May 8, 2011

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

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

Re: Comments by Individual Members of the Delta ISB on 3rd Staff Draft Delta Plan

During the Delta ISB teleconference meeting of April 25th, the members decided that there had been insufficient progress in the 3rd Staff Draft Delta Plan to merit a new assessment by the Delta ISB as a whole. Individual members also expressed concern that the Delta ISB may be becoming too wrapped up in the actual drafting of the report to also serve as an objective reviewer of the final draft. Thus, for a combination of reasons, the Delta ISB is not providing an assessment of the 3rd Draft.

However, individual board members were given the option to provide comments as individuals.

I am pleased to forward the comments of four individual board members who chose to provide their feedback.

Brian Atwater (by chapter and by page: line)

Suggestions below that I guess to be the most important:
Chapter 1 – Avoid expanding "the Delta," as a place name, into the Suisun Marsh
Chapter 2 – Add problem statements about the key points
Chapter 7 – Add a problem statement about simultaneous, multiple levee failures

Chapter 1

9: 23 – 10: 9	Add maps and graphs that paint these pictures
9: 24-25	Introduce the Sacramento – San Joaquin Delta accurately: as the predominantly freshwater arm of the estuary that encompasses Suisun, San Pablo, and San Francisco Bays as well.
9: 29	Why single out the marshes? Page 61, line 24, describes an environmental "mosaic" of 700,000 acres.
9: 32	"communities...face the constant threat of flooding" ignores farms, roads, and utilities, and the threat may be more nuanced than "constant"
9: 35	Might simplify to "waterways, natural and man-made".

10: 26-34	Simplify the sequence statewide, Delta, statewide
10: 37	Clarify "catastrophic failure in the Delta". If this threat is big, address it by making it into a problem statement in Chapter 7 that sets up policies and (or) recommendations about it.
10: 40	"up to 25 feet" contrasts with the more accurate estimate, "commonly 12-15 feet" (p. 95, lines 26-27)
11: 4-5	Connotes 100 percent certainty that an earthquake (or earthquakes) will change the Delta by 2100
11: Table 1-1	The earthquake hazard could be restated more accurately, as on page 90, lines 3-4. The earthquake probability given in the existing Table 1-1 is misleading because it implies unwarranted precision (62 percent) but mainly because it doesn't say how that Bay Area probability translates into a probability that something in the Delta will change – change being the table's announced topic.
11: Table 1-1	Rephrase "Probability of island flooding from high water relative to record to 2005." What does this statistic mean? What accounts for the expected increase?
13: 9,16	Do levees weaken with age?
13: 27-30	Use "Primary Planning Area" for the combination, "Delta and Suisun Marsh". Calling this combination as "the Delta" will undermine the Delta Plan by sowing confusion. Consider, for instance: p. 9, lines 27 and 35; 61 (historical ecology), 66 (setting in San Francisco Bay estuary, lines 37-38), 90, line 3 ("faults near the western Delta").
13: 31	Explain why the Delta watershed excludes the Kings River drainage basin and some of the other areas tributary to Tulare Lake (historically the wet-season lake discharged into the San Joaquin River). Tie this explanation to a map by outlining the Tulare part of the Delta's drainage basin in Fig. 1-1. Atwater, B.F., Adam, D.P., Bradbury, J.P., Forester, R.M., Mark, R.K., Lettis, W.R., Fisher, G.R., Gobalet, K.W., and Robinson, S.W., 1986, A fan dam for Tulare Lake, California, and implications for the Wisconsin-glacial history of the Sierra Nevada: Geological Society of America Bulletin, v. 97, p. 97-109.
14: 2	Replace the tentative "study area"
14: 3, Fig. 1-1	Label Suisun Marsh. Show dams, aqueducts, storage facilities (they are more germane than the highways)
17: 24-25	Cite instead, as an abundantly reviewed and easily accessed consensus document, U.S. Geological Survey Open-File Report 2007-1437, (http://pubs.usgs.gov/of/2007/1437/)

Chapter 2

19-32	With adaptive management and best available science being so central to the Delta Plan, should this chapter provide problem statements that lead to policies, recommendations, or both concerning adaptive management, scientific research, and monitoring?
22: 7-9	Repeats p. 21, lines 33-35
24: 28-29	Rewrite
27: 4-5	Support or omit
27: 7-9	Recast in terms of Fig. 2-1, and broaden the rationale beyond "change". Some processes worth understanding or monitoring may yield either change or status. Others, as in the case of earthquakes, merely pose a threat of change.
28: Table 2-1	Retitle, "Generalized ranking of scientific sources". Lots of garbage gets through peer review, and "sources with more 'scientific credibility' [why in quotes?] aren't necessarily confined to the "top of the list" (the first row below the heading). For a perspective on modern science's neglect of traditional knowledge, see Thrush, C., and Ludwin, R.S., 2007, Finding fault: indigenous seismology, colonial science, and the rediscovery of earthquakes and tsunamis in Cascadia. American Indian Culture and Research Journal, v. 31, p. 1-24.
29: Table 2-2	If specific to the Primary Planning Area (in the "Relevance" row), retitle "Criteria for best available science on the Delta and Suisun Marsh"
30: 2-9	First of two paragraphs one change. These may confuse because the first deals with change in understanding, while the second refers to change in the Delta and Suisun Marsh themselves
30: 32-34	In the role of "central entity," might the Delta Science Program offer problem statements, policies, and recommendations about adaptive management and Delta science? These needn't be any more cast in stone than other policies and recommendations in the 2012 Delta Plan.

Chapter 4

45: 17-19	Cite supporting reference on this inferred cause and effect. Put it in context of other stressors, including prior "domestication" of the historical ecology

Chapter 5

61: 28-30	Simplify names to "northern Delta", "central Delta", and "southern Delta". Use lowercase for the modifiers because the names are informal. Abandon the simplistic geomorphic names. The northern Delta, for instance, contained distributaries with natural levees that flanked flood basins. Some of these distributaries, tidal at low flow, rejoined to form

	islands, and tidal wetlands merged with some of the basins. Support all this with maps and block diagrams from SFEI.
61: 37	Much of the vegetated tidal wetland of the central Delta did not form islands, but instead extended to the toes of alluvial fans. The figure "200,000 acres" is hard to visualize without the aid of a map.
Chapter 7	
87-97	Could the risk chapter contain a problem statement about the earthquake threat implied in Chapter 1 (on p. 10, line 37, and in Table 1-1)? Topics could include the potential consequences of an earthquake (or flood) that causes simultaneous submergence of multiple islands in the central Delta and the anticipated effects of such a catastrophe on water quality in the southern Delta, fish habitat, and transportation. Could the chapter propose related policies or recommendations or contingency planning?
87: 7	Replace "historically a tidal marsh" with the historical ecological nuance of page 61-62
87: 32-33	Rewrite "Failure of significant parts of the Delta's flood management system will be unavoidable." What is significant? Which parts – dams, bypasses, levees? Do these various parts really amount to a "system"? And what if levees get raised 5 feet?
90: 3-4	The Midland Fault extends under the western Delta as well as near it.
96: 25-30	Cited better on page 17

Michael Healey

Most of the comments below are editorial. I did not find any fatal flaws in the plan or any glaring gaps.

P9 L28, L30: avoid use of "reclaimed". Farm land was not reclaimed from the delta. It was created by diking and draining. At the same time, of course, wetland ecosystems were eliminated.

L32: change "evolved" to "grown up"

L36-38: say why inflow has declined 30%

L38: in isolation from what??

P10, L5: More important than rainstorms is water stored as snow and released in the spring freshet. Capturing this flow is probably more important than capturing rainstorms at present. This may change with climate change. This is not to say that atmospheric

rivers are not important but I don't think they are the main water supply issue at the moment.

L10-14: This ppg needs revision. Valued elements are not clear in the ppg.

P13, L6: Syntax problem here I think.

P24, L23-32: Decisions about level of action to be taken should also take into account the potential cost of delaying larger scale actions. No point being cautious and calling for more research if, in the mean time, the species of concern goes extinct.

P24, 25: Design/implement actions/monitoring. Somewhere there needs to be a discussion about how to handle the tradeoffs involved in resource allocation between actions/monitoring. Monitoring can be expanded infinitely but delivers diminishing returns. This points to the need for good simulation models as these can be used in a benefit cost analysis of monitoring.

P24-26: A key issue in adaptive management is knowing when to adapt. Design of analysis needs to consider how long an action needs to be in place before measurable change is expected. Given the variability of natural systems it is also very difficult to know when things are going awry. Again, well designed simulation models that allow exploration of sensitivity and "what if" scenarios are invaluable. I also think a good design model is the clinical trial in medicine. Although not directly transferable to ecosystem or water supply issues, the clinical trial model establishes important principles, including specific time frames and sample sizes, specific comparisons to be analyzed (treatment vs placebo, novel treatment vs traditional treatment, etc.), ongoing evaluation and updating of expectations, rules for when to abandon a trial that is doing more harm than good, etc. All of these principles are relevant to AM and suitable decision rules need to be in place. Note that demanding statistical significance may not be the best decision rule as it places heavy emphasis on avoiding type 1 error. Type 2 error can often have more social relevance. Furthermore, statistical assessments tend to focus on particular variables while a more multi-attribute assessment may have greater relevance to decision makers.

P28, Table 2.1: Still needs some work I think. Other scientific reports, etc., can receive formal external review (e.g., Science program reviews of agency reports.) The relative reliability of information sources is also open to debate. I would dispense with the table. The issues around different sources of information are well covered in the text.

P61, 62: References to the landscape of the historic delta (Grossinger et al. 2010, Whipple et al. 2010, 2011) are merely abstracts of papers presented at conferences. These ideas are important and should be supported by fuller and more thoroughly reviewed analyses.

P62, L12: 90% of wetlands lost to diking and draining. Other places the figure is 95%. Is there a definitive figure or do the different figures refer to somewhat different things?

P62 L21: A polder is defined as an area of low lying land captured from the sea or lake by diking. It does not specify subsidence although many polders in the Netherlands (where the term comes from) have subsided.

P64, L27: Should specify Delta smelt.

P70: Performance measures: Define "progress toward". What does this mean in quantitative terms?

P71. L7, 8: Key processes mentioned are all very high in a sewage pond. Needs some clarification here.

P77, L22/23: Invasive species, in general, do not constitute a water quality issue although certain invasive species may affect water quality.

L25/26: Sources of impairment should include industry and construction, legacy pollutants, atmospheric sources. Urban runoff is usually considered a non-point source (storm drains). Waste treatment plants should receive specific mention. As the Delta is a high traffic area, runoff from highways and railway rights of way could also contribute to water quality impairment from outside urban areas. Note also that ballast water is not the only source of invasive species.

P82: performance measures. Why not include progress in developing and applying TMDLs?

Overall, I felt the water quality chapter was not developed very fully. It needs more meat.

P90 L2/3: Shouldn't it be "<u>when</u> a significant earthquake occurs"

P103 L19-21: Concern is expressed for urban development on the Delta fringe exposing increasing numbers of residents to risk from flood. This ring development of the delta is also a concern with regard to achieving the goals of ecosystem restoration. In my view it was not sufficiently highlighted in the ecosystem restoration chapter.

P104: Performance measures. These do not seem to have much to do with cultural uniqueness.

P108 L12: Stressor pays fees could also be used to prevent or offset the stress. Prevention is more effective than repair

P110, L15, 16: I am not sure what this means – "more than 50% of the needs for oversight"

Richard Norgaard

Notes on a Delta Science Plan

The Delta Science Program (DSP) carries on the collaborative scientific work of the CALFED Science Program. The Delta Independent Science Board role focuses on science program review, as compared to the broader role played by the CALFED Independent Science Board. Both the DSP and the Delta ISB are referred to in the enabling legislation and given certain responsibilities, though limited authority.

The purpose of including a Science Plan in the Delta Plan would be to lay out the roles of science in the plan, specifically to: 1) shift from the more strictly collaborative relationships toward more formal relationships and 2) help assure that the quality of the "best available" science is maintained and improved through: a) coordinating monitoring, analysis, and data management among the agencies doing science, b) helping identify and coordinate the scientific response to emerging environmental problems, c) supporting scientific exchange and the synthesis of scientific knowledge through conferences and workshops as well as journals such as *San Francisco Estuary and Watershed Science*, and d) disseminating scientific information to managers and the public in usable form.

While a "Science Plan" sounds like something that is designed and set, it may be best to think of a Science Plan as a "stand in" for the possibilities that the science undertaken by the different agencies, the NGOs, and universities can be greater than the sum of its parts with some coordinative efforts. As the Delta ISB reviews the Delta science programs of the various agencies and perhaps beyond, it should surely address whether and how the program's contributions help make Delta science as a whole greater than the sum of its parts, and how it might be made to do so better.

The Science Plan could also link the adaptive environmental management developed in Chapter 2 to the broader issues of governance in Chapter 3.

A few notes on the Third Staff Draft

"Best available science" is used throughout the draft, as it should be since it is also in the enabling legislation. But at some places (for example, page 39, full paragraph 2), the term is more fully defined. I suspect the Plan needs an appendix in which the term is elaborated fully. And in this elaboration, there should be some mention as to how projects might also contribute to the maintenance and improvement of the best available science through their monitoring and data reporting (page 40).

Chapter 5, Restoring the Delta Ecosystem: Creating a More Natural Flow Regime and Improving Habitat

Page 64 – 66: while nutrient composition is mentioned (p 65, para 1, line 3) and poor water quality shows up at the bottom of page 65, these sections still bother me.

Unnaturally higher flows in historically low flow times have been maintained because water is being used to transport waste. To return toward historic flow regimes will also mean wastes need to be reduced upstream.

John Wiens

Chapter 1

- p. 9, third full ¶ (it would have been good to have lines numbered): in the listing of actions avoided, change "or" to "and" (all must be avoided).
- P. 10: it might be good to include a bulleted listing of the major factors threatening the Delta and the co-equal goals, to reinforce the complexity and magnitude of the challenges in developing a comprehensive plan.
- Also, this section deals mostly with the water-delivery infrastructure, and the only elements of biodiversity or ecosystem integrity that are mentioned are fish. There is more to the Delta ecosystem than that. If the broader spectrum of biodiversity, landscapes, and ecosystem services is not at least mentioned up front, the stage will be set for ignoring it throughout the plan.
- Table 1-1: Many of these changes will foster increasing populations and spread of invasive species, further disrupting ecosystem function.
- As an aside, it's hard to have much optimism that BDCP will contribute much to the Delta Plan, given the NAS review (the main points of which reinforce the conclusions reached by the two review panels I was a member of: incomplete and in some cases sloppy work – an embarrassment).
- In general, this chapter provides a good background for the plan as a whole. The emphasis on the role of science-based adaptive management is appropriate.

Chapter 2

- The Delta Science Program should be the primary entity guiding adaptive management and ensuring that it is in fact based on the best available science.
- The figure (in the Word version I'm viewing) hasn't come through completely.
- The phrase "best available science" appears frequently. It would be good to devote a few sentences, or perhaps a sidebox, to describing exactly what is meant by this phrase; without that, the specificity of the dictates to use "best available science" is diminished. [I now see this covered on p. 27. It might be useful to include this earlier, or at least to have some cross-referencing to the section on best available science earlier in the draft.]
- Under part 2 ("Do"), it might be useful to include a few words about striving to design the implementation of actions (or monitoring) such that the results are amenable to statistical analysis. This requires *a priori* attention to such bothersome details as sample sizes (and statistical power), the use of appropriate reference conditions or samples, and the measurement of covariates, without

which it may be difficult in this complex system to disentangle the outcomes of the actions from those of multiple other factors in the environment.

- At some point the reference citations should be cleaned up. Several are incomplete (e.g., there is no link to the report of the Bay Delta Conservation Plan Independent Science Advisors on Adaptive Management; the citation to Williams et al. is not the one given in that publication).
- Overall, this chapter does a good job of establishing an adaptive-management framework. If it is actually followed (and the Delta Science Program will bear considerable responsibility for ensuring that), it could become a real milestone (vs. millstone).

Chapter 3

- What is the nature of the "further Council discussions" of the best available science provision on p. 39?
- P. 39-40: it might be good to include a specific provision for incorporating the generated data into a widely-accessible data-management system. This aspect is far too often ignored or forgotten, with the result that the data generated in research or monitoring are not available for others to build upon.
- It is unclear how Certifications of Consistency are acted upon. It appears that, unless there is an appeal, the Council simply serves the role of receiving Certifications, not reviewing them or providing feedback. Shouldn't the Council, perhaps through the Delta Science Program, be undertaking some sort of review to ensure that the proposed covered actions do indeed meet the requirements? Perhaps this is obvious, but it didn't seem so to me. Seems like a weakness to leave compliance up to the appeals process, if that indeed is the case.

Chapter 4

[This is outside of my area of expertise and I'm short on time, so I'll move on to the next chapter]

Chapter 5

- The definition of restoration is actually quite forward-looking, acknowledging that some ideal state of the ecosystem at some past time is not a realistic target. This is still a matter of some debate in the conservation and restoration ecology communities.
- P. 66, 3rd full ¶: the emphasis is (understandably) on fish, but if one is to adopt a landscape perspective it's important to consider *all* elements of the Delta landscape, terrestrial and aquatic and their interconnections, and therefore the elements of biodiversity that occupy these landscapes. Unless these other elements are explicitly noted in the plan, they are likely to be ignored as the plan begins to be implemented.
- The same neglect of the terrestrial and interface elements of landscapes is evident in the problem statement on p. 68.

- P. 67: it would be good to have the policies spelled out in future drafts.
- P. 69 top: it would be good to include these figures in the plan; otherwise it's difficult to comprehend the policies. The Plan should be a stand-alone document.
- P. 70, first bullet under ER R2: prioritization of where and how to conduct restoration projects, for what goals, is critical, as resources for restoration will always be more limited than the needs. A formal framework and protocol for prioritization should be established and used. This is an area in which the Delta Science Program should take a lead.
- P. 72-73: the performance measures mostly focus on "progress" toward particular goals. The devil is in the details of exactly how "progress" is measured. This would also be a good place to establish the linkage between performance measures and the process of adaptive management (i.e., performance measures tell one whether to keep going with what one's doing or to change course).
- The performance measures tend to neglect all of the good words that were offered about landscapes earlier in the report, resorting only to simplistic cataloging of area and corridors. Landscapes are where the activities of people and the co-equal goals come together, so restoration must incorporate all these elements, not focus myopically on area of habitat X or migratory corridors for species Y.
- Overall, a good chapter, with the background well developed and well referenced.
- I couldn't help but notice that the citation for the reference to one of my papers (Wiens 2002) is missing from the references. This suggests that attention should be given to double-checking references and citations throughout.

Chapters 6 and 7

Not reviewed

Chapter 8

- This treatment is woefully insufficient; hopefully later drafts will develop these multiple values and uses of the Delta in considerably more detail.
- Although "natural" values are highlighted, nowhere are they developed. The natural values of "healthy ecosystems" are an important part of the heritage of the Delta as place.

Chapter 9

Not reviewed