broad Recommendations

Integration. Chapter 1 provides a comprehensive overview of the interrelationships among the major issues. It is striking, however, that the subsequent chapters on specific issues make so little reference to these interrelationships. This makes it appear as if problems can be managed separately and as if there are not tradeoffs among solutions to different problems. The DISB strongly recommends that, while chapters must address a specific topic, each of chapters 4-8 should also provide some examples of trade-offs with other policy goals. In one case, Chapter 8, the lack of integration is so extreme that the recommendations are completely at odds with other chapters. The whole purpose of the iniating legislation, the creation of the Delta Stewardship Council, and the development of a Delta Plan is to balance co-equal goals. As Chairman Isenberg has frequently stated, the Delta cannot be managed issue by issue, with separate stakeholders expecting their needs to always be met. The Delta Plan needs to reflect and make the legal and environmental realities more explicit.

Adaptive Management. Chapter 2 describes adaptive management, but the Delta Plan does not yet integrate the establishment, use, and maintenance of adaptive management. The legislature mandates adaptive management, yet none of chapters 4-8 begins to address how adaptive management will be used. The DISB recommends that each of chapters 4-8 incorporate descriptions of how adaptive management may be used in the future. In some cases, it may be appropriate to indicate how adaptive management practiced to achieve another policy goal might affect the policy goal addressed in the specific chapter.

Further, the DISB recognizes that professionals with experience leading successful adaptive management programs will be needed to train others and to provide support services . The DISB recommends that the Plan explicitly recognize the need for sufficient properly trained personnel, for the training of existing scientists and managers, and for the on-going support of adaptive management.

Monitoring Needs and Performance Measures. The DISB acknowledges the difficulties of identifying monitoring needs and performance measures without having appropriate conceptual models of expected outcomes under different management regimes. Nevertheless, successful monitoring and performance measures have been developed for other complex environmental systems from San Francisco Bay to Chesapeake Bay. The DISB recommends that examples of relatively successful systems of monitoring and performance measures be included in the plan to illustrate how they can work.

Further, the DISB recommends that the Plan include a description of how better monitoring will be coordinated and carried out, probably in the governance chapter.

Science Needs. The DISB recommends that each of chapters 4-8 provide a brief summary of the state of the science with respect to the issues addressed in the chapter, in broad terms, and describe the critical science needs. In the judgment of the DISB, conceptual models that incorporate tradeoffs and predict outcomes will be required in order to design adaptive management programs and establish monitoring needs and performance measures.

Chapter-by-Chapter Recommendations

Many of the following recommendations complement the four broad recommendations summarized above. More detailed editorial comments for authors of the chapters are provided in a subsequent section.

Chapter 1.

As noted in the introductory paragraph, Chapter 1 provides an informative overview of the major problems of the Delta and how they interrelate. The DISB found the descriptions of the state of the Delta, the feedbacks described, and the possible futures to be scientifically sound at the level they need to be communicated here. At the same time, the DISB was struck by the fact that the role of science in understanding the Delta and its role in finding solutions in the Delta are not mentioned in this chapter. The DISB highly recommends that the role of science be brought into this otherwise engaging overview.

Chapter 2.

This chapter provides an excellent description of adaptive management (AM) and best available science. It is an effective synthesis of the existing literature presented in a manner that is instructive. The description, however, is entirely in the abstract.

To make the description more realistic, the DISB recommends that considerable emphasis be placed on the identification of barriers to implementing AM and how these barriers can be overcome. While the DISB discouraged the use of examples from the Delta to illustrate AM, it recommends their use to illustrate the difficulties of carrying out an AM approach. The chapter would benefit, for example, from an analysis of how AM played out in CALFED sponsored ecosystem restoration.

Given the DISB's broad recommendation that each of the policy chapters illustrate the use of AM in the future, Chapter 2 may be able to link to these illustrations to help integrate the Plan and better ground the use of AM in the Delta early in the Plan.

The DISB also recognizes that considerable investment will be needed to train both managers and scientists to shift effectively into AM and that the individual agencies will need a shared, standing unit, probably within the Delta Science Program (DSP), to provide support for and to ensure the use of AM. Professionals who have successfully applied AM will need to be available to train others and provide support services thereafter. The individual agencies should also be planning future hires based on experience with AM. The DISB recommends that this be made explicit in Chapter 2, probably as part of the description of the Delta Science Plan that will be developed in 2012.

<u>More Specific Comments</u>

The regime shift diagram may not convey enough information for many readers. It may be better to provide a bullet list of scientific advances over the last decade rather than a discussion of regime shift.

The nine-step AM process is clearly laid out and well justified with appropriate literature citations, but the DISB has further thoughts that might help in the next draft.

Step 3, Modeling Linkages Between Actions and Objectives: This section focuses on conceptual models. In our discussions of AM in CALFED and elsewhere we emphasized development of conceptual models for two reasons. The people we were working with were inexperienced with any kind of formal modeling and were suspicious of simulation modeling. Getting them to think in terms of conceptual models, which they routinely used in a cognitive sense, seemed the easier approach, although many practitioners firmly denied that they ever used any kind of model. However, in terms of evaluating the quantitative impact of management actions, simulation is by far the more powerful tool. It might be better here to recognize conceptual modeling as a preliminary step. Policy makers might never go beyond this step as well developed conceptual models may be all that is needed in communicating the science to the policy maker. However, for technical assessment of action/outcome linkages simulations are likely to be necessary. The DISB recommends that this progression, from concept to formal model to simulation, and the importance of simulation in developing and evaluating management actions be more clearly spelled out.

Step 7,Aanalyze, Synthesize, Communicate: The analysis should be built around the original conceptual model but a broader exploratory analysis should also be undertaken as this can indicate new or different relationships that were not included in the original conceptual model.

If simulation is used to explore the outcomes of actions in the first instance the simulation should provide an expectation of how much response to expect in a particular period of time. Monitoring and subsequent analysis could then be designed efficiently in relation to the time frame of expected response.

Where the magnitude of expected response over time is highly uncertain, Bayesian updating of model expectations could be conducted as information is gathered over time. This will strengthen the interpretation of any particular analysis.

The DISB does not think these details of AM need to be fully discussed but their potential value should be briefly indicated.

Monitoring: The short section on monitoring on page 48 leaves us wondering if this implies that the DSP will undertake a comprehensive monitoring program. Indeed, throughout it is not always clear what exactly the DSP will do and what it expects other agencies or research institutes will undertake on its behalf.

Policies: The one policy statement relating to application of AM is left to Chapter 3 and is a sub-policy of G P1. It should be repeated at the end of this chapter and worded more as a stand alone policy. Other problem statements and policies could be included as well, such as one that speaks to the need for a Delta science plan.

Performance Measures: There are none. It would be useful to include some measures of performance regarding AM implementation and in terms of financing and effectiveness of the DSP.

Might this chapter usefully relate some of the Delta Plan's policies and recommendations to scientific issues that would likely be central to a Delta Science Plan? Examples might tie to policies and recommendations in the Ecosystem realm (ER), perhaps also among RR R5, RR

R7, RR R12, FP R1, FP R9.

Some of the scientific issues the chapter might briefly explore: How have the procedural requirements like those in G P1 played out (or not) in a recent Delta restoration project or Delta risk assessment? What Delta analogies or punch-lines strengthen the take-home messages in the Florida and Australia sidebars? What are the likely outlines of a Delta Science Plan, and how would they tie to big issues in the Delta Plan? Room can be made for such engagement by moving, to an Appendix, the current belaboring of the nine steps and the best available science.

Chapter 3.

The governance chapter emphasizes criteria and processes for determining when a plan or project fits the Delta Plan. Best available science and AM are critical criteria for approval. The DISB also notes that the Council has the authority to amend the plan in accordance with best available science in the spirit of AM. Yet the governance chapter says nothing about the governance needs to sustain best available science and AM. While these needs will be elaborated more fully in the development of the Delta Science Plan during 2012, the DISB recommends that the governance chapter acknowledge that governance mechanisms will be needed to: 1) assure the training of scientists-managers in AM, 2) coordinate the monitoring programs among the agencies, 3) facilitate access to data, 4) encourage communication between managers and scientists across agencies, 5) keep the public informed on the state of the Delta and AM, and 6) specify how the Delta Science Program relates to and, to the extent appropriate, oversees other science efforts.

Chapter 4.

The narrative in Chapter 4 revolves around meeting a key objective in the 2009 legislation: increasing water supply reliability by reducing reliance on water from the Delta, through increased water use efficiency, regional self-reliance, increased storage, and improved conveyance. The litmus test for all problem statements, policies and recommendations is how effectively they address this aspect of the legislation.

Although the Fifth Staff Draft shows considerable improvement over earlier versions, it still has a number of problems or weaknesses. The Council has the opportunity to influence the multiple parallel planning efforts that ultimately influence the Delta Plan or its implementation. It may want to consider taking a more assertive approach in this regard. Some important examples of weaknesses in the chapter include:

The Plan is a Captive of Other Plans: California is perpetually engaged in water planning, with multiple federal, State and local agencies with different and occasionally conflicting mandates all involved and with deadlines that slip at different rates. The 2009 legislation attempted to address this by giving the Delta Stewardship Council authority to align and/or steer these many plans into a single overarching plan. The current draft does not embrace this goal, proposing simply to await and adopt State Water Resources Control Board (SWRCB) flow criteria and BDCP conclusions about flow and conveyance rather than seeking to guide their development, although retaining some authority through the requirement of consistency.

The most significant departure from this approach is the threat under Policy ER P1 that if the SWRCB does not meet the June 2, 2014, deadline for developing new flow

standards for the Delta, the Council may withhold or recommend withholding approval for certain water projects. A similar exercise of authority by the Council is not planned for any other aspect of water management, for which relatively weak recommendations are all that is offered.

Lack of Clarity: the language used in various parts of the draft (noted in specific comments below) is imprecise. Most notable of these is WR P1, which reads: *"A covered action to export water from, transfer water through, or use water in the Delta is inconsistent with the Delta Plan if the covered action negatively impacts one or more of the coequal goals and one or more of the water suppliers that receive water from the Delta significantly causes the need for the covered action by failing to comply with one or more of the following:"* As written, the policy implies that an action must <u>both</u> negatively impact one or more of the coequal goals <u>and</u> one or more water suppliers must fail to comply with one or more other… etc. In general, the policy statements in the plan are convoluted and prolix and this one is particularly messy. More clarity would strengthen the plan.

Reducing Reliance on Delta Water: the legislation and the Delta Plan set a goal of reducing State reliance on water from the Delta. This could involve reductions in total exports, reductions in net use upstream, reductions in in-Delta use, changes in timing of use, or all of the above. Yet the Delta Plan principally focuses on regional self-reliance through improved efficiency, conservation, re-use/recycling programs, development of local sources, better accounting, etc. Although it seems obvious that improvements in regional supplies will reduce pressure on the Delta, the specific connection between the two is not made well. For example, reductions in per-capita use of water in urban settings CAN make more water available for consumptive use. In most urban environments, however, this "new" water is used to support growth and, thus, no net decrease in overall regional consumption of water. Indeed, the growth in number of water users can lead to hardening of demand, resulting in no reduction in pressure or even more pressure on the Delta. The same can occur in agricultural settings where increases in water use efficiency can lead to planting of more acreage (including the current trend of perennial crops) and no net reduction in regional water consumption.

A more direct statement about reducing withdrawals from the Delta would be of value together with more quantitative measures of performance. We recognize the political sensitivity around statements about water reallocation but the Delta Plan needs to be more direct about the need for changes in allocation for environmental purposes both in terms of absolute volume and seasonal discharges.

Improved Water Supply Reliability: the Delta Plan rightfully points out that the legislature did not make explicit what it meant by improvements in water supply reliability. The Plan makes a good attempt at articulating this in the earlier chapters, but in this, the most crucial chapter, reliability remains an elusive concept. The Delta Plan seems to imply that reliability will be addressed through demand management and regional self sufficiency rather than supply management and reliance on the Delta. But it never actually says this. A more direct statement would help both in terms of water management and development of meaningful performance measures.

Improved Water Use Efficiency: The phrase "efficiency" is used loosely in the Delta Plan. Efficiency of urban water use is different from efficiency of agricultural or environmental water use. Efficiency is not well connected with how it impacts the co-equal

goals, which is a problem throughout the document. This lack of connection appears to be by design, however, to avoid being too specific.

Reporting is an aspect of efficiency on which there is progress in the Delta Plan but it remains vague. The Delta Plan demands that agricultural water suppliers measure the volume of water delivered to customers but does not demand that this information be reported. The requirement that regions work to achieve regional water balance implies that regional water use will be measured but will Delta water users be required to report specific uses of water? This is a hugely controversial issue, but is where the Council can have a significant, positive impact.

What Happened to the Delta Watermaster? The 2009 legislation created the Delta Watermaster, who will oversee the day-to-day administration of water rights, enforcement activities, and reports on water right activities. This individual could be one of the most important links to the SWRCB and has the potential to be integral to achieving the co-equal goals. However, with the exception of passing mention in a table, the Delta Watermaster is not a part of the Delta Plan. If this is not simply an oversight, then the reasons should be clearly articulated.

Integration With the Coequal Goals. Although water allocation is critical to water supply reliability, ecosystem restoration, and preservation of Delta as Place the chapter is virtually silent on anything but water supply reliability. Each of the issues raised in the chapter needs to be explored in relation to the coequal goals and the preservation of Delta as a unique place. This need not involve a huge expansion of the chapter. Rather a judicious cross referencing of chapter 4 with chapters 5 and 8 together with recognition of the inevitable trade offs that will have to be made would help with the integration among chapters.

Adaptive Management and Water Supply Reliability. The chapter makes no mention of AM of water flows and allocation or regional self sufficiency. Does that mean that the Council does not see a role for AM in water supply reliability? Otherwise the chapter needs to provide some guidance on how AM will be incorporated into the assessment of delta flow standards, regional self sufficiency, conjunctive use, etc.

Science Needs. The chapter would benefit from identification of key science needs to achieve the goal of water supply reliability and integration of water supply with ecosystem and Delta as place. Examples include: improved projections of future surface-water flows, improved estimates of groundwater resources, and further assessment of X2 as a predictor of biological effects.

Performance Measures. Performance measures (particularly the Administrative measures) read like an afterthought. Some specific comments:

Administrative Performance Measures. Many of these performance measures apply state-wide and are not expressed in a way that clearly relates to the co-equal goals of the Delta Plan. These should be narrowed in scope and purpose to be more effective and clear. Additionally, the percentage of water suppliers who have adopted plans is not a useful measure. It is more relevant to focus on the percentage of water that is currently governed by water supply plans. This problem of percentage of agencies (rather than percentage of Delta water) persists throughout the administrative performance measures text.

Driver Performance Measures. All of these (and outcome performance measures as well) begin with "Progress Toward" which is very distinct from the language used on administrative performance measures. Yet these are written more like real performance

measures. The last one—Progress in reviewing existing water conservation….—really belongs in the administrative performance measures category.

Outcome Performance Measures. There are three general problems with the outcome performance measures. First, they are much more vague than the preceding driver performance measures. How will you know when you have achieved your goal? Second, several (see above) are written as though they apply to the entire state. How will improvements in the Upper Klamath Project impact the co-equal goals of the Delta? These should be more narrowly focused. Finally, it is not clear how these (or the preceding performance measures) map onto the policies and recommendations contained in the text. Perhaps it would be useful to develop a table that clearly shows how each problem, policy and recommendation is addressed by these performance measures.

Specific Comments on Outcome Performance Measures.

"*Progress toward increasing statewide urban and agricultural water efficiency, measured by the amount of water used in these sectors relative to preceding years (reported in 5-year increments starting from 2000).* " First, it is not clear how statewide increases in efficiency address the co-equal goals for the Delta. Second, as stated, this is not really a measure of efficiency. In the urban sector, efficiency is usually defined as per capita water use (a useful measure). In the agricultural sector, it is usually economic efficiency that is measured (value of production/acre-feet applied). In both cases, efficiency can be high with no reduction in net water use. On the urban side, population growth can outpace increases in efficiency while on the ag side, efficiency can just translate to more crops, using the same amount of water (or more). A better measure may be reductions in net use of Delta water in both sectors, although actual efficiencies in Delta water use as expressed above would be a useful measure.

"*Progress toward increasing local and regional water supplies, measured by the amount of additional supplies made available (reported in 5-year increments from 2000)*." Presumably, this refers to both management of demand and management of supply. Both should be part of a performance measure.

"*Progress toward increasing the reliability of water supply exported from the Sacramento River or the San Joaquin watershed…..*" If this is going to be a performance measure, then the Council will have to explicitly define, and quantify, what it means by "reliability". The legislation was vague on this issue, but it would help a great deal if it were defined with some precision.

"*Progress toward attaining regional water balance…..*" There is, according to DWR, no such thing as an "average" year. They are wet, above average, below average, dry, critically dry. The performance measure should match DWR's classifications.

"*Progress toward achieving improvements to the management of California's groundwater basins….*" This is the most vague and poorly defined of the outcome performance measures. What, precisely, will success look like on this performance measure and, as noted above, how will this affect the co-equal goals?

The Council has the opportunity to influence the multiple parallel planning efforts that ultimately influence the Delta Plan. It may want to consider taking a more assertive approach in this regard.

Chapter 5.

The focus of this chapter is on flow and habitat with more limited attention to stressors. Overall, it is weak on specifics although it highlights some important and previously neglected aspects of ecosystem restoration. As it stands, it leans very heavily on the (not yet reviewed) multiagency Ecosystem Restoration Program (ERP) Conservation Strategy, and the Bay Delta Conservation Plan, which is still in preparation. This chapter suggests that the Delta Plan has absorbed the ERP program for the Delta but, in fact, has only absorbed the section relating to land elevations and its implication for habitat restoration. This chapter and others need to more clearly state what is included from other plans.

Ecosystem restoration is in part dependent on what future flow criteria for the Delta will be. However, these criteria remain to be developed and there is little discussion in the chapter about the need to integrate ecosystem restoration with flow patterns. The Delta Conservation Strategy remains unspecific about details of flow regimes and habitat restoration but sets important criteria for both flows and habitat. Unfortunately, for the goal of reliable water supply, the flow criteria for ecosystem restoration recognize that there will always be a need for flexibility in managing Delta flows for species conservation. This could be particularly contentious as water contractors are looking for assurances about export amounts, a topic that the Delta Plan does not address.

There is mention in several places of prioritization. Indeed, prioritization of efforts must be an essential part of all phases of implementation of the Plan, since it is unlikely that resources will be available to do everything that is needed. But deciding on priorities involves a difficult and contentious balancing act among tradeoffs. This should not be ignored; rather, the Delta Plan should set forth the elements of a general approach to prioritization: what criteria are to be used, how are conflicting needs to be weighted, etc. There are many approaches to prioritization in the economics and ecological literature; these should be assimilated into the Delta Plan rather than left hanging for some future effort.

The segregation of ecosystem restoration/management and human uses of water is strong in the structure of the Delta Plan. There needs to be better recognition of the trade off between water supply reliability and ecosystem restoration in this chapter. This could be done with few words but much better cross referencing.

The desirability of achieving better collaboration and coordination among the agencies is acknowledged in various parts of the appendices (e.g., the monitoring program). This is critical to the success of the Plan; it would be strengthened by the inclusion of specific recommendations for inter-agency collaboration and coordination with examples.

The Historical Delta

This draft covers the historical Delta well but there is limited discussion of how this information may guide local restoration efforts. Understanding the historical ecosystem and its variations (p. 107, lines 31-34) can provide critical information for assessing the range of conditions to which organisms have been exposed in the past, and therefore the potential scope of their adaptability to future changes but this perspective should not be pushed too far. The Delta Plan recognizes that it will not be possible to restore it to historical conditions, but some consideration should also be made of how some alterations are so drastic that any legacy value of the historical data would be minimal. Achieving "close approximation of its natural potential" (p. 109, lines 21-23) may be too optimistic,

especially in light of recognition elsewhere in the Draft Plan that it will be difficult to achieve this. If the writers mean achieving something close to the natural potential of the Delta ecosystem under its present highly modified condition, then this should be clarified.

The description of the historical Delta does not mention variable salinity, and it should. That is one of the characteristics of the historical condition that could help guide restoration efforts. This is discussed in Chapter 6, so a great deal does not need to be said here, but it would be useful to mention it and to point to Chapter 6 for further discussion of this issue.

Landscape perspective

The focus of the chapter is on aquatic habitats and native aquatic species. This is a legacy of the historic conflict over water and aquatic species that was at the core of previous initiatives (e.g. CVPIA, CALFED) and remains a focus of concern for the Council. The Council has the opportunity to go beyond this aquatic focus, however, to include more fully the wide range of terrestrial and semi-aquatic species that are also important and endangered in the Delta. The importance of more terrestrial species is mentioned in various places but it is hard to detect a strong appreciation for the needs of these species in either the plan or the ERP Conservation Strategy.

Although the chapter appropriately discusses the importance of a landscape perspective, this perspective is not apparent in the Delta Plan's policies and recommendations. For example, the various restoration projects identified, their locations and areas are not presented in a landscape context. What is the relationship, in landscape ecology terms, among the five locations/habitats identified for immediate restoration? What is the landscape rationale for these locations and habitat types and habitat extent? If these relationships have not been considered then "landscape" becomes merely a buzzword. P. 108, L. 12-17: and throughout this chapter, it is important to emphasize that the Delta is more than rivers and streams. These are embedded in a landscape mosaic that has also undergone massive historical changes, and this surrounding landscape both affects and is affected by what goes on in the aquatic systems. There should be more explicit mention of land-water interconnections, which involve more than floodplains or riparian zones. The emphasis appears to be only on increasing connectivity.

There is a general neglect of riparian and other terrestrial habitats and landscapes. A vast body of literature points to the intimate connections between riparian vegetation and the associated aquatic system, but aside from a brief discussion of the controversy about tree removal on levees there is little mention of restoration or management of riparian areas. Fostering habitats and connectivity for migratory birds is mentioned in several places, but apparently the focus here is on birds using the water rather than species (several of which are state- or federally listed) that use riparian woodlands, much less the adjacent agricultural landscapes. Is connectivity something that applies only to the water? In short, there is little in this chapter that provides perspective, guidance, or recommendations useful to thinking about how to manage or restore non-aquatic environments or species.

Flows

The discussion of flows is interesting but leaves out some important considerations. Most of the science concerning the importance of flow regimes refers to river channels rather

than estuaries. The estuarine studies point to the importance of flow in driving 2-layer circulation in the estuary (a nutrient pumping mechanism) and an empirical link between flow magnitude and productivity of some commercially important species. Rivers also deliver sediment and interact with tides to create patterns of deposition and erosion that shape estuarine habitats. River deltas are constructed by the dynamic interaction of river flows, tides, local geology and landforms, sediment transport and deposition. But the habitat forming processes in estuaries are more complex than in river channels and, at least according to Perillo (1995), still poorly understood. This is important because ER P1 (pp. 113-114) leaves setting flow requirements up to the SWRCB, which may not think in terms of the more complex relationships in estuaries unless encouraged to do so. Fortunately, the relationship between flows and habitats is fairly well covered in the ERP Conservation Strategy. But many people reading the plan will not necessarily refer to this strategy. A more thorough cross referencing of this chapter and the key documents of the ERP Conservation Strategy and, perhaps, the draft ecosystem flow standards developed by the SWRCB might help.

More science could have been brought to bear in setting minimum standards for the Delta flow regime. It is not sufficient simply to refer to the coequal goals without providing at least some minimal guidance about flow requirements in the estuary to meet those goals (beyond the rather nominal establishment of a more natural seasonal hydrograph). Admittedly, this is a very difficult and sensitive issue. The Council has deferred to the authority of the SWRCB in this matter and the SWRCB is developing flow standards in consultation with DWR and with BDCP. As sensitive as the issue is, however, we would like the Council to be bolder about its expectations.

The linkage between a call for a coordinated land-use policy and developing more natural flow regimes is not self-evident (p. 112, line 21), but it merits greater attention. While flow is largely determined by how much water enters the system at a particular point and time, land uses can have major impacts on how much of that water continues downstream, at what rates, and with what quality.

Specific mention of the problem of reverse flows should be included in the problem statement (p. 112, lines 34-37).

The text in the box on p. 111 indicates that peak flows come earlier and at lower magnitudes. Although this may be true it is not apparent on the graph for the Sacramento River where peak flows still occur in February-March as they did historically, although they are of lesser magnitude.

Restoration goals

The definition of restoration is forward-looking in its recognition of the fact that past conditions are not attainable, its specification of current conditions and drivers, and its acknowledgment of future changes. Such thinking about the targets of restoration should also be central to AM and the targets and goals that are set there. Caution should be exercised, however, in emphasizing functional rather than structural or compositional targets; framing goals in terms of the "natural potential" of a system sounds good, but is scarcely operational. The same could be said about the term "resilient."

Casting "healthy" ecosystems in terms of their resilience and capacity to retain "the full suite of original species" also seems unrealistic. Given the massive changes in the past and the different, yet also massive, changes projected for the future, it might be better to

think of adapting systems to cope with change and managing to follow desirable rather than undesirable future trajectories of change rather than aiming for some ideal state. As it is likely that the future will be quite different from the past, we should manage to anticipate the future rather than cling to notions that "the full suite of original species" is at all realistic as a restoration goal. At the same time, there is no doubt that "creating a more natural flow regime, restoring habitats, and reducing threats and stresses" (lines 42-43) are valid and important actions – it's just that doing so may not produce the original suite of species or a healthy ecosystem, but instead enable the system to cope with future changes to retain ecological value.

The need for an AM approach is barely mentioned in this chapter; yet it is critical that this approach be used to assess the effectiveness of various restoration actions. Recognition of the importance of using AM in restoration actions needs to be included in this chapter, and included as part of the recommendations. Chapter 3 notes that all restoration actions need to include an AM plan, but that requirement should be reiterated here. Also an AM approach is appropriate not only for restoration actions, but also for policy recommendations (e.g. modified flow requirements). There should be some discussion of how AM could (should) be implemented in ecological restoration.

Foci for immediate restoration include Cache Slough complex, Suisun Marsh, Yolo Bypass, Mokelumne/Cosumnes confluence, and Lower San Joaquin floodplain. These are suitable starting foci, as are the habitats and habitat areas targeted for restoration. However, the plan should clarify that these are starting targets for restoration and that, as more information comes available, additional areas and habitats are likely to need to be included. These restoration recommendations (ER R1) would be stronger if the Plan provided the criteria/rationale that were used for identifying the restoration projects used as examples in this section. Furthermore, restoration needs to be guided by conceptual models as discussed in Chapter 2; the importance of these should also be acknowledged in this chapter. Indeed, it would strengthen the chapter if an overall conceptual model of ecological restoration could be made a framework for the chapter. Such a framework would provide a clear illustration of the interdependence of ecosystem restoration and flow criteria, which is presently not well developed in the chapter. Finally, if landscape ecology is to guide restoration, these foci of restoration need to be assessed from a landscape perspective.

Stressors

In the bulleted, brief descriptions of stressor categories (p. 122), the possibility to address and manage for "globally determined stressors" and "legacy stressors" is a rather bleak and negative assessment. Even these types of stressors can be addressed to an extent by adaptive actions and partial mitigation, which is acknowledged in the text that follows.

Inclusion of more recommended *specific* actions would make this section better. The only stressor for which recommendations have been developed is invasive species. To some extent other stressors are considered in other chapters (e.g., water quality), but others are ignored or not clearly linked with policies and recommendations. As elsewhere, this could be addressed mainly through cross referencing with chapter 6.

The discussion of non-native invasive species (e.g., p. 124, lines 12-14) implies that all such species produce detrimental effects on ecosystem structure and function. This is not always true, and it will be increasingly difficult to issue blanket condemnations of such

species as environmental changes prompt distributional shifts that create new combinations of species. There is an urgent need for criteria and metrics that can be used to assess the net benefits and costs of different types of invasive species, whether exotic or natives from elsewhere. Anticipating which species may enter (or leave) the ecosystems can provide useful guidance for effective management, or "pro-active adaptive management". This is an area where research might pay significant dividends.

The list of possible "Stage 2 Actions" (p. 123) is very unbalanced with some very specific actions and some very broad, poorly defined actions included. It is not useful as now compiled, and Action 2 apparently is missing.

Performance measures

An explicit linkage should be made to AM in the section on performance measures. Accurate and operational performance measures are essential if AM is to work as outlined. Furthermore, conceptual models linking proposed restoration actions with desired outcomes (another step in AM) can help identify appropriate and more quantitative performance measures.

The performance measures included in the Delta Plan are vague. Rather than the "progress toward" requirement, there should be quantitative targets that, even if not met, allow an unequivocal assessment of progress. For example, what is meant by progress toward achieving viable populations of native species? Does this mean that one or more species have increased in abundance, that one or more species have been taken off the endangered list, or that one or more species have achieved viable population status? If an upward trend in abundance from long term monitoring is the preferred metric, then over what time frame and at what slope? There is enough vagueness in most of these that almost any outcome, short of population collapse, could be made to look like success. Furthermore, "viable populations" sounds nice, but how does one gauge population viability? Formal Population Viability Analysis is fraught with difficulties. Is viability the same as persistence? The point is that broad objectives are being framed in terms of goals that may not be operational, which makes it difficult to determine whether progress is being made or AM should prompt a change in actions or policies.

It is not clear how "lessons learned" (p. 125, line 22 and p. 127, line 25) can be a metric. Number of lessons learned? Usefulness of lessons learned? Many of the measures are cast in terms of upward trends. More is not necessarily always better. Whether or not trends should be upward should be related to specified goals; when the goal has been attained, a continuing upward trend may be detrimental. Each section should include specific metrics and timeline. The metrics should include "maintaining and restoring functions". The restoration should not only be about number of acres restored but the quality of the restored habitat.

Performance measures (p. 127) should include some measure of increased river-floodplain connectivity, perhaps a measure of time/extent of floodplain inundation. The metrics should be broadened to include function and quality of restored habitat. The trends that are reported are vague and are not supported by scientific studies published in the peer-reviewed literature. Metrics (line 20) should include hydrologic monitoring and hydrodynamic modeling as well as comparison to historical data. The objective should be to set criteria based on historical data or flows needed to meet ecosystem functions and use monitoring to assess whether goals are met.

Science Needs
The uncertainties identified in the chapter suggest a number of key science needs that should be more clearly identified as a lead in to the future development of the Delta Science Plan.

Adaptive Management and Ecosystem Restoration
It is in ecosystem restoration that AM is likely to find it's most obvious applications. Yet there is no discussion of how to incorporate AM into ecosystem restoration. This should be developed with a few examples and cross-referencing to chapter 2. This might also be a place to briefly review some of the AM projects initiated under CALFED and use them to suggest how AM could be made more effective in the Delta Plan.

Integration Among Chapters
As noted earlier, integration among chapters is important to the overall coherence of the plan but is largely lacking from chapters 4-8. For example, the relationship between ecosystem restoration and the availability of water for export is a critical aspect of the coequal goals but is not mentioned. But there are more complex interrelationships that also need to be acknowledged. For example, the interplay of levee stability; the likelihood of a levee breaking earthquake; implications of levee breaches for Delta habitat, water quality, and listed species; contribution of Delta agricultural practices to island subsidence and its implications for levee stability and protection of the unique values of the Delta; potential for reversing subsidence through carbon sequestration; potential for Delta farmers to market carbon credits; etc. These complex interrelationships connect chapters 4 through 8 and emphasize the interconnectedness of problems and solutions in and outside the Delta. These connections were recognized in the Delta Vision but are not well expressed in the Delta Plan. It is not practical to explore the degree of interconnectedness in detail in chapter 5 or elsewhere but enough needs to be explained so that it is clear the kinds of tradeoffs that will have to be made.

Comments on specific policies
ER P3: The restrictions on this policy seem to put rather significant constraints on the Delta Plan. Is the Council satisfied that development within the excluded areas will not compromise the coequal goals?

ER P 5: Change to: Agencies proposing covered actions shall demonstrate that the potential for unplanned introductions of non-native invasive species or improved habitat for existing invasive species has been fully considered and avoided or mitigated in a way that protects the integrity of the ecosystem.

Chapter 6.
This chapter begins with a brief description of water quality issues and then focuses on three water quality concerns; salinity, drinking water quality, and environmental water quality. The chapter provides a useful overview of a range of water quality issues and, considering this is the first full draft of the water quality chapter that we have seen we

were pleased with how well developed it was. Nevertheless, we found what we consider to be a number of shortcomings that we hope can be addressed in the final draft.

Although we understand the reasons for listing salinity as a separate issue, technically salinity is a subset of both drinking water and environmental water quality. This should be made clear and the reasons for singling out salinity should be clarified.

The discussion of salinity in the report is somewhat limited and the associated policy focuses primarily on the development of new flow standards for the Delta. Although freshwater inflows are a dominant factor in salinity and salinity distribution in the Delta other factors should be considered as well. For example, one proposal for restoring the Delta ecosystem involves recreating a more dendritic channel geometry. Such a physical modification would have profound effects on salinity distribution in the Delta. Likewise, construction of a peripheral canal would probably affect the dilution of San Joaquin water in the south Delta and dramatically change water quality there while the north Delta would be primarily fed by high quality Sacramento River water. A levee breach could also have a dramatic effect on Delta salinity in the short term, and perhaps long term, depending on decisions regarding reconstruction. Some of these drivers, as well as sea level rise, are briefly mentioned but not explored sufficiently.

The drinking water quality and environmental water quality sections are more fully developed, particularly the environmental water quality section. Yet, given the range of issues around drinking water quality from the Delta it is not clear why so much more attention is devoted to environmental water quality. There is a risk that the imbalance in attention given to these two general water quality issues will be taken as an indication of the importance that the Council attaches to each.

The DISB believes that this chapter should contain a recommendation that the effects of proposed alterations in conveyance of water on overall Delta water quality needs to be evaluated soon, possibly as early as July 1, 2012.

It is not clear why flow objectives for the overall Delta are to be set by 2014, but flow objectives for high-priority tributaries are not going to be set until 2018 (p 139:1-4). Aren't flows in these tributaries a key component of Delta flows?

As in other chapters, we feel this chapter should include some advice from the Council about how AM could be incorporated into water quality management. The chapter also needs more focused discussion about water quality and the coequal goals as well as cross referencing with other chapters to improve the overall integration of the Delta Plan. Some of the significant science needs in addressing water quality should also be mentioned.

Specific Comments (because this is the first complete draft of this chapter reviewed by the DISB, there are more specific comments than for other chapters)

Page, line:

133, 17: Best available standards, or best available science? I would argue for science, since often there will be good science that can inform management, while development of standards may be years away.

134: Granting waivers for agricultural and other waste dischargers provided they comply with certain procedures without regard for ambient water quality could compromise attempts to improve water quality and goes against the Delta Plan's policy of polluter pays. The plan should require an evaluation of the impact of such waivers on water quality.

Table 6-1 should differentiate which TMDLs are approved and which are under development. It also seems as though the TMDL process is too slow and cumbersome to result in timely improvements in water quality.

136, 44: The statement that precipitation is the primary driver of salinity variability in the western Delta and Suisun Marsh needs supporting citation(s).

137, Figure 6-1: Revise to, "Delta salinity varies with inflow and outflow. ***High river*** flows (***left***) push freshwater well into Suisun Bay and produce low salinity conditions throughout the Delta. ***During low flow periods (right),*** seawater can be seen pushing into the interior Delta from Suisun Bay with high salinity also entering from the San Joaquin River in the southeastern Delta."

137, 19: X2 is a location, so it might be more clear to say "(X2 located nearer the Golden Gate)" instead of "(lower X2 values)"

137, 20: To the reader from outside the region, it is not apparent why X2 located nearer the Gate would be associated with higher abundances of longfin smelt and bay shrimp, since the previous discussion implies that these species follow X2, not that their populations are affected by its location. Is it instead the magnitude of the low salinity zone (LSZ) that is the major factor, with X2 location an indicator of the magnitude of the LSZ? Furthermore, the relationship between organism abundance and X2 is likely not causal, at least in many circumstances, but is secondary resulting from the response of organisms to greater freshwater outflow.

138: The policy regarding salinity deals only with some environmental issues related to salinity and is focused on the SWRCB's development of new Delta flow standards. However, salinity is also a drinking water issue and policy and recommendations should address that too.

138, 32: The text correctly identifies the issues associated with salinity, but suggests no resolution. Who should be placing "significant attention" to this issue and in what time frame?

138, 36: What is the evidence that altered salinity regimes are favoring introduced species? Which introduced species are favored?

140: Shouldn't there be some mention of *Microcystis* blooms and their impact on drinking water quality in this drinking water section? I see that it is discussed later, so perhaps it could just be mentioned here with reference to further discussion in a later section.

140, 4-6: Consider incorporating findings from Kraus et al. (2008) Assessing the contribution of wetlands and subsided islands to dissolved organic matter and disinfection byproduct precursors in the Sacramento–San Joaquin River Delta: A geochemical approach. Organic Geochemistry 39, 1302–1318. This study showed that dissolved organic matter (DOM) derived from wetlands and island drains had greater haloacetic acid precursor content relative to incoming river water, while two wetlands contributed DOM with greater propensity to form trihalomethanes. These results are pertinent to restoration of the Delta. Large-scale introduction of shallow wetlands, a proposed restoration strategy, could alter existing dissolved organic carbon and disinfection byproduct precursor concentrations, depending on their hydrologic connection to Delta channels.

141: As the preceding discussion shows, drinking waters throughout the state can be contaminated in various ways, it is not just Delta water.

Curiously, the potential impact of revised Delta flow criteria on drinking water quality is not mentioned here.

141: Policies. We presume there are no policies with respect to drinking water quality because the Council does not have that authority? If so can that be made explicit?

141: Recommendations are not in chronological order, should they be? And they are not consistent: one calls for construction to begin as soon as possible, another calls for implementation to follow, and yet others recommend planning and strategies, but not implementation.

141, 29: What is meant by "other substances in the food web"? If this is intended to call out persistent, bioaccumulative, toxic substances (PBTs), say so.

141, 27-30: This paragraph is written as representing a partial listing, but is it in fact listing the pollutants of highest concern for the Delta? If so, say so, and give reference to any regional process that was used to derive these as high priorities. If there have not been regional processes to prioritize pollutants of highest concern for the Delta, that would be important to highlight here.

142-143: The Delta Plan cites several studies in this section documenting correlative relationships between water quality and primary production. It is important to add a caveat that correlation does not mean causation and further experiments are needed to support cause and effect relationships.

142 L 25: Given the results published by Cloern and colleagues, do we want to say that the role of ammonium remains "an open question"? I think we should state that while it is an active area of research, simplistic explanations like the role of ammonium concentrations are unlikely.

142, 33: Substitute peer reviewed literature citation for Mioni & Paytan (2010), which is an oral presentation in brownbag series.

Figure 6-2 is good; We don't know what is still "under development", but a similar figure for ammonium and for phosphorus could be useful. Likewise a figure illustrating the increase in transparency of Delta water.

143, 1-2: Substitute language such as "are currently being investigated" or "is the topic of recently funded studies" since "receiving significant current research support" seems subjective (i.e. how is "significant support" defined?).

143, 28: Surely more than sustained research and monitoring is needed. The existing research indicates that nutrients are likely to become even more important as drivers of productivity in the Delta. The existing science suggests that stricter measures controlling nutrient inputs are needed.

144, 44-45 and 145, 1-6: There is a disconnect here. The critical transport pathways listed for pyrethroids do not include any relevant to urban/suburban sources, yet those are listed as major sources.

145, 13-14: Does Baxter et al also recommend ways to address the large uncertainties inherent in assessing the influence of contaminants on the pelagic organism decline (POD)? If so, a brief summary of those approaches would be very informative for this chapter.

145, 16: It would be good to start this section off with a brief summary of mercury and why we care, to include the definition of methylmercury vs total mercury.

145, 20-21: Does the current regulatory approach (not environment) "include" a Delta TMDL, or is that TMDL going to be the foundation of the regulatory framework? Also,

in the recommendations (148:39-41) it is stated that the MeHg TMDL is completed, while the language on p 145 indicates that it is in progress.

145, 25: Comment – it is important to discern between proportion of the total loadings and actual concentrations (and related toxic effects). While in-Delta sources may comprise a small proportion of the loadings, low concentrations can still have negative ecological effects.

146-7: Bioaccumulation of selenium is mentioned and also of some emerging pollutants but not of mercury and pesticide pollutants. Why not?

146, 13-15: Further study is needed to determine the dominant processes influencing methylmercury during its transport through the Delta.

146, 18-20: Provide measure of variance around these average concentrations.

147, 28: The term "emerging pollutants" is better phrased as "contaminants of emerging concern", and in any event it is not true that these chemicals are unregulated.

148, 1: Add sediments (see Canuel et al. (2009) Changes in sediment and organic carbon accumulation in a highly-disturbed ecosystem: The Sacramento-San Joaquin River Delta (California, USA). Marine Pollution Bulletin 59: 154–163.)

148, 30: Numeric nutrient standards are being adopted by many states under pressure from EPA. Narrative standards are less effective, so it seems most reasonable to call only for numeric standards. However, in the absence of well established numeric standards, narrative standards can provide a helpful starting point.

149: WQ R7 mentions monitoring programs, but then doesn't link them to an AM. As we noted earlier, the chapter needs to demonstrate how AM can be used in relation to water quality problems for both drinking water and environmental water.

WQ R8: This singles out wastewater treatment plants and urban runoff, but says nothing about agricultural runoff. Where in this list of recommendations is there a call for reducing loads of nutrients, pesticides, selenium and other toxicants from agricultural runoff?

WQR9: What is meant by "conduct or require special studies"? Should such studies be designed, implemented, reported, or incorporated into policy by January 1, 2014? This needs development.

149-150: Only administrative performance measures are given for drinking water quality and these may not assure improved drinking water quality for poor and disadvantaged communities.

149, 36-39: There has already been a multi-year effort to develop performance measures for the Delta, with little progress. We don't see that the Delta Plan is going to result in much more progress. Unless someone is tasked with developing performance measures by a particular date, we don't see that any more progress is going to be made. And without performance measures, AM is not possible. Conceptual models can be useful in determining what performance measures would be useful.

The outcome performance measures proposed show some promise. If there were actual numbers associated with these, they would be more useful. A call for monitoring programs that will enable these measurements to be made should be a part of this.

There has been no discussion of dissolved oxygen in this section. Shouldn't there have been a section on this?

Chapter 7.

This chapter needs significant improvement in the way it describes the basis for the Plan's policies on flood risk and in the way those policies are related to the coequal goals. This is critical if the Delta Plan's short list of action items will include floodway protection, levee-work funding (subvention), and levee-risk analysis. Specific suggestions for improvement include:

1. Begin with a nicely illustrated, fully referenced, nuanced overview of the problems and controversies to be addressed, much as pages 67-78 do for water supply. Provide the reader with information needed to understand and evaluate the policies and recommendations that follow.
2. Explore the probability side of the risk equation. What are the reasons for the levee failures that the Delta Plan seeks to prevent or at least prepare for? The chapter needs to go beyond the list on page 162, lines 8-14; the minimal analysis on page 161, lines 14-20 and page 166, lines 19-25; and the glibness of the problem statement on page 184, line 3. It needs, for instance, a timeline and map showing the history of Delta levee failures, coded as much as possible by inferred cause of failure. The timeline could be stacked with one showing peak water levels. Another graphic would show flood-control dams in the Delta watershed, flood pathways to and through the Delta, and flow capacities of these paths. Still another graphic, mapping active faults that may threaten Delta levees and summarizing what's known about the earthquake history and potential of those faults, would help the Delta Plan go beyond the earthquake probability quoted in Chapter 1 (p. 25, Table 1-2).
3. Explore the consequences side of the risk equation. Figures 7-1, 7-4, and 7-5 give the impression that risk is driven by houses. Figure 7-3 instead emphasizes water exports, as do lines 14-20 of page 161. The chapter should acknowledge and examine current disagreements about the economic benefits of maintaining Delta levees – disagreements brought out in the August draft of the Delta Protection Commission's *Economic Sustainability Plan*. It should explore the ecological consequences of levee failure – the kinds and effects of organisms that colonize the flooded islands, for instance.
4. Relate flood risk to the themes and concerns in other parts of the Delta Plan, especially the ecosystem half of the coequal goals. Such links include potential conflicts between RR R12 (p. 185, line 26-30) and flow standards (ER P1). The links may even extend to the hope for income for carbon credit (FP R9, p. 211, lines 43-44).
5. List the main needs for advances in science and engineering that the problems and policies require. Many of these can be grouped under the probability side of risk, others under consequences.
6. Add a section on AM. Consider the kinds of flood-risk projects that could be subject to it under the Delta Plan.
7. Make sure that each problem statement and policy is fleshed out.
8. Consider and cite relevant publications. The existing reference list contains only two publications from peer-reviewed journals (and the citation format falls short of the standard in Chapters 5 and 6).

There are some positive aspects in the chapter. For example, on page 166 the Council states:

> *"…it is more important than ever that the levees in the Delta are designed, constructed, and maintained to provide the level of flood risk reduction commensurate with the land and resource uses they protect. "*

This is a clear, effective statement of policy and the chapter generally does a good job of not confusing risk with likelihood of levee failure. This is an important foundation for the overall Delta Plan and the Council repeatedly makes clear that a risk-based approach to levee investments should be undertaken.

Yet, the chapter also leans heavily on a series of minimum levee standards (HMP, PL 84-99, etc.) that must be met in the Delta. The Council sees these as short-term measures awaiting completion of future plans by other agencies, but we remain concerned that agencies faced with high costs and limited resources will tend to work toward the minimum standard. Furthermore, all of these minimum standards referred to in the chapter are explicitly <u>not</u> risk-based. It will be important for the Council to guard against the many incentives to apply minimum standards as these run strongly counter to the Council's own goals. One safeguard might be to have the plan specify that there must be an analysis of the way risk of levee failure affects policy RR P3 and its application of standards in Table 7-1.

An additional difficult issue for the Council will be how to incorporate the Delta Protection Commission's Economic Sustainability Plan into the larger Delta Plan. A fundamental tenet of the draft version of the Economic Sustainability Plan is that *all* levees in the Delta be brought up to PL 84-99 standards. This minimum standard, which will require $1-2B in resources from outside of the Delta (presumably bond funds), does not represent a risk-based approach. And, as noted below in comments, has the potential to be a policy disaster once PL 84-99 standards are revised, making most of the Project levees, if not all levees, out of compliance.

Preparing complex documents like this is a formidable task, particularly under such a short timeframe. However, to be an effective plan, it should be integrated. All aspects of the broader Delta Plan—water supply reliability, ecosystem restoration, in-Delta economy and infrastructure—are linked to the levees of the Delta. In addition, Delta as an "evolving place" as it is described in the legislation will evolve through changes in the levees. This chapter focuses almost solely on risk reduction for island assets (with the exception of conserving some land for future set backs and bypasses). There needs to be more explicit linkages to the co-equal goals and to other chapters.

Although changing conditions are acknowledged in the text, there is little about how the Delta geography might change. In particular, the plan does not tackle the issue of what to do when an island floods, unless RR R7 (P 180) is intended to do this. More clarity on this issue would be welcome. Does the Council support the current DWR policy regarding flooded islands? Or does it wish to expand on that policy? Of all the events likely to affect the Delta, island flooding is the most certain. Yet the Delta Plan is silent on whether to leave some islands flooded. This silence may be based on political realities, but the Delta Plan should, at minimum, acknowledge that this is an issue.

Chapter 8.

For good scientific reasons, Chapter 8 on how to "protect and enhance the unique cultural, recreational, natural resources, and agricultural values of the California Delta as an evolving place" is the most difficult to write. It is the only chapter addressing a socio-ecological system rather than simply emphasizing an environmental system in which people are rarely mentioned. It is also the only chapter where values are addressed directly. Other chapters address water reliability, water quality, ecosystem restoration, and risk reduction, avoiding the values of those who are interested in a solution. Emphasizing increasing water reliability, water quality, ecological restoration, and safety while not spelling out possible tradeoffs among the goals suggests that no value tradeoffs are at stake. Chapter 8, on the other hand, addresses the livelihoods of specific people, the sustainability of particular economic sectors, the future of specific legacy towns, and the culture of Delta communities. The value-laden, subjective, and, in the case of culture, abstract nature of the primary issues of this chapter are difficult to avoid.

The difficulties are further compounded by the shortage of good data, especially historical data, even where data might have been possible. This problem mostly reflects the fact that the Delta is in five different counties and was never treated as a unit for the purposes of data collection. This is also due to the fact that the interests of people in the Delta have not had strong agencies and well-established research programs in place for decades. For reasons closely tied to the problems of data, there are very few prior analyses of how the issues of concern in this chapter relate to changes in environmental factors, let alone the tradeoffs between protecting and enhancing the unique cultural, recreational, and agricultural values.

As written, Chapter 8 provides a dry description of current conditions. To long time Delta observers, many of the values appear to be in decline, but few trends are provided in the chapter. Even if trends could be better described, there are few analyses that provide scientific interpretations to inform policy and management practices to affect the trends. Rather, the legislature has stipulated that the values of the Delta are to be protected, and the authors of this chapter repeat the legislative directive frequently. The Delta Protection Commission is developing an *Economic Sustainability Plan* (ESP) to which this chapter repeatedly refers. The August 9, 2011 draft of the ESP provides a wealth of current information about the Delta and its residents and recreation users. Within the lengthy document, there are excellent descriptions of the Delta environment and people. The ESP, however, makes assumptions about expenditures on levee maintenance and investments in recreation infrastructure paid for by State, federal, or other funds that are probably unrealistic. More importantly, the draft ESP makes policy recommendations about levees, water flows, and ecological restoration that are in direct conflict with the co-equal goals. Specifically, the performance measure in Chapter 8 of the fifth staff draft of the Delta Plan that total agricultural acreage will be maintained or increased in the future is in direct contradiction with ecological restoration and levee maintenance and enhancement based on risk criteria. This leaves major questions for the DSC to address.

A notable weakness of the chapter is a lack of any serious discussion of how the unique attributes of the Delta are likely to evolve over time and what this will mean for protecting the Delta as place. For example, subsidence of islands is a serious issue in the Delta, affecting levee stability, risk of catastrophic flooding, land use options, and much more. Subsidence is discussed at some length in Chapter 7 but is not even mentioned in this

chapter. Chapter 7 also discusses the potential for subsidence reversal and economic benefits that might be obtained from carbon credits. Although the technology for subsidence reversal and what it might contribute to the economy of the Delta is in early stages of development, this is the kind of "evolution" of the Delta that should be examined in this chapter.

The DISB is also concerned that this chapter pays too little attention to the influences of markets, increasingly global, and State and federal agricultural as well as other policies. The breadth of the issues being addressed in this chapter require an equally broad perspective on the factors affecting the Delta as a unique and evolving place.

Chapter 9.

The DISB has little to add to the chapter on finance other than to argue for some connection to our recommendations for placeholders for science governance in Chapter 3 and parallel items in the budget. It might also be appropriate to consider whether science might be financed differently than other needs. Lastly, the DISB is concerned that carbon offsets are specifically mentioned as a possible revenue source while the the implications of land management practices for carbon offsets are not mentioned in any of the other chapters.

Specific, more editorial, comments for Chapter Authors

The following more editorial comments are provided by one or more board members but have not been vetted by the DISB as a whole.

Preface

Page, line

5, 23-32: *reliability* – Provide a glossary for all key terms. Refer there to main riffs on the definitions (for *reliability* they include the fine definition here; page 24, lines 19-25, 26, lines, 14 and 15; the full-page sidebar on page 68; and page 69, lines 7-21). In the spirit of the co-equal goals, should the expansions say more about water for the environment?

6, 37: Explain, here or in a glossary, California's "dual water-rights system"

7, 4: Explain the "2020 deadline"**Chapter 1**

Page, line

16 and 18: These maps, and all others in the Delta Plan, should include scales, in miles or in both miles and kilometers.

17, 3: Expand "tidal marsh" to "tidal marsh and tidal swamp", because willow-fern swamps were common along distributaries of the San Joaquin (swamp = wetland dominated by woody plants)

17, 31: Change "salt water" to "brackish water" because fully marine salinities do not extend into Suisun Bay

22, Table 1-1: Does the Bureau of Reclamation really maintain more than 700 miles of Delta levees? The table says the Army Corps maintains 400 miles, and that the total is

1100 miles. How do these numbers square with those on pages 39-43 of the August 9, 2011 draft of the "Economic Sustainability Plan for the Sacramento-San Joaquin Delta"?

23, 39: "river systems flowing into the Delta drain about 40 percent of the land in California" – This is the traditional estimate, consistent with the map on page 76 but not with the "CALFED boundary" on page 16. Does the southernmost San Joaquin Valley sometimes drain across the natural dam at the toes of the Kings River and Los Gatos Creek fans? Historically that was the case; Tulare Lake intermittently drained northward into the San Joaquin River trunk. Unless such drainage is impossible today, the drainage basin of the Delta probably should include the areas tributary to Tulare Lake. If instead the "CALFED boundary" prevails, a note should be added to Figure 1-1 that explains why these southern areas are excluded. Consider also the use of "Delta watershed" elsewhere: p. 56, lines 24-27; p. 67, line 34; p. 77, line 25. The comment applies to usage of that term throughout the Delta Plan.

25, Table 1-2: Replace this table with graphs that put well-founded projections in historical context. Omit the earthquake probabilities: their significance for Delta levees is difficult to judge from the information provided. As for the confusing guess about the increase in probability in flooding, replace it with a cumulative graph of levee failures in the Delta since, say, 1900 (the writers of Chapter 7 need to provide it with a more detailed version of such a graph). The beginnings of a dashed extrapolation, queried, would forewarn of future levee failures more credibly than the confusing percentages quoted in the existing table.

25, 4: "start the process" – To give credit where credit is due, isn't that process already underway, as on page 4, lines 35-39, and page 5, lines 6-7?

29, 1-3: Check status of National Research Council report on sea-level rise in California, Oregon, and Washington. This report will be more authoritative than the url now cited. The State of California provided most of the funds for this NRC study.

Chapter 2

Page, line

35, 31: The groundwater overdraft by satellite imagery study should be cited

36: The regime shift figure would be easier to understand if the first column were environmental drivers, the second old regime, and the third new regime. What is a policy maker supposed to do with the information that there has been a regime shift? So what if there is a new conceptual model? What does that mean in terms of making management recommendations? This section is too vague and jargon-laden. We also don't think your average reader could interpret the bottom part (hills and valleys) of the figure. This sidebar would benefit from some more specifics, such as some examples of how scientific research has altered understanding of the Delta ecosystem.

36: Table at bottom of insert is unreadable.

37, 37: Insert citation to Fig. 2-1 here.

39, 11-12: This statement, i.e. that "all problem statements must be based on the best available science," is not true. A problem statement is just that. Science can address the issues and lead to solutions in some cases.

39. "Model Linkages....." We liked this brief paragraph that explains why models are important and briefly addresses the kinds of models that are needed.

39, 13-14: Revise to, “The boundaries of the problem (e.g., geographic and temporal scales) should be defined in the problem statement.”

39, 16-17: Yes, emphasizing the need for clear goals and objectives is critical and here science does play a role to help define the pathway to solutions.

39, 23-24: Add biogeochemical and food web models to list.

39, 37-38: As written, it doesn't seem to make sense. It is just a semantics problem.

39. Step 4: "Select and Evaluate....." Should there be some brief text here on "rejected alternative actions" to inform stakeholders and managers of possible alternative actions that could have been considered? This seems important in an AM framework.

40-43: The points 5-8 in the AM framework are both appropriate and well presented.

42, 9: Change “practicable” to “practical”.

42, 21: Need to consider situations where there is no measureable change but actions may have prevented further deterioration to the ecosystem. For example, release of nutrients stored in sediments may mask the effects of reduced loadings. In the case of the Delta, legacy pollutants may delay ecosystem responses to restoration actions.

43, 1-2: Key to communication is effective use of multiple venues and overall transparency. The proposed interdisciplinary team should include media savvy personnel, as well as team members that are experienced with developing effective web-based materials. Use of Twitter, Facebook, etc. K-12 education, museum and outreach opportunities. Aldo Leopold Leadership Program, etc.

43, 5-6: Adaptation must consider both changes to the current understanding of a problem as well as "changes in current conditions." Since we are dealing with dynamic systems, current conditions may change due to environmental change as well as the socio-economic situation (e.g., financial, policy, political, etc.).

44-48: Nice presentation of how best available science links to adaptive management.

45, 28-32: The State of Washington criteria don't add much to this plan. The six criteria to define a "valid scientific process" didn't resonate. The Plan would be better off without the Washington criteria.

Figure 2-1: We would like to see performance measures explicitly included in this figure. Determine performance measures should be a part of step 2. The way objectives have been defined makes them sound like performance measures. Criteria for performance measures should be identified, just as has been done with other aspects of this section (e.g., best available science).

Table 2-1. Peer Review. "When to Conduct Peer Review." As written, peer review is to be applied to proposed projects, and policies and plans. It also should be applied to outcomes and products of projects.

Table 2-1, Peer Review Coordination—(1) doesn’t make sense without further explanation-the process needs clearer explanation initially, i.e. that there is both an independent review team and an entity that coordinates the review (selects review team members). Perhaps coordination should go first in the list. Are they envisioning the DSP as coordinator? Is “particular and special expertise in the subject under review” really necessary for the coordinator?

Summary of some main suggestions after the September 1 discussions:

1. Relate the Delta Plan to advances and unknowns in Delta science. Link these to the coequal goals, to specific policies, to the Plan's overarching themes. Link also to items on Joe Grindstaff's short list of near-term action items, such as quantifying risks (probabilities x consequences) of levee failure and proceeding with restoration projects in five areas.
2. Treat AM transparently and openly by reporting the lessons learned from previous attempts to apply it in the Delta.
3. Make the "Knowledge Base for Adaptive Management" co-equal by expanding into the realms of water and levee engineers.
4. Discuss challenges facing the DSP, drawing on Dr. Cliff Dahm's recent outline.
5. Revamp the sidebars on pages 36, 40, 43, and 47. In the Kissimmee and Australian examples, put the Delta in the topic sentence of each and return to it in the concluding paragraph. The announced topic of the Australian example, could be the communication of adaptive management to policy, people and the public. The sidebar could help the reader envision report cards for ecosystem restoration projects in the Delta. The Australian material itself plays a supporting role.

Chapter 3

Page, line

56, 18-23: geographic names – The Delta Plan risks confusion in governance by annexing Suisun Marsh as an arm of the geographic "Delta". Chapter 1 respects the longstanding distinction; now the rest of the report should do so as well. Chapter 8, for instance, probably refers throughout to the Delta in the customary sense, and it even refers at one point to "the Delta and Suisun Marsh" (p. 199, line 8), but the chapter's maps show the annexation.

Chapter 4.

Page, line

68, (text box): states "*Our state's water supplies vary from year to year for many reasons:*" and then lists seven different causes. These are phrased inconsistently based on the previously quoted statement. In addition, climate change and sea level rise are not yet established as causes of year-to-year variation, although they may well exacerbate this variability in the future.

69, 5: refers to sharp decline of native "fisheries". Should be native fishes.

69, 12: Unclear what the Council means in reference to enhanced conservation and efficiency. A footnote might be in order. See discussion above.

69, 20: it remains unclear whether improved reliability is achieved solely through enhanced storage and conveyance or whether this is combined with a reduction in total water use, either through reductions in exports or increases in inflows.

74, 18: "increased irrigation and efficiency". Drop the "and"

75, 32: There is some confusion here. If you are going to count EBMUD and SFPUC in the equation of Delta diversions, then you are going to have to get into all the other diversions as well. In-Delta use is about 1 MAF. Direct Bay Area use of the Delta is also about 1 MAF (not Hetch Hetchy or Mokelumne River aqueduct). Check figures on this.

76: One of several figures that complement the text of the chapter's informative preamble. Fix inconsistencies in the map and the text in the terms used for drainage basins on the Sacramento and San Joaquin sides. Replace in the pie diagrams "Other" with "Eastside streams".

77, 12: "This problem is compounded by SWP and CVP contracts that promise more water than can be consistently delivered." Technically, these contracts never promised this amount of water, since the amount to be delivered is set by the contractors. However, it did imply more water than can be delivered and this figure of 60-63%, which is the new normal, has been regularly used to indicate underperformance of the projects. This is a subtle, but important distinction.

By statute, those who use water from the Delta are required to reduce their "reliance" on Delta water, through portfolio approaches to supply. It is not clear if the Council is supposed to set a target for that reduction and what, specifically, constitutes a reduction in reliance.

78: Check export figure of 6 MAF against those in the pie diagrams on page 76.

79, Fig. 4-3: Put these numbers in perspective by adding, at right, two y-axis scales: Equivalent consumption, in millions of users; and Equivalent percentage of average SWP+CWP exports. The graph itself needs upgrading to the standards of the graphic on page 76.

82: WR P1: *A covered action to export water from, transfer water through, or use water in the Delta is inconsistent with the Delta Plan if the covered action negatively impacts one or more of the coequal goals and one or more of the water suppliers that receive water from the Delta significantly causes the need for the covered action by failing to comply with one or more of the following*. This sentence suffers from many ills. Mostly, it is impossible to understand.

82: Agricultural Efficient Water Management Practices. As the council knows, it is not clear how this policy will impact the co-equal goals, since efficiency does not always translate to reductions in net water use and demand. The science behind this policy is not well-established in the text as well. Reductions in total demand, and net use, will best meet the co-equal goals and the requirement in legislation that water users decrease their use of the Delta water.

Policy ER P1: *Develop, implement and enforce new flow/water quality standards for the Delta.* This policy is more threat to take unilateral action than action itself. However, the policy, as stated, offers little guidance to the State Board as to the specific connection between flow standards and co-equal goals. The policy is, therefore, vague and will be hard to measure.

ER R8: *Complete BDCP*. It is intriguing to note that the threat contained in ER P1 is not used in regards to BDCP, or any other planning effort for that matter. There are undoubtedly many reasons, available to the insiders on this issue, but this is inconsistent. Given the regulatory differences between BDCP, particularly because of federal involvement in the latter process, it is reasonable for the Council to take a different posture. But it should, at minimum, be spelled out more clearly.

88, 25: This is an overstatement of the "ownership" of SWP in low elevation watersheds. It also misses some vital facts. The lowest elevation watersheds are less impacted, because they already receive high proportions of rain relative to snow. It is the

moderate elevation watersheds that are most vulnerable, particularly in the northern and central Sierra.

89, 36: Problem Statement for storage and conveyance. The statement itself fails to capture how fully-connected California's network of water supply is. Instead, it focuses solely on SWP and CVP facilities and exports from the Delta. Yet many of the most critical storage and conveyance facilities are not owned by SWP and CVP. This problem statement also narrows in on the conflict between timing of exports and ecosystem demands, when the narrative is more broad than that. Inflows are equally important to the Delta and are directly affected by the amount and operation of storage and conveyance. Recognizing the need to keep these problem statements short, it might be better worded as: "The State's interconnected network of surface and groundwater storage is insufficient, both in storage volume and conveyance capacity, to meet the co-equal goals for the Delta." Major improvements will take decades to complete.

It is unclear why the Council has not chosen to make policies here, since this issue was identified by the Delta Vision Blue Ribbon Panel as one of the most important. The recommendation that DWR complete its evaluation of surface water storage alternatives does not address the problem statement. Scientific investigations have repeatedly shown that improved conveyance, particularly in ways that facilitates water transfers, can significantly improve reliability and reduce overall demand. There is also no doubt that improved storage, particularly in groundwater basins, has the potential to reduce pressures on the Delta. Because of this, the relative silence on the part of the Council is a bit surprising.

Groundwater Management. It is also surprising that the Council chooses to make no policy with respect to groundwater management. It is clear from WR P1 that regions that take water from the Delta will have to achieve water balance, along with reduced reliance on the Delta. Groundwater will, in all likelihood, be the most important tool in meeting those objectives, whether through increased storage or conjunctive use. There should at least be the mention here of the policies expressed in WR P1. WR R9, R10 are, in effect, a restatement of parts of WR P1.

93, 37: Define "significant."

95, 22: The SWRCB did not require all groundwater users to report use. Just some specific users.

Improved reporting and transparency: the Problem Statement is factually correct, but there is no clear connection to meeting the co-equal objectives of the Delta.

WR P2: Transparency requirements. As stated, it is not clear how broad or narrow the reach of this policy is likely to be. Is it focused solely on SWP and CVP contracts, or does it include all Delta water users? Also, the policy only addresses half of the problem (transparency).

WR R11: Standardized reporting. This has the potential to be a far-reaching, but significant policy, particularly if connected directly to the requirements for achieving water balance and sustainability. The Council may want to consider elevating this to a policy.

Performance Measures. See summary above about the need to invest in precise performance measures.

97, 2: Not "fisheries". "native fishes" seems better, but the issue is more about how these conveyance and operational changes impact key ecosystem attributes necessary to support native fishes.

98, 30-32: Can this measure be explained more clearly?

MAIN SUGGESTIONS from the ISB discussion on September 1:

1. Add reminders of the coequal goals by doing more to relate human water to environmental water.
2. Add section or sidebar on the chapter's science needs. These include improved projections of future surface-water flows (p. 85, lines 35-38; p. 88, lines 19-27), improved estimates of groundwater resources (p. 93, lines 28-31), and further assessment of X2 as a predictor of biological effects.

Chapter 5

Page, line:

107, 28: Change language to, "is not probable" to be consistent with language used on Page 109, line 20.

107, 24-27: Explicitly recognizing "recovery of threatened or endangered species" could be added.

109, 25-26: This sentence seems vague. How will "least intervention" and "eventually mimic historical landscape functions" be defined and tracked?

110, 27-28: Include the following as living and non-living elements: land use, soil type, vegetation, water flow and availability. Change "waterways" to "water flow and availability".

110, 34: Omit "all" at beginning of sentence. Revise to, "Ecosystems change over time in response to numerous natural and anthropogenic drivers of change …"

111: Change "crowd out" to "compete with native species". Space availability may not be the main driver for competition between native and non-native species. Resources such as the availability of particular habitats, food availability, and other environmental factors can influence competition between native and non-native species.

111: Include a measure of variance for data presented in this figure.

111: Provide support for statement, "encouraging non-native fish and vegetation, which can crowd out native species that depend on a more varied environment" by a reference citation or some other means.

112, 12-13: It would help to note what other public trust considerations are not included – or at least provide some examples.

112, 14-21: It is not clear what these bullets are supposed to be. Are they key points made in the SWRCB document? Are they points not made there but relevant to consideration of flow requirements? Are they statements about why alteration of the flow regime will not suffice to improve ecosystem condition?

112, 18: Change to, "(when to migrate)" and "(where to migrate to)".

112, 3: Change to, "that water flows more similar to historical flow conditions".

112, 4-5: Use more recent references, if available, to support this statement.

113, 14: Change to, "indicates *that* the items …"

113, 3: Change to "*are* key to the achievement of the coequal goals."

114, 44-45: "Many nonnative species in the Delta evolved in ecosystems with much less variable habitat conditions (Moyle et al. 2010)." Note that Moyle et al (2010) don't actually say this. They do say that nonnatives invaded when the San Francisco estuary became less variable.

114: The discussion of land cover type (L 9-22) is interesting but we don't understand its relevance here. Using land cover type as an index of ecosystem and landscape structure was developed for terrestrial habitats where the dominant vegetation tells a lot about the overall community. As the ppg points out, this approach is not really applicable to aquatic habitats (at least superficially). But is anyone proposing simply to use the extent of open water as a measure of estuarine habitat quality? Maybe the section should start at L 23.

114, 44: Change to, "*to* humans."

114, 23-28: "extirpation" rather than "extinction" is a more probable threat in most coastal-estuarine systems as a consequence of overexploitation or habitat destruction. Of course, for a fish like delta smelt, extinction is a distinct possibility.

116, 27: What types of actions would not allow future habitat restoration? An example of these should be included. Housing development or urbanization would seem to be a good example to use.

119, 17: Change to, "the region should *be returned* to uplands with vernal pool…"

121, 20-21: Add biogeochemical models to list of models. Of particular importance is linking biogeochemical models to food web models.

122, 10-18: Reverse order so that "Current stressors" is listed before "Anticipated stressors".

122, 15-16: Change to, "modified ratios of nitrogen species (nitrate and ammonium) as well as altered ratios of nitrogen to phosphorus". Change "selenium release" and pesticide release" to "input" or "delivery".

122: "Current Stressors" …add introduced, non-native species to the list after this bullet. They are recognized in the text below.

123, Action 6: Include carbon (dissolved and particulate organic carbon) and inorganic nutrients in water quality monitoring programs.

124, 3-4: Change to, "providing nutrients and food to native salmon"

124, 4: Omit "for" in "for recreation".

124: Problem Statement, Policies, Recommendations. A rewrite could make it clearer and more compelling.

125: Performance Measures, lines 36-38. More specificity to what is meant by "large areas" or "selected Delta river channels" would help.

126, 127, 33: Have "all migratory routes" been identified? If not, perhaps that is the first step. If they have, then a reference for that document should be noted.

127, 21-25: Change to, "Pilot-scale Delta habitat restoration projects *will be* developed and initiated …."

References

Perillo, G. (ed.) 1995. Geomorphology and sedimentology in estuaries. Developments in Sedimentology 53. Elsevier. New York.

Chapter 6

Page, line:

133, 4: Suggest a change to, "Impaired water quality is an influential stressor contributing to ***environmental*** problems ***in*** the Delta and improved water quality is inherent in the coequal goals."

133, 8: Revise to, "oversight ***by*** the United States Environmental Protection Agency (USEPA)"

133, 24-25: Change "At all times the Delta should be free of toxic substances that exceed toxic amounts" to "At all times the Delta should be free of toxic substances that adversely affect human or environmental health".

133, 26: Change "significantly" to "adversely".

134, 4-5: Change to "because freshwater inflows from the Sacramento River, which has better water quality than the San Joaquin River, are higher." "Water quality is poorer in the San Joaquin because a higher proportion of its water is either used for agriculture or drained from agricultural fields than in the Sacramento Valley."

134, 12: Change bromide to bromides

134, 29: Delete "point and nonpoint sources, such as" since between those two terms, everything is encompassed.

134, 30: Are there active mines that contribute pollutants?

136, 37: Change "clearly shows" to "depicts".

138, 8: Use an alternative, and ideally a primary, reference to describe how salts are concentrated during evaporation and transpiration.

138, 13: Some indication of what "much higher" means, in psu, would be helpful here.

139, 25: This suggests that there are no directly harmful substances in water withdrawn for municipal drinking water—is that true?

139, 24, 32, and elsewhere: By bromide, it is assumed that bromides is what is meant.

142, 5: μM is micromolar, not micrometer.

142, 7: Revise to, "However, timeseries data collected from field studies …"

142, 9: Revise to, "Phytoplankton form the base of the food web .."

142, 15-16: Does this sentence imply a sequential, and unidirectional, shift from diatoms, to green algae/cryptophytes, to flagellates, to blue-green algae?

142, 20: Change to "demonstrated".

142, 21: Insert period following "and generate false correlations" Add "'These authors' argue that no relationship …"

142, 29: Should say "includes known HAB-forming species".

143, 6-7: Replace "Susan Ustin and colleagues" with "Several recent studies …"

143, Caption to Figure 6-2: It is impossible to discern the different symbol types. Also, only a single data source (USGS) is noted in the figure caption.143, 12: Replace "was" with "is".

144, 11: Delete "Although often used interchangeably with insecticide" and "technically"

144, 12: Change "destroying" to "killing".

144, 14-16: Change to "include organophosphorus (OP) compounds (for example, diazinon and chlorpyrifos), pyrethroids, and legacy organochlorines (OCs, for example DDTs, chlordane, and dieldrin),".

144, 22: Change to "OPs and pyrethroids, common replacements of the OC pesticides".

144, 27: Change "adhere" to "sorb". Change order to adhere (or sorb) to particles and be transported with and accumulate with sediment …

144, 29: Revise to, "pyrethroids have been detected at toxic concentrations in the majority of …"

145, 8-10: Change to "Johnson et al. (2010) reported that the available chemical, toxicological, and histological data are insufficient to determine whether contaminants played an important role in the POD."

145, 17: Change "Historical" to "Historic"

145, 27: Change "fluxing through the Delta" to "being transported or cycled within the Delta".

145, 32-38: Suggest this paragraph could be the introduction to the mercury section.

146, 10-11: Change to, "the Central Delta ***has lower concentrations*** of methylmercury ***compared to*** tributary areas …"

146, 41: Change to, "largest point source of this pollutant". "Significant" suggests some statistical support.

147, 17-19: Provide literature citation supporting statement about bivalves retaining selenium.

147, 33: The Hoenicke et al. (2007) reference is missing from the list of references.

147, 33: Consider adding review article by Schwarzenbach et al. (2006) The Challenges of Micropollutants in Aquatic Systems. Science.

148, 12: "Panning" should be changed to "planning"

163, 6: Interruption of conveyance – Include as a depicted consequence in Figures 7-1 and 7-5.

164, 1: "recently" In review since 2009?

164 Figure 7-2: Tailor this diagram, if retained, to the Delta by including levees, ship channels (to help set up RR R2), and ecological restorations.

Chapter 7.

Page, line:

161, 10: "the Delta" "The Delta and Suisun marsh together include..." Here and elsewhere in the report, there is confusion as to whether Suisun marsh is included and when it is to be included, this should simply be stated.

162, 7: Histories of levee failure can be compiled, in large part, from Appendix A (p. 446-467) of this classic reference: Thompson, John, 1957, The settlement geography of the Sacramento-San Joaquin Delta, California: Unpublished Ph.D. thesis, Stanford University, 551 p. A levee-failure history needs at least two kinds of context:

* flood-control history upstream
* levee-construction history in the Delta

The latter is covered well in Thompson's dissertation. A timeline of levee failure could identify 1906 as the year of a large Bay Area earthquake.

164: National Committee on Levee Safety report to Congress. This has the potential to change standards for Delta levees. This will, in turn, change the impact of classification systems proposed in this document and their relative economic consequence.

165: Problem Statement: appears to be a failure to integrate and understand the role of levee construction/flood management as one of the principal stressors in the Delta.

This is addressed obliquely in later comments in this chapter, but is worth noting in the problem statement.

165, RR P1: The policy requires mitigation for future flood flows. There is, of course, great debate over what those future flood flows are likely to be. Some guiding language from the Council, or citation of a report as a current standard, may be of some help here.

165: RR P2: The footnote *implies* that the policy only applies to FEMA-designated floodplains. Needs to be made clear that the Council is defining this and not FEMA.

165, Policies: Although the two policies are worthwhile and do define a critical element of the Plan, it would be more effective to specifically require the counties to address this in the land use planning documents. As the Council has done about setting policies that require specific planning elements for water supply reliability, it should require the same on the land use side.

166: RR R2: This recommendation that dredging efforts be conducted in a manner that is consistent with the Delta Plan appears to avoid an important issue. Dredging has broad water quality, habitat and flood management implications. The Council should establish a clear policy in this regard. Instead, it appears to be left up to the ACOE to make this plan without genuine policy guidance.

166, 38: Most climate models do not suggest an increase in precipitation, but do suggest an increase in peak inflows to the Delta due to increases in rain versus snow.

166, 24: Change "are" to "be" for the subjunctive voice

166, 34-35: Plot Primary Zone and Secondary Zone boundaries in Figure 7-6 or revised equivalent.

167 Figure 7-3: Say more about the assumptions behind this figure (for instance, an earthquake of what probability, on what fault?). Say why the source prepared the figure. Use a simpler unit for salinity and show where seawater plots on it. Change "salt water" to "brackish water" and "saline" to "brackish" if the intruding waters contain a lot less salt than does seawater.

168, 39-40: Does this sentence mean that no urban areas lie behind levees in any part of the legal Delta?

168, 4: The Council should make clear that the minimum standards set out below are not based on risk.

171, Figure 7-5: Redesign the figure to relate it more fully to the coequal goals – to matters of reliable water supply and ecosystem restoration. Relate it more explicitly to risk (an arrow pointing downward could depict increasing consequences). Is the levee for the wetlands meant to be a natural levee?

172, 9-12: Clarify by acknowledging that probability is built into risk.

172, 39-40: The categories here appear to exclude the Mokelumne Aqueduct.

173, 1: Again, this statement misses the key point that flood protection efforts are one of the larger stressors of Delta ecosystems due to the exclusion of intertidal and floodplain habitat and the alteration of open water habitat.

173, Problem Statement: There are reasons to quibble with this statement. Existing standards and law *are* sufficient to reduce flood risk. Rather, they do not reduce risk sufficiently.

173, Policy RR R3: This is a difficult policy to comprehend, given that Table 7-1 has not been introduced. The policy itself requires a bit more explanation, particularly in light

of the fact that this uses the exact same approach (minimum standards) that the Council objects to (standards-based approaches rather than risk-based approaches).

173, 17: Reads as though the state should plan emergency notification procedures for recreation users. Not sure if that is what the writers meant.

173, RR R4: There is not a clear connection between the Problem Statement, the Policies and this particular recommendation. Perhaps the wording could be made clear regarding the purpose.

173, 35-36: "This means..." – Does this cause-and-effect square completely with page 170, lines 27-29?

175, Table 7-1: The most striking aspect of Table 7-1, which is a tabulated policy statement, is that the minimum standard for agricultural islands is the HMP standard. This standard was set principally as an interim standard, with the goal of eventually upgrading all levees to the PL 84-99 standard in the Delta. This was a commitment (albeit without the resources to meet it) as part of the CALFED Record of Decision. Thus, implicit in the Council's minimum standards approach is that it is acceptable to maintain levees below the PL 84-99 standard. From a risk-based approach, this makes sense since the cost of bringing all levees up to PL 84-99 standards is $1-2B and may well exhaust all available funding for levee improvements without substantially reducing risk.

177, Figure 7-6: Consistent with the details in the Delta Protection Commission's Economic Sustainability Plan? What does the hyphen mean in "State – Federal"? Caption the figure accurately to avoid conflating the Delta and Suisun Marsh.

178, 6: Quantify "significant funding"

178, RR P4: The policy is a threat to set priorities for flood investment if DWR does not. This might be a more effective policy if the principles regarding risk-based approaches as the underpinnings of any strategy were more clearly articulated. In this way, if DWR comes back with a business-as-usual framework that simply maintains the current HMP-PL 84-99 standards as the primary approach, the Council can clearly demonstrate that it is inconsistent with the Delta Plan.

178, RR R5: The Council *recommends* elements that should be in the Framework. In reality, to be consistent with the Plan, the framework must include these elements. For this reason, it seems appropriate to include this recommendation in the Policy. Most strikingly, the recommendations make no mention of the central tenet of risk-based approaches to flood protection. It should be made clear again that the Framework should move beyond minimum standards-based approaches.

181, 17-18: Redundant?

182, RR R10: The Delta Flood Risk Management Assessment District is, in effect, a super-reclamation district. Given the fragmented, ad hoc way that Delta levees are managed, this has considerable merit. However, it is unclear how this integrates with local Reclamation District's and the current jurisdictions of USACE, DWR and the Flood Board, not to mention the DPC and the DSC. To whom will this special district answer and how will it be governed? There is the strong potential to have this District run and be governed entirely by in-Delta interests, yet there is the need for oversight to protect statewide interests due to the requirement of large sums of money from bonds and other sources external to the Delta. In addition, and perhaps more importantly, this new District must have as its highest priority the co-equal goals. If not, the issues of habitat restoration,

water quality and water supply reliability will always remain subservient. This would, in effect, be a continuation of the currently fragmented governance of the Delta.

183, 4: It is both unreasonable and poor practice to require annual updates of Expected Annual Damage (EAD) and loss of life values for the Delta. This is not a trivial exercise if done correctly and annual updates impose an unreasonable burden on agencies.

183, 6: The USACE is developing a levee risk management system. The long history of working with the Corps here in the Valley should be kept in mind. They rarely meet reasonable deadlines, and, given recent behavior and their need to undergo many years of review, it is highly unlikely that they will develop this system in time to be of use to the Council. This illustrates how the overall Delta Plan remains a captive of other plans.

183, 20-30: This paragraph mangles the issue of subsidence, both on why it has and is occurring, and why it is of importance to the co-equal goals. This needs some editing.

183, 20-30: Consult, paraphrase, and cite published papers about subsidence in the Delta.

183, 29-30: Expand into a separate paragraph and use it to set up the recommendation on page 184, line 7.

184, maps: Minimum font 7 point. Summarize causes of subsidence more accurately.

184: After problem statement on line 3 – Need a "Policies" entry here, as on page 185, lines 24-25?

184, Problem Statement: This problem statement reads as an afterthought or a gross oversimplification. Historical subsidence has increased the demand for large levees, subsidence—historic and on-going--creates the capacity for large impacts on water supply due to pulling brackish water into the Delta during island failures and then changes to the tidal prism after failure that increase salinity.

184, Recommendations: The DSC appears to have decided not to engage on the issue of subsidence. Yet this process clearly impacts the co-equal goals. As part of the DSC's commitment to transparency, it should articulate why this issue is not worthy of policy or, for that matter, substantive recommendation.

185, Policies and Recommendations: The Council appears also to have chosen not to address the issue of flood inflows, which are impacted not just by reservoir operations, but flood management infrastructure writ large.

185, Performance measures: The performance measures are grouped as administrative and outcome. Not clear why driver performance measures were omitted but there should probably be some. As in other chapters, the performance measures are not well thought out and need a lot of work.

187, 4: Cite volume and page numbers

188, 10: Name the authors, not their employer(s)

Chapter 8

Page, line:

191, 6: The Delta's human history began long before the Gold Rush, and the Delta Plan's stakeholders include a lot of Indian Tribes -- ample reasons for Chapter 8 to summarize what's known about the Delta's first nations. The summary could touch on origins, customs, and archaeological legacy. Here's a dusty citation about Delta archaeology in Sacramento and Contra Costa Counties (on Tyler, Bradford, and Jersey

Islands and on Bethel, Hotchkiss, Holland, and Veale Tracts): Cook, S.F., and Elsasser, A.B., 1956, Burials in sand mounds of the Delta region of the Sacramento - San Joaquin River system: Papers in California Archaeology, [Reports of the] University of California Archaeological Survey, no. 35, p. 26-46.

199: None of the recommendations address the very real concern identified that there is urban encroachment. Urban encroachment is controlled through plans for ecosystem restoration, but the *Economic Sustainability Plan* generally argues against setting land aside unless it will clearly help the economy (also see the next comment with respect to maintaining or increasing agricultural acreage).

200: Administrative, Driver, and Performance Measures all refer to the *Economic Sustainability Plan* wherein the latest draft includes assumptions and recommendations that conflict with the co-equal goals of the Delta Plan. Indeed, one of the performance measures is that total agricultural acreage will be maintained or increased in the future, in direct contradiction with ecological restoration and levee maintenance and enhancement based on risk criteria.

200, 33: The chapter's reference list should include: Thompson, John, 1957, The settlement geography of the Sacramento-San Joaquin Delta, California: Unpublished Ph.D. thesis, Stanford University, 551 p.