

# CWF Phase 2a: Initial Panel Findings

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# Positive Feedback

- ▶ Clearly, objectively written
- ▶ The draft permit acknowledges uncertainty more fully and presents steps that could be taken to accommodate it.
- ▶ Generally good attention/updates to recent scientific publications and research findings.
- ▶ It provides greater detail regarding methods used to minimize construction impact, and provides more extensive information on analyses related to entrainment, predation, the abiotic habitat index, *Microcystis*, and reducing phytoplankton/zooplankton export at SDD vs. in situ production
- ▶ Adaptive Management Framework is a good starting point.
- ▶ Effects analyses on salmon were easier to follow.

# CDWF 2081(b) permit

To what extent are the analyses used for the CDWF 2081(b) permit application scientifically sound and their conclusions scientifically supported?

## Overall Panel Response

- The application recognizes where uncertainty limits the type of analyses that can be defended.
- For those analyses that can be defended, the methods are generally sound and are scientifically supported.
- In general, the best available science has been used but we recognize that new information and analyses are necessary to effectively evaluate the impact of the project.

# 2081(b) permit: General Questions

- Question 2A: Do analyses of CWF operations and impacts to species through 2060 resolve panel comments raised in Phase 1 of this review? Is climate change adequately incorporated into the cumulative analysis?
  - ▶ GCMs were not extended beyond 2030.
  - ▶ For the smelts, thermal effects depend on results published by Brown et al. (2016), which did not extend beyond 2039. Impacts related to changes in X2 are based on 2025. It is acknowledged that entrainment at the NDD may increase due to increasing sea level. Higher water temperatures are expected to cause habitat compression and reduced reproductive potential under both the PP and NAA to comparable extents. These positions are straightforward and are incorporated into the cumulative effects.
  - ▶ For salmon, the analysis should justify why climate change will not differentially impact salmon via the PP versus NAA. A small change in Chinook viability associated with the project in the future when conditions may be even less favorable may have greater consequences than at present.

# 2081(b) permit: General Questions

- Question 2B: The 2081(b) application currently utilized long-term averages to analyze near and far field effects of CWF operations on habitat conditions. Does this approach adequately describe year-to-year effects of CWF on covered fish species' population dynamics? Are there alternative analytical approaches available that are more appropriate?
  - ▶ For Delta Smelt, population dynamics were not modeled due to widely recognized uncertainties in model parameterization. Year-to-year variation in individual effects (entrainment,  $X_2$ , abiotic habitat index) were considered by water-year type.
  - ▶ There is not enough data to model Longfin Smelt population dynamics.
  - ▶ Year-to-year variation was modeled assuming that successive years were independent. Does not allow for cumulative effects of, for example, a sequence of dry years, such as the recent 4-year drought.

# 2081(b) permit: General Questions

- Question 2C—Part A: Is the approach used to characterize take and associated impacts to covered fish species populations scientifically valid given current understanding and the recognized limitations of available tools?
  - ▶ Sources of take have been adequately characterized.
  - ▶ Delta Smelt and Longfin Smelt: Yes, given the lack of parameterized life-cycle models
  - ▶ Salmon: A comprehensive life-cycle model is a better way to look at cumulative effects than examining a collection of life-stage-specific analyses of impact.

# 2081(b) permit: General Questions

- Question 2C—Part B: Are there improvements to the current methods that could be implemented, or are there available alternative analytical approaches that are more appropriate for analyzing the extent of take and associated impacts to the species?
- ▶ Additional investigative approaches are outlined in Table 4.0-1 of the permit, but these are limited to specific, estimated impacts (entrainment, X<sub>2</sub>, flow relationships with fish, etc.) and did not include impacts that were avoided altogether due to uncertainty (e.g., food-web and population dynamics).
- ▶ More comprehensive life-cycle models are needed to integrate survival across life stages and water years while considering key factors. See recommendation by the Salmonid Life-Cycle Model Independent Panel (Rose et al. 2011).

# 2081(b) permit: General Questions

- Question 2D: Do the conclusions of the effects analyses for covered species adequately acknowledge and incorporate uncertainty as recommended in Phase 1 of this review?
  - ▶ Yes for the smelts.
  - ▶ Much improvement over BA. Table 4.0-1 gives new, overall emphasis to uncertainty challenges.
  - ▶ However, text still cites predicted mean values from tables and boxplots, excluding uncertainties, to draw conclusions about NAA versus PA outcomes. The Panel will argue that this practice implicitly assumes that all factors not included in models have zero total net effect on the predicted response.

# 2081(b) permit: Longfin Smelt

- Question 3A: Is the proposed approach to achieve the March through May spring outflow targets for Longfin Smelt likely to result in spring outflow equivalent to existing conditions?
- Question 3b: The relationship between outflow and Longfin Smelt abundance uses a six-month (January through June) averaging window (Kimmerer 2009). How well does the 2081 (b) application justify using a three month (March through May) averaging window to provide outflow targets and operational criteria during that period?
- ▶ From a statistical sense, yes. However, investigating and modeling the process-based mechanisms should be high priority research, preferably over a six-month averaging window.

# 2081(b) permit: Delta Smelt

- Question 4A: In the analysis of CWF construction and operational effects, how appropriate are beach seine surveys from the Delta Juvenile Fish Monitoring Program and Freeport diversion monitoring data (ICF 2015), in which Delta Smelt have been observed as by-catch, to characterize the proportion of the total Delta Smelt population in the vicinity of the north Delta diversions? Could these datasets be analyzed differently to better support the effects analysis?
- ▶ Yes: The net and deployment specifications are appropriate. The nets are deployed throughout the year and the geographic range of deployment extends long distances upstream and downstream of the NDD, using a reasonable number of stations. However, for future monitoring, note that the conditions at the NDD (hardened shoreline, fast currents) will contrast with typical conditions of beach seine deployment.

# 2081(b) permit: Chinook Salmon

- Question 5A: How well does the effects analysis evaluate new adverse effects on salmonid species due to north Delta operations and changes in south Delta operations?
- ▶ Report presents findings from a number of available approaches for evaluating specific portions of project operations on salmon survival.
  - Appropriate but sometimes the main report could provide more information about assumptions and limitations of the approach.
  - Details of the findings typically presented in objective fashion.
- ▶ However, concluding statements do not describe high uncertainty that is typically described in the main text, e.g. Winter Chinook 4.3.7.2.3.
- ▶ Concluding statements on Take (Winter Chinook 4.3.8.3) do not reflect main text and tend to underestimate potential adverse effects. Science Panel made this same comment when reviewing BDCP.
  - The Report concludes: “the overall potential for take is low.” The detailed text does not support this conclusion.

# 2081(b) permit: Chinook Salmon

- Question 5A: How well does the effects analysis evaluate new adverse effects on salmonid species due to north Delta operations and changes in south Delta operations?
- ▶ Most survival and movement studies relied on tagging of very large yearling hatchery salmon. These tagged fish may not represent smaller life history types and other species of salmon. Smaller salmon use estuarine habitats differently from larger salmon, as generally noted in the report, but this is not considered when presenting quantitative results.
- ▶ Sometimes the report critiques findings of one study versus another, but sometimes conflicting findings are not fully evaluated to inform the reader of strengths and weaknesses of different approach.
- ▶ Benefits of “Take Minimization Measures” overstated.
  - Measures would “greatly reduce the potential for mortality of individuals, which makes it unlikely that activities will affect reproductive rates of the population or survivorship of individuals.”
  - “Mitigation is expected to fully offset habitat loss and any loss of individuals because high-quality, larger-scale, intact habitat will be acquired, enhanced, and managed in perpetuity. Thus the PP fully mitigates for the potential incidental take of winter-run Chinook salmon.”

# 2081(b) permit: Chinook Salmon

- Question 5B: Are the analyses of take by life stage and water year type scientifically sound? How useful are these analyses for determining annual population impacts?
  - ▶ Yes, the approach that examines effects by life stage and water year is appropriate.
    - ▶ For example, above-Delta analyses consider each life stage, which is good. SALMOD typically predicted beneficial temperature effects on eggs and juveniles and adverse effects of flow on eggs, leading to 6% (dry) to 20% (below normal) greater loss of juvenile winter-run Chinook production associated with PP. But overall loss was 3%. This highlights the importance of looking at effects by life stage and water years.
  - ▶ However, a comprehensive life cycle model is needed to fully evaluate project effects. Some life cycle models used (IOS, OBAN, SALMOD) but these models are not comprehensive (see model reviews by Rose et al. 2011).
  - ▶ Habitat alterations were underestimated: “Habitat losses would be small”, e.g., 50 & 0.42 acres. “not expected to have a population-level effect”. Analysis should consider the percentage of Sacramento River water diverted by month and by water year, e.g., 40% in Nov of below normal years. This suggests considerable potential habitat is removed in some years and months.
  - ▶ The overall net effect of the Project on winter and spring Chinook Salmon is uncertain. Science in the watershed has been used to inform the impact analysis but many uncertainties remain, as discussed above. These quantitative analyses underestimate uncertainty. Conclusions about PP impacts on salmon do not account for uncertainty and overstate a belief that the PP will have no impact.

# Cumulative system effects

- ▶ This application includes species-level and life-stage-specific analyses. However, the cumulative, Delta-scale ecosystem effects and how those impact viability of the population need to be addressed.
- ▶ Mitigation of long-term incidental take associated with project operations is not being addressed on a Delta-wide scale.
- ▶ Smaller life stages utilize shallow, brackish water in the Delta. The complicated interaction between North Delta diversions, river flow, tides, and shifts in salinity and shallow habitat were not adequately addressed.
- ▶ For example, how does the removal of up to 40% of the river water (hydrograph provided to the panel) in some months affect vegetation (high marsh, riparian) and associated habitat, downstream secondary productivity, and turbidity?
- ▶ It is unclear whether the applicants have analyzed the effect of the 10% suspended-sediment (fines) loss due to NDD operations.

# CWF Adaptive Management Framework

Are the compliance monitoring, collaborative science, and adaptive management approaches in the Framework appropriate for addressing the uncertainties associated with the implementation of CWF, specifically related to CWF operations in conjunction with SWP and CVP facilities?

- The Panel's interpretation why this AM Framework is being established is to insure compliance with Section 7. The AM Framework should be thought of as an "insurance policy" for the fish.
- It should be precautionary and proactive to protect against uncertainties, including the effects of climate change that may affect smelt, salmon, and their habitat.
- This framework should set priorities for science that will reduce uncertainty about the species needs.

# Adaptive Management: Specific Questions

- Question 1A: Does the Framework adequately reflect comments and issues raised in Phase 1 of this review?
- ▶ The AM Framework is a good starting point, but more details need to be filled in.
  - ▶ Funding for both monitoring and research
  - ▶ Active Management and triggers?
    - ▶ It is unclear what belongs in the real-time operational monitoring and what belongs in the AM Framework.
    - ▶ Many of the AM “triggers” in Appendix 1 are not triggers to adaptively respond to factors affecting the covered species, rather they are mitigation measures. Mitigation should be monitored, of course (monitor fish performance and mitigation measures). Each issue should have quantitative, measurable benchmarks (many do not). Some salmon performance metrics are quantitative; are they measurable?
  - ▶ Research priorities should be driven by gaps in conceptual models. For example: Longfin Smelt vs. Delta outflow relationship.

# Adaptive Management: Specific Questions

- Questions 1B: Is the Framework sufficient to address the uncertainties associated with the current analyses and provide a timely mechanism for addressing future changes in operations based on new understanding of listed species distribution and abundance?
- ▶ The Framework is a good start, assuming the scientific questions will be appropriately prioritized and actionable metrics will be developed to avoid jeopardy.
  - ▶ Good list of uncertainties and potential research but unclear which uncertainties will be targeted for reduction through experimentation and learning
- ▶ Will there be a mechanism for responding to unanticipated events on a timescale of less than 1-2 years?
- ▶ Need to articulate AM strategy in the face of uncertainties that cannot be reduced? (i.e. precautionary principle)

# Adaptive Management: Specific Questions

- Question 1C: How well does the Framework build off and incorporate existing adaptive management or related efforts? Does the Framework adequately address areas or gaps not currently covered by existing efforts?
- ▶ The Framework builds on several other reports (IEP-MAST/SAIL) to develop research needs. This list does include the most notable research. However, the big task will be for this list to be prioritized even further. Other adaptive management initiatives like CSAMP/CAMT are contributing to the development of the AM Framework.

# Adaptive Management: Specific Questions

- Question 1D: How thoroughly do the steps and decision making processes outlined in the Framework support its intent and objectives?
  - ▶ The four phases are well described.
  - ▶ If the purpose is to comply with Section 7 (i.e. protect the fish), then decision-making about the science should be primarily based on input from personnel with scientific background. The panel is concerned about stakeholders' influence on the research prioritization.

# Adaptive Management: Specific Questions

- Question 1E: Do the commitments to new research, monitoring, and modeling appropriately support the management component of the Framework?
- ▶ What guarantees are there behind the commitments?
- ▶ How will the Framework address the need for additional resources, people, and capacity for research?

# Adaptive Management: Specific Questions

- Question 1F: Will the approaches to scientific research and monitoring allow robust and adequate documentation of effectiveness in reducing uncertainty associated with CWF and existing measures to minimize and mitigate impacts to species?
  - Question 1G: Will the approaches to scientific research, monitoring, and associated decision making allow for tracking the effects of CWF on populations of the four listed species over time and the effectiveness of management actions?
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- ▶ Monitoring needs to be designed to have the capability to assess the outcomes of adaptive management and mitigation actions.
  - ▶ The bigger concern is transparency and accountability for how decisions will be made in response to what is tracked.