

## Selection Panel Review Summary

**Proposal Number:** 012

**Proposal Title:** Minimizing impact of mercury from BDCP restoration activities

**Principal Investigator:** Kenneth Coale

**Amount Requested:** \$300,000

**Recommended Amount:** \$0

**Summary:** The proposed project would identify areas of high total mercury in sediment within the Yolo Bypass and evaluate them in relation to enhancement actions proposed by BDCP. Based on that assessment, engineering solutions to minimize methylation would be proposed.

**Assessment:** The proposed research is relevant to current BDCP planning activities and has the potential to assist with future restoration in the Yolo Bypass. However, the proposal lacked critical elements and did not provide enough details for the Selection Panel to have confidence in the work that would be conducted. The proposal lacked detail associated with the collection of sediment samples, the rationale for analyzing only total mercury, the rationale for collecting deep core sediment samples, and a discussion on how the potential engineering solutions would be developed. There was no mention of the other factors besides total mercury concentrations that drive methylmercury production and bioaccumulation, and the proposal fails to acknowledge the importance of these factors. Moreover, total mercury concentration is poorly correlated with methylmercury production. There was a lack of detail in how core samples would be collected and no statistical approach was provided to determine where core samples should be collected, or how to deal with spatial variability around each sampling location. A conceptual model was provided in the proposal, but it did not directly address the fundamentals of the current project and it was not discussed thoroughly in the proposal. Budget details also were absent. The proposal was unclear as to whether access permits were needed and if needed if they could be obtained.

**CALFED Ecosystem Restoration Program**  
**External Scientific Review Form**

**Proposal Number:** 012

**Proposal Title:** Minimizing impact of Mercury from BDCP Restoration Activities

**Reviewer:** #1

**Conflict of Interest Statements:**

I have no financial interest in this proposal (please mark correct response).

- Correct X
- Incorrect

**General Review Questions:**

Along with your written observations in response to the questions below, please rate each using the following criteria:

- Excellent: Outstanding in all respects
- Very Good: High quality in nearly all aspects
- Good: Quality work, but with some deficiencies
- Fair: Lacking in one or more critical aspects
- Poor: Serious deficiencies

1. **Problem/Goals.** Is the problem that the project is designed to address adequately described? Are the goals, objectives, and hypotheses clearly stated and internally consistent? Does the proposal describe the ecosystem goals it is designed to address (link to ERP goals)?

Comments:

The problem the project addresses, minimizing mercury impacts resulting from wetland restoration activities in the Yolo Bypass, is clearly stated and described. Project goals, objectives and hypotheses are clearly stated and consistent. The project proponents have provided documentation about how their project links ERP strategic goals and objectives (Goal 4 Habitats/Objective 1: Restoration of major habitat types; and Goal 6 Water and Sediment Quality/Objective 1: Reduce loadings and concentrations of toxic contaminants in aquatic environments to levels not adversely affecting aquatic organisms, wildlife, and human health).

Rating: Very Good

2. **Approach.** Does the proposal clearly describe its approach (including study design and methods, if appropriate)? Is the approach well designed and appropriate for meeting the objectives of the project as described in the proposal? Will the proposal contribute to our knowledge base?

Comments:

The proposal clearly describes its approach: Objective 1 tasks--sample and analyze of Yolo Bypass sediments for total mercury and methyl mercury content to fill in significant mercury data gaps; Object 2 tasks--collect of detailed information on proposed BDCP projects and identifying those projects occurring where soils have high levels of total mercury; and Objective 3 tasks--prepare an engineering report evaluating solutions to minimize methyl mercury loadings to the Delta from BDCP projects.

The sediment sampling and analysis portion of this project, as described in the proposal, will yield important new information on the distribution of total and methyl mercury and fill in data gaps in the Yolo Bypass. However, more detail about sediment core sampling would be helpful. For example: What is the nature of the samples collected at the surface, at one meter and at 2 meters and why were these sample depths chosen? Is each sample composed of 4 or 6 cm of core? If so, is the top of the 1 meter sample at 1 meter or is the 1 meter sample centered on 1 meter? Will the core be split and ½ of the interval sampled archived should additional future study prove necessary? There is also no mention of what information on the physical characteristics of the samples will be recorded (some examples are: particle size, color, stratigraphic/structural features such as layering, organic matter or plant root presence). Such information may aid in identifying subtle variations in total and methyl mercury and the origins of mercury variations in the Yolo By-Pass.

A concern regarding the proposed project sediment core sampling plan is that the total and methyl mercury contents of portions of the core between the surface, 1 m and 2 m samples may be significantly different than the sampled core intervals (i.e., x cm length of core representing the surface, 1 m and 2 m samples) and this condition would not be documented. The project proponents do not address this possibility. If previous sediment sampling has shown this is not a significant issue the project proponents did not state that here. If there is not detailed information available on total and methyl mercury variation with depth from previous Yolo By-Pass work then there are other approaches to core sampling for investigating vertical mercury variability that might be considered by the project proponents. Several possible approaches are: complete continuous sampling of the core, using intervals of several cm, at a few key sites in the Yolo Bypass; complete continuous sampling of core over three intervals for all cores--0 to 4 cm, 4 cm to 1 m and 1 m to 2 m, and homogenizing each interval prior to collecting a portion for lab analysis; or 3) collect surface, 1 m and 2 m samples as planned but collect a representative sample within any core interval showing dramatically different physical characteristics from the core intervals at the 3 routine sample depths.

The new sediment mercury information and the habitat restoration engineering information generated by this project should contribute important new information that will aid in wetland restoration project planning to help minimize methyl mercury generation and export to the Delta by those projects. This will be true whether or not the project's proposed sediment core sampling plan is adjusted incorporate one or more of the above listed suggestions. The suggestions are offered as possible approaches to maximize mercury information resulting from core sampling and analysis.

Rating: Good

3. **Feasibility.** Is the proposed project's approach fully documented and technically feasible? Can the project be completed within reasonably foreseeable constraints (e.g., acquiring permits, construction, weather, etc...)? Does the proposal thoroughly address requirements

such as environmental compliance and permitting? Is the scale of the project consistent with the objectives?

Comments:

The project's approach is well documented, technically feasible and the project should be able to be completed within the proposed three year time-frame. The proponents already have experience with Objective 1, sediment collection and mercury analysis of sediment samples in the project area. Objective 2, Collection of detailed information on proposed BDCP projects and comparing their locations to elevated total mercury sediment locations in the Yolo Bypass, is straightforward. Objective 3 naturally follows Objective 2 once the location, areal extent and type of proposed habitat restoration activities in elevated mercury areas are known. Information pulled together during Objective 2 activities should also allow for the identification of other information potentially helpful to the Objective 3 evaluation of engineering options activities (e.g., NRCS soil engineering characteristics data for Yolo By-Pass soils).

The project proponents have indicated that no permits are required and it is not contingent on other projects. However, there appears to be some uncertainty regarding access to Conaway Ranch property. The proponents state in Item 5, page 13 or 19 of their proposal that "access permissions" are not required for the project. In Section 3, page 3 of 19 of their proposal they state "Conaway Ranch access is being negotiated with California Department of Fish and Game." With the recent ownership change for Conaway Ranch (December 2010) it would be helpful to know the likelihood of achieving access to Conaway Ranch and whether access would be restricted to specific time periods that may be present sampling difficulties (e.g., working around farming activities). With about 60 days between the announcement of Conaway Ranch ownership change and the submission deadline for this proposal, it is a little surprising that the proponents did not include more detailed and consistent information regarding the status of their Conaway Ranch access.

The scale of the project is consistent with project objectives.

Rating: Good

4. **Conceptual Model.** Does the proposal provide a conceptual model that describes the interconnections among the key ecosystem components relevant to the action(s) being proposed? Does the conceptual model clearly explain the hypotheses it is testing?

Comments:

The proposal provides reference to and figures representing the Bay-Delta Mercury Conceptual model and a conceptual model from the DRERIP (Alpers and others, Delta Regional Ecosystem Restoration Implementation Plan, 2008). Unfortunately, the narrative discussing these models and how the proposal fits these models is minimal. The narrative explains the basis of the proposal--the importance of knowing the location of high total mercury areas with respect to locations of wetland restoration activities (*and this is of primary importance!*). However, it neglects to mention or comment on the significance other factors that may impact methyl mercury production such as sulfate availability and the form(s) of mercury in project area sediment (e.g., HgS, Hg<sup>0</sup>, Hg adsorbed onto Fe or Mn oxyhydroxides, etc.). If previous research has determined that these additional factors are of minimal importance or unimportant for methyl mercury generation within the Yolo Bypass then a comment stating that would be helpful at this

point in the proposal. If one or more of these factors is important then this would also be the place where that importance could be pointed out and reasons presented as to why the project proponents are only investigating total and methyl mercury abundance in project area sediments (*There may be good reasons for not investigating these other factors in this proposal but we don't know what these are because the proponents have not discussed these significance of these additional factors in their narrative.*)

Rating: Good

5. **Performance Evaluation Plan (Monitoring Plan and Performance Measures).** Does the proposal include a plan for project performance evaluation (monitoring to assess results and evaluate assumptions and hypotheses)? Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Will future studies or restoration projects be able to incorporate the information from this project?

Comments:

The proposal includes a QA/QC plan for mercury analyses involving collecting field duplicate samples at 5 percent of sample sites to evaluate field variability and a laboratory QA/QC plan involving certified reference material, spike recoveries of total mercury on native and analytical duplicates of native samples for each batch of 20 samples. The field and laboratory QA/QC plans should be adequate. Quarterly reports, scientific talks at two science conferences and updates to the Yolo Bypass Working group will allow opportunities for outside feedback on analytical results and working hypotheses and outside monitoring of progress during the project's 3 year duration.

Rating: Very Good aspects

6. **Expected Products/Outcomes.** Are products of value likely from the project? Are products of value also likely from the individual components of the project? Will the results of this study be readily accessible?

Comments:

This project should generate valuable additional information on the spatial distribution of total and methyl mercury and on habitat restoration engineering and cost analysis for various habitat restoration options specific to the Yolo Bypass. This information should significantly improve habitat restoration project planning and wetland management to reduce methyl mercury loads to the Delta from BDCP projects. As the project proponents suggest, the new information generated by this study should significantly aid applicants for new wetlands in answering RWQCB questions about the impacts of mercury resulting from their proposed restoration efforts.

Rating: Excellent

7. **Previous Related Work.** Does the proposed project continue past work or include any work that could be considered a duplication of work previously done or currently being done by others?

Comments:

The project continues and expands on past work (Heim and others, 2010) in that it will sample areas in the Yolo Bypass south of the Cache Creek and Putah Creek confluences that have limited or no previous sampling for total or methyl mercury in sediment. It should not be considered a duplication of previous sediment sampling or analytical work. I am not aware of others currently doing similar sediment sampling and mercury analytical working the Yolo Bypass.

I am not aware of anyone previously or currently preparing engineering evaluations of BDCP projects and project locations to minimize resulting methyl mercury loadings to the Delta. This project activity should generate important new information useful for planning wetland restoration projects to insure their impacts on methyl mercury loads to the Delta are minimized.

Rating: Very Good

8. **Qualifications.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project? Do they have working knowledge of California streams and rivers?

Comments:

The project primary and co-primary investigators have been involved with a number of previous projects related to mercury impacts in the Bay-Delta and associated tributaries both as project managers and researchers. Their projects have been well designed and executed, and contributed valuable information and insights about the extent, mechanisms and possible mitigation of the mercury methylation problem in the Bay-Delta and associated tributaries. The Fish and Game mercury lab at MLML is capable of providing the high quality mercury and methylmercury analyses needed for this project. The subcontractor, Greg Reller, is very knowledgeable and experienced in site environmental assessment, and in design and evaluation of cleanup and site restoration options, particularly historic mine sites (including mercury mine sites).

Rating: Excellent

9. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed? If the budget is considered to be excessive or inadequate for the work proposed, please highlight areas of the budget that may be of concern.

Comments:

The budget amount requested appears reasonable and adequate for the work proposed (*It is not specifically broken out in the budget but I assume field sampling and laboratory expendables are included within the \$10,645 materials category under operating expenses*).

Rating: Very Good

**Additional comments:**

This project will provide valuable new information on the spatial distribution of total and methyl mercury and on habitat restoration engineering options and on costs to minimize methyl mercury generation and export in the Yolo Bypass. The new information should greatly assist current and future proposed habitat restoration projects for the Yolo Bypass to move forward in the approval process.

## Overall Evaluation Summary Rating

In the space below, please provide an overall rating of the proposal using one of the following categories:

- **Superior:** Outstanding in all respects with superior technical and scientific value and no significant concerns. Expected to add substantial new thinking/concepts to our knowledge/understanding of the topic proposed.
- **Above Average:** A very good proposal with at least high technical and scientific value and no significant concerns. Will add solid basic knowledge/understanding of the topic proposed.
- **Adequate:** A reasonable proposal without serious technical deficiencies and at least adequate value scientifically. Will add some useful knowledge to the topic proposed.
- **Inadequate:** A technically deficient proposal and/or one with low value, serious impediments or concerns. Will not likely change our basic knowledge/understanding of the topic proposed.

Rating: **Above Average**

Please provide a brief explanation of your summary rating:

This is a good proposal. This project will close significant data gaps in the spatial distribution of total and methyl mercury in Yolo Bypass sediment. It will also provide valuable engineering and cost information for wetland habitat restoration options that minimize methyl mercury impacts to the Delta. Such information should be valuable to groups advocating current or future habitat restoration projects in the Yolo Bypass and assist them in satisfying RWQCB concerns regarding mercury impacts from proposed projects.

This project proposal was not rated as Superior because of inconsistent information regarding property access, limited information and discussion of the sediment sampling approach, minimal narrative provided about the conceptual model and other minor omissions. Of these the property access question is the most critical. However, it should be able to be resolved quickly through discussions with the current Conaway Ranch owner, if it has not been resolved already.

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## CALFED Ecosystem Restoration Program

### External Scientific Review Form

**Proposal Number:** 012

**Proposal Title:** Minimizing impact of Mercury from BDCP Restoration Activities

**Reviewer: #2**

**Conflict of Interest Statements:**

I have no financial interest in this proposal (please mark correct response).

- Correct

**General Review Questions:**

Along with your written observations in response to the questions below, please rate each using the following criteria:

- Excellent: Outstanding in all respects
- Very Good: High quality in nearly all aspects
- Good: Quality work, but with some deficiencies
- Fair: Lacking in one or more critical aspects
- Poor: Serious deficiencies

1. **Problem/Goals.** Is the problem that the project is designed to address adequately described? Are the goals, objectives, and hypotheses clearly stated and internally consistent? Does the proposal describe the ecosystem goals it is designed to address (link to ERP goals)?

Comments:

The proposed project is to generate a map of tHg soil inventory for Yolo Bypass, with the express presumption that this map will identify the locations in Yolo Bypass with the highest probability of forming and releasing MMHg. The map would be used to evaluate where wetland restorations could be sited in Yolo Bypass to minimize MMHg production and/or release, or, alternatively, to evaluate engineering solutions to minimize MMHg production or release. An engineering evaluation would provide estimates of different mitigation methods. While a map of soil tHg content in Yolo Bypass would be useful, the premise of the project is flawed because MMHg in wetlands is not a simple function of tHg inventory in soils.

Rating: Fair

2. **Approach.** Does the proposal clearly describe its approach (including study design and methods, if appropriate)? Is the approach well designed and appropriate for meeting the objectives of the project as described in the proposal? Will the proposal contribute to our knowledge base?

Comments:

My summary evaluation is that the proposed project is lacking in some key areas and therefore has a relatively poor likelihood of meeting the objectives.

Key soil characteristics – the project proposes to map the soil tHg concentration with depth to 2m for the Yolo Bypass to identify where wetlands restoration projects are least likely to produce and release MMHg. However, production of MMHg is poorly correlated to tHg



inventory is soils. MMHg production is related to the reactivity of Hg in the soils, sulfate, iron, organic carbon content, grain size, and many other important soil characteristics. Measurement of soil characteristics other than tHg is not described, so any ability to predict MMHg formation rates is likely to be relatively poor.

Spatial variability – the project is to collect 100 cores throughout Yolo Bypass to a depth of 2 meters. The statistical approach to identifying the sampling locations within Yolo Bypass is not described, but almost any spatially distributed scheme should be adequate. Of more concern is that the statistical approach for constraining the spatial variability around each sampling location is not described. Considerable spatial variability in tHg concentration can exist over relatively short horizontal distances – meters to tens of meters. To ensure that each sampling location is representative of the local soils, multiple point samples must be collected at each sampling location according to a statistical design. In a similar project, we collected 10 to 20 cores around each sampling location to represent local soil conditions. Given the expense of analysis, soils were subsampled by depth and homogenized, generating only one composite sample for analysis. I believe such an approach is necessary here. We routinely collected 50 to 100 4m cores in a day, so this type of sampling is quite feasible.

Engineering analysis – In addition to the soil sampling, the proposal requests funding for an “engineering evaluation” to assess costs and difficulties associated with minimizing MMHg release from future restorations. According to the proposal “The engineering solutions to reduce MMHg loads include: 1) Removal of the sediments with the highest levels of Hgt; 2) Isolation of the sediments with the highest levels of Hgt with the use of berms; 3) Location of wetlands in areas that have the lowest levels of Hgt; and incorporation of settling ponds whenever possible to settle out Hg and MMHg.” For this project component, the proposal requests \$130,000. The scope and detail of the analysis is not described and thus could not be reviewed. Given the analysis is for hypothetical projects, the value is not clear. The costs of sediment removal and berm construction are relatively well known, so the analysis for these costs is not particularly valuable. Evaluation of specific hydrologic controls to limit MMHg production or release are not discussed. Knowledge of the groundwater system in the Yolo Bypass (e.g. Putah Sinks) is missing from the proposal and incorporation of groundwater into the engineering analysis is not described.

Rating: Fair

3. **Feasibility.** Is the proposed project’s approach fully documented and technically feasible? Can the project be completed within reasonably foreseeable constraints (e.g., acquiring permits, construction, weather, etc...)? Does the proposal thoroughly address requirements such as environmental compliance and permitting? Is the scale of the project consistent with the objectives?

Comments:

The project approach is not fully described, but generating a tHg map is technically feasible within the budget requested and timeframe. It is not possible to evaluate the engineering evaluation component of the project because insufficient detail was provided.

It is not clear if access to Conaway Ranch will be secured, but this appears to be a relatively small hurdle.

Rating: Good

4. **Conceptual Model.** Does the proposal provide a conceptual model that describes the interconnections among the key ecosystem components relevant to the action(s) being proposed? Does the conceptual model clearly explain the hypotheses it is testing?

Comments:

The conceptual model presented in this proposal is a general description of mercury cycling in California comprising mercury transport, MMHg formation, and mercury bioaccumulation in Delta food chains. The conceptual model does not directly address the fundamentals of this project: the processes that affect formation of MMHg in soils, particularly wetland soils. It is not clear from the conceptual model that the proposal authors have adequately considered relevant key processes in their project design.

Rating: Poor

5. **Performance Evaluation Plan (Monitoring Plan and Performance Measures).** Does the proposal include a plan for project performance evaluation (monitoring to assess results and evaluate assumptions and hypotheses)? Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Will future studies or restoration projects be able to incorporate the information from this project?

Comments: None included – no review possible.

Rating: None possible

6. **Expected Products/Outcomes.** Are products of value likely from the project? Are products of value also likely from the individual components of the project? Will the results of this study be readily accessible?

Comments:

If the project is conducted as described, a major product of the project – a map of the soil inventory of tHg with depth in Yolo Bypass – may be of questionable value because (a) the sampling design lacks statistical rigor and thus the accuracy of the individual point measurements questionable, and (b) the tHg inventory of soils is a poor predictor of MMHg production. Consequently, any engineering evaluation based on this map will be of questionable value for planning wetland restorations in Yolo Bypass.

Rating: Fair

7. **Previous Related Work.** Does the proposed project continue past work or include any work that could be considered a duplication of work previously done or currently being done by others?

Comments:

The proposed project duplicates and extends a soil survey sampling of the Yolo Bypass concluded in 2010. This work expands the previous study by infilling some areas not previously sampled, and sampling with depth.

This project further proposes an “engineering evaluation” of the difficulties and costs associated with avoiding or mitigating the most contaminated soils.

Such a soil map would be useful, and sampling near the outlet of Cache Creek would fill a glaring gap in the previous map. The benefit of extending the soil survey to include several depths is not made clear in the proposal, but would be unquestionably useful for future planning.

Rating: Good

8. **Qualifications.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project? Do they have working knowledge of California streams and rivers?

Comments:

What is the track record of applicants in terms of past projects?

A search of SCOPUS, Web of Science, and SFE and W Science (a common outlet for CALED-funded research) returned three journal articles that members of the project team have published based on Bay-Delta funded research.

Is the project team qualified to efficiently and effectively implement the proposed project?

The project team has an extensive background conducting mercury research in the San Francisco Estuary and Delta.

Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

With the exception of access to Conaway Ranch, which is presumably forthcoming, adequate support appears available.

Do they have working knowledge of California streams and rivers?

To my knowledge, the project team has limited experience in stream and river settings, but this should not present a problem for successful completion of this project.

Rating: Very Good

9. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed? If the budget is considered to be excessive or inadequate for the work proposed, please highlight areas of the budget that may be of concern.

Comments:

Approximately \$50,000 appears to be requested for 300 tHg analyses and 50 MMHg analyses on soils, which is reasonable.

\$50,000 is requested for travel and per diem without any explanation in the budget justification. This would cover on the order of 200 person days of travel. If for sampling, this would amount to 3 cores per day for a 2 person team. Based on my experience, this seems a very low production rate for coring, so it is not clear what this funding will be used for.

\$130,000 is requested for the “engineering evaluation” but the scope of the evaluation is described only vaguely, and no example reports are referenced. None of the references cited in the proposal had Reller listed as an author. It is not possible to evaluate if these monies are well allocated.

Rating: Inadequate information to review budget

**Additional comments:**

None.

**Overall Evaluation Summary Rating**

In the space below, please provide an overall rating of the proposal using one of the following categories:

- **Superior:** Outstanding in all respects with superior technical and scientific value and no significant concerns. Expected to add substantial new thinking/concepts to our knowledge/understanding of the topic proposed.
- **Above Average:** A very good proposal with at least high technical and scientific value and no significant concerns. Will add solid basic knowledge/understanding of the topic proposed.
- **Adequate:** A reasonable proposal without serious technical deficiencies and at least adequate value scientifically. Will add some useful knowledge to the topic proposed.
- **Inadequate:** A technically deficient proposal and/or one with low value, serious impediments or concerns. Will not likely change our basic knowledge/understanding of the topic proposed.

Rating: The proposed project appears **adequate** for production of a tHg map of Yolo Bypass if sampling plan is revised, but is **inadequate** to meet the stated objectives of providing guidance on implementing restoration in Yolo Bypass to minimize MMHg.

Please provide a brief explanation of your summary rating:

The key product of the proposed project is a map of soil tHg concentration with depth to 2m for the Yolo Bypass. While the project would improve the map of soil tHg in Yolo Bypass recently generated by Heim (2010), it is of questionable value for siting future restorations or assessing likely production of MMHg because MMHg production is not directly related to tHg inventory. The project does not assess soil characteristics important to Hg methylation. Further, the accuracy of the soil tHg concentration data is questionable because the sampling scheme described had little statistical rigor.

The other major product of the proposed project is an engineering evaluation of methods to reduce MMHg production in potential future restoration sites. The proposed engineering

evaluation was not sufficiently described to review – there were no details of scope, methods, or products. The value of conducting such an analysis as part of this project rather than as part of the design and engineering of individual restoration projects is not clear.

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## CALFED Ecosystem Restoration Program

### External Scientific Review Form

**Proposal Number:** 012

**Proposal Title:** Minimizing impact of Mercury from BDCP Restoration Activities

**Reviewer:** #3

#### Conflict of Interest Statements:

I have no financial interest in this proposal (please mark correct response).

- Correct

- Incorrect

#### General Review Questions:

Along with your written observations in response to the questions below, please rate each using the following criteria:

Excellent: Outstanding in all respects

Very Good: High quality in nearly all aspects

Good: Quality work, but with some deficiencies

Fair: Lacking in one or more critical aspects

Poor: Serious deficiencies

1. **Problem/Goals.** Is the problem that the project is designed to address adequately described? Are the goals, objectives, and hypotheses clearly stated and internally consistent? Does the proposal describe the ecosystem goals it is designed to address (link to ERP goals)?

Comments:

The overall goal is to inform the planning of the BDCP to minimize methylmercury loadings from the Yolo bypass, but my comments on approach and conceptual model reveal that this reviewer is doubtful that this project is the best approach for informing the BDCP planning activities. The project objectives are not really objectives, but rather tasks and therefore do not add any useful detail to the goal statement. There is no scientific hypothesis and the word hypothesis is not mentioned in the proposal. The implied hypothesis is that 1) wetlands on soil with mercury in the bypass are more likely to methylate mercury than wetlands on soil without mercury. This implied hypotheses further implies that mercury in the soil is the primary or only source of mercury, and that we could significantly reduce methylmercury by limiting wetland restoration to lands with little or no mercury.

Is MeHG limited by total mercury or rather by the amount of methylating environments? If the latter, which this reviewer understands to be the case, shouldn't research be focused on designing and managing wetlands to minimize methylation, instead of trying in vain to create wetlands where there is no mercury. Isn't there enough mercury in the Yolo bypass or flowing in from Cache Creek to generate methylmercury in methylating wetland environments even if new wetlands are constructed on clean soil?

Page 19 of the DRERIP conceptual model points out that frequent wetting and drying as well as temperature, are key factors effecting the methylation of mercury. The proposal could better achieve its goal by providing guidance on the timing, duration, and frequency of inundation – all factors that are easier to control than the presence of mercury in the Yolo bypass.

The Yolo bypass already floods frequently, presumably with mercury rich water from Cache Creek and Knights Land Ridge Cut, as well as water from the Sacramento Valley, thus creating an ideal environment for methylation regardless of BDCP actions. BDCP actions will increase the frequency of prolonged inundation, but it may actually reduce the number of wetting and drying cycles. To the extent that BDCP causes one prolonged inundation instead of 2 or 3 inundation events from local run-off during a winter, BDCP activities to increase flow from the Sacramento may actually reduce the numbers of wetting and drying cycles or lower the water temperature.

If the goal is to minimize mercury methylation from BDCP activities, wouldn't it make more sense to focus on the timing, magnitude, and duration of managed flows onto the bypass rather than the location of wetlands on the bypass which cannot be controlled during existing and future events when the weir is overtopped.

In short, it seems to this review that the proposal at best is designed to solve only a fraction of the problem and even then, I am doubtful that the proposed remediation strategies have any merit in the hydraulic environment of the Delta.

Rating: Fair

2. **Approach.** Does the proposal clearly describe its approach (including study design and methods, if appropriate)? Is the approach well designed and appropriate for meeting the objectives of the project as described in the proposal? Will the proposal contribute to our knowledge base?

Comments:

The approach is to 1) collect samples, 2) try to figure out what BDCP plans to do, and 3) try to identify some strategies such as berms or retention basins for limiting inundation or catching sediment with mercury.

Collecting samples seems worthwhile, but the proposal does not provide much discussion about how they will evaluate how reactive the HG is, which appears to be an important consideration. Lack of detail in the budget makes it difficult to understand how much of the overall effort is actually devoted to collecting data vs. planning.

The second task is to collect “detailed information” on the proposed BDCP that would occur in areas with high Hg. This reviewer is very familiar with BDCP and the Yolo Bypass conservation measure and is certain that detailed information is not available.

The third task involves engineering reports on that evaluate solutions to minimizing MMHg loadings to the Delta as a result of BDCP projects. This last task is simply not consistent with the PSP priorities, and the preliminary ideas for how do to this (i.e. constructing berms or settling basins) do not seem very promising given the function and hydraulic characteristics of the bypass.

Rating: Poor

3. **Feasibility.** Is the proposed project’s approach fully documented and technically feasible? Can the project be completed within reasonably foreseeable constraints (e.g., acquiring permits, construction, weather, etc...)? Does the proposal thoroughly address requirements such as environmental compliance and permitting? Is the scale of the project consistent with the objectives?

Comments:

Collection of Hg data is feasible. This reviewer doubts whether it is feasible or useful to control methylmercury fluxes by constructing berms, excavation, or retention ponds. Berms on the bypass are problematic and berms parallel to the flow could just trap water during unplanned flood events under base conditions, rather than control it during managed events under BDCP. How would detention basins work in the bypass, especially when it was flooded?

Most importantly, is it really feasible to control mercury methylation on the bypass by simply changing the substrate in a few areas? Data collection as proposed would be useful, but the proposal doesn’t provide detail about what this would cost or entail.

Rating: Poor

4. **Conceptual Model.** Does the proposal provide a conceptual model that describes the interconnections among the key ecosystem components relevant to the action(s) being proposed? Does the conceptual model clearly explain the hypotheses it is testing?

Comments:

The conceptual model discussion is very limited and does not discuss any of the complexities. There is no scientific hypothesis and the word hypothesis is not mentioned in the proposal. The hypotheses is discussed above in the goals section.

Rating: Poor

5. **Performance Evaluation Plan (Monitoring Plan and Performance Measures).** Does the proposal include a plan for project performance evaluation (monitoring to assess results and evaluate assumptions and hypotheses)? Does the project include appropriate performance measures to measure success relative to the project’s goals and objectives? Will future studies or restoration projects be able to incorporate the information from this project?

Comments:

The proposal does not mention performance monitoring or performance measures.

Rating: Poor

6. **Expected Products/Outcomes.** Are products of value likely from the project? Are products of value also likely from the individual components of the project? Will the results of this study be readily accessible?

Comments:

Data collection and analysis could be very useful, but it is unclear from the budget what fraction of the total budget would actually be spent on collection and analysis.

Rating: Good.

7. **Previous Related Work.** Does the proposed project continue past work or include any work that could be considered a duplication of work previously done or currently being done by others?

Comments:

Yes. Proposes to expand on the existing survey of Yolo Bypass conducted by (Heim et al., 2010). This project will fill in the following data gaps of the Heim et al. (2010) study: 1) add stations to increase coverage of Hgt distribution; 2) access and sample extensively the area of Conaway Ranch; 3) sample Hgt distribution in soils with depth.

Rating: Good.

8. **Qualifications.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project? Do they have working knowledge of California streams and rivers?

Comments:

The team is qualified.

Rating: Good.

9. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed? If the budget is considered to be excessive or inadequate for the work proposed, please highlight areas of the budget that may be of concern.

Comments:

The budget includes \$50,000 plus overhead for travel and per diem out of a \$300,000 budget. Where are they traveling to and from?



The lack of budget detail is a red flag. It is impossible to see how much money will be spent collecting data vs. developing schemes to dig up sediment or wall off portions of the bypass.

Rating: Poor

**Additional comments:**

**Overall Evaluation Summary Rating**

In the space below, please provide an overall rating of the proposal using one of the following categories:

- **Superior:** Outstanding in all respects with superior technical and scientific value and no significant concerns. Expected to add substantial new thinking/concepts to our knowledge/understanding of the topic proposed.
- **Above Average:** A very good proposal with at least high technical and scientific value and no significant concerns. Will add solid basic knowledge/understanding of the topic proposed.
- **Adequate:** A reasonable proposal without serious technical deficiencies and at least adequate value scientifically. Will add some useful knowledge to the topic proposed.
- **Inadequate:** A technically deficient proposal and/or one with low value, serious impediments or concerns. Will not likely change our basic knowledge/understanding of the topic proposed.

Rating: **Inadequate**

Please provide a brief explanation of your summary rating: This proposal is not very well developed and there is little detail about the worthwhile portion of the project, data collection. The planning portions of the project are not well thought out. There is no detail in the budget to determine how much money will be spent on data collection vs. unnecessary planning.