Proposal Reviews

#129: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

San Francisco Estuary Institute

Final Selection Panel Review	
Initial Selection Panel Review	
Research and Restoration Technical Panel Review	
Bay Regional Review	
External Scientific Review	#1 #2 #3 #4
Prior Performance/Next Phase Funding	#1 #2
Environmental Compliance	
Budget	

Final Selection Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Final Selection Panel Review

Proposal Number: 129

Applicant Organization: San Francisco Estuary Institute

Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

Please provide an overall evaluation rating.

Fund	
As Is	**-**
In Part	**-**
With Conditions	**-**
Consider as Directed Action	**X**
Not Recommended	**-**

Amount: **$1,108,380.00**

Conditions, if any, of approval (if there are no conditions, please put "None"):

None

Provide a brief explanation of your rating:

Letters from the ABAG CALFED Task Force and San Francisco Estuary Project and from the Clean Estuary Partnership commented on this proposal. The Selection Panel believes the applicants should respond to these comments when their proposal is revised for consideration as a directed action, following the CALFED Science Program mercury workshop. The workshop will develop an integrated science strategy to address questions pertaining to potential linkages between wetland-restoration activities, the production of methylmercury, and contamination of aquatic biota, fish, and wildlife, which can influence human exposure to methylmercury. It will provide a setting to coordinate CALFED-supported mercury monitoring and research with marsh restoration projects that the selection panel recommends, as suggested in the comment letter from the Clean Estuary Partnership. The applicants should consider and incorporate recommendations emanating from that workshop into their revised proposal.

Initial Selection Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Initial Selection Panel Review

Proposal Number: 129

Applicant Organization: San Francisco Estuary Institute

Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

Please provide an overall evaluation rating.

Explanation of Recommendation Categories: Fund

- **As Is** (a proposal recommended for funding as proposed)
- **In Part** (a proposal for which partial funding is recommended for selected project phases or components)
- **With Conditions** (a proposal for which funds are recommended if the applicant contractually agrees to meet the specified conditions)

Consider as Directed Action in Annual Workplan (a proposal addressing a high priority action that requires some revision followed by additional review prior to being recommended for funding)
Not Recommended (a proposal not currently recommended for funding-after revision may be considered in the future)

Note on "Amount":

For proposals recommended as Fund As Is, Fund In Part or Fund With Conditions, the dollar amount is the amount recommended by the Selection Panel.

For proposals recommended as Consider as Directed Action in Annual Workplan, the dollar amount is the amount requested by the applicant(s).

Fund	
As Is	**-**
In Part	**-**
With Conditions	**-**
Consider as Directed Action	**X**
Not Recommended	**-**

Amount: **$1,108,380.00**

Conditions, if any, of approval (if there are no conditions, please put "None"):

None

Provide a brief explanation of your rating:

This proposal addresses topics of significant ecological and management concern: the production of methylmercury and its bioaccumulation in food webs supporting nesting birds and their young. The proposed work would focus on processes and factors influencing methylmercury exposure of the federally endangered clapper rail in tidal wetlands in North San Francisco Bay. Analyses of clapper rail eggs from nests in this area have shown high concentrations of mercury that could adversely affect developing young. The clapper rail nests in the study area (tidal marshes), and its feeding range is believed to be local. Diminished reproductive success could adversely affect populations of clapper rails and other avian species exposed to high levels of methylmercury via dietary uptake.

A multidisciplinary team of investigators, including a microbial ecologist, an environmental biogeochemist, a wildlife biologist, and aquatic biologists, would do the proposed work. The two USGS scientists on the team have extensive experience with large, process-level studies of mercury cycling at the ecosystem scale, and the Selection Panel believes that their leadership on the scientific team would be essential to the success of the project. Scientific reviewers emphasized that success will hinge on identifying trophic pathways for methylmercury exposure in the clapper rail. The project budget is realistic and well justified.

The scientific reviewers and Selection Panel were generally supportive of the proposal, but agreed that much more emphasis should be given to ecological work to define the diet and food web of the clapper rail. The Selection Panel believes that this proposal should be considered as a directed action after these comments have been addressed in a revised proposal. The Panel also recommends that the applicants participate in the Mercury Science Strategy Workshop being planned by CALFED, tentatively for fall 2002. The applicants should also consider and incorporate recommendations emanating from that workshop into their revised proposal.

Research and Restoration Technical Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Research and Restoration Technical Panel Review Form

Proposal Number: 129

Applicant Organization: San Francisco Estuary Institute

Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

Review:

Please provide an overall evaluation summary rating:

Superior: outstanding in all respects;
Above Average: Quality proposal, medium or high regional value, and no significant administrative concerns;
Adequate: No serious deficiencies, no significant regional impediments, and no significant administrative concerns;
Not Recommended: Serious deficiencies, significant regional impediments or significant administrative concerns.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Superior	**The panel was very positive about the fundamental design and potential for success of the project. This is a strong proposal that focuses on a small watershed study area to evaluate mercury transformations and bioaccumulation. The incorporation of studies affecting Hg bioaccumulation in a threatened species is of great interest. As a large portion of the success of the project may rest with defining links in bioaccumulation of Hg in the clapper rail, the panel felt strongly that the group should redirect to provide some focused work on identifying key components of the clapper rail diet. A more thorough explanation of stable isotope food web work (C, N) may help. The panel also felt that the group should also demonstrate better integration with other groups working within their study region, including the exact same marsh site. These minor changes should not detract from an otherwise fine proposal. PIs should be certain that permits are in place for collection of samples directly involving clapper rail.**
XAbove average	
-Adequate	
-Not recommended	

1. **Goals and Justification.** Does the proposal present a clear statement of goals, objectives and hypotheses? Does the proposal present a clear justification and conceptual model for the project?

   The authors present a study of Hg cycling of a confined wetland watershed in the North San Francisco Bay area. The site is notable because elevated levels of Hg have been observed in the eggs of the endangered California clapper rail, which nests in the area. The PIs propose a detailed study of the Petaluma River and its associated wetlands along a tidal and salinity gradient. The goal of this project is to fill in some of the gaps in our knowledge of where Hg

methylation occurs in San Francisco Bay/Delta, and what controls MeHg production, specifically: 1. Spatial and temporal variation of mercury (Hg) and methylmercury (MeHg) in North San Francisco Bay tidal wetlands. 2. Environmental factors influencing the net methylation of Hg in these areas. 3. MeHg bioaccumulation and impacts in California clapper rails and other species at different trophic levels in these environments. The concept and goals of this study are clearly stated: How does MeHg production and bioaccumulation in marshes change with 1) salinity and 2) marsh development over time after restoration. Their study sites also encompass marsh sites of various ages.

A study designed to evaluate the processes that lead to enhanced bioaccumulation of Hg in clapper rail eggs is worthwhile and timely. The PIs present a research plan that evaluates geochemical and microbiological processes along a salinity gradient in the river system in an attempt to evaluate processes influencing the food webs of such marsh systems. A conceptual model of methylmercury production for the marshes is provided, although it is somewhat simplistic.

2. **Likelihood of Success (Approach, Feasibility, Capabilities and Performance Measures).** Is the project likely to succeed based on the approach, feasibility and project team capabilities? Are the proposed performance measures adequate for measuring the project's success?

   The PIs have addressed a specific concern at a marsh system within the Bay-Delta region. It is a site of enhanced bioaccumulation of Hg in nesting bird eggs. The study brings a geochemist, microbiologist and an ecologist to tackle the research. The choice of a confined system is interesting and the gradient of sites along a salinity gradient should prove a nice geochemical gradient. The PIs will use novel techniques, especially those related to stable isotopic techniques, to study transformations of Hg and MeHg in the system. It is imperative that the PIs develop a food web for the clapper rail. It appears that the feeding range of this study is quite local and that biota produced within the marshes of study is responsible for the Hg in rail eggs. That must be directly evaluated. There is slight mention of stable isotopic C and N work to be done at UC Davis, yet it appears to be a sidelight of the research. That important phase should be stressed and incorporated.

   The PIs present a clear number of steps as performance measures that involve peer review and QA. It might have been instructive to see accomplishment of specific project goals in Year 1 that would lead to specific tasks or alterations in forthcoming years.

3. **Outcomes and Products.** Will the project advance the state of scientific knowledge in general and/or make an important contribution to the state of knowledge of the Bay-Delta Watershed? For restoration proposals, is the project likely to contribute to ecosystem restoration or species recoveries in a significant way? Will the project produce products useful to decision-makers and scientists?

   The PIs have a history of producing results for projects that involve management concerns. The USGS group has had extensive interactions with management concerns in the Florida Everglades and should have success in this project addressing similar Hg issues. Both publish cutting-edge work in their fields, and have significant experience in large process-based field projects like this one. The success of the project will depend on their availability to guide this work, since most of the SFEI group is new to this level of Hg research. A large level of success will depend on identifying routes of trophic transfer in the clapper rail and similar piscivorous birds.

4. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget is rather high, but a result of the overhead costs of agencies. It would be nice to see involvement of postdoctoral and graduate students on individual research subprojects. Perhaps some costs can be diverted to field sampling of events. With such a confined study area, sampling of events at several sites would take no longer than a day.

5. **Regional Review.** How did the regional panel(s) rank the proposal (High, Medium, Low)? Did the regional panel(s) identify significant benefits (regional priorities, linkages with other activities, local involvement) or impediments (local constraints, conflicts with other activities, lack of local involvement) to this proposal? What were they?

   HIGH The regional panel favors environmental water quality projects (like this one) which will provide information about mercury in the region useful for making decisions about mercury management and cleanup.

6. **Administrative Review.** Were there significant concerns about the proposal with regard to the prior performance, environmental compliance and budget administrative reviews? What were they?

   Must obtain a Scientific Collecting Permit for sampling of fish and rail eggs. Section 7 consultation with the US Fish and Wildlife Service is necessary. California Clapper Rail is a FULLY protected species and the Department of Fish and Game is not authorized to issue any permits for collecting or incidental take of this species. Permits for California Clapper Rail collection cannot be issued by the State. Advise Section 7 consultation with USFWS for sampling and collection. Must obtain Scientific Collecting Permit for fish sampling and rail egg collection.

Miscellaneous comments:

None

Bay Regional Review:

Proposal Number: 129

Applicant Organization: San Francisco Estuary Institute

Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

Overall Ranking: **-**Low **-**Medium **X**High

Provide a brief summary explanation of the committee's ranking:

The regional panel favors environmental water quality projects (like this one) which will provide information about mercury in the region useful for making decisions about mercury management and cleanup.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   N/A to this type of project (scientific project)

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   MR #5 (Ensure that restoration isn't threatened by degraded water quality) bullet 2 - Hg

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   XYes **-**No

   How?

   Yes. This project makes direct links to environmental health toxicity (when is mercury available, in what flora or fauna, in which forms and at what concentrations). This project will help with decisions about restoration project design and management.

4. Does the project adequately involve local people and institutions?

   XYes **-**No

How?

The team of scientists is local, and the sample locations are within the region.

Other Comments:

Mercury methylation has a (?small?) potential to derail environmental restoration. This project will likely answer scientific questions and avoid a derailment.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **129**

Applicant Organization: **San Francisco Estuary Institute**

Proposal Title: **Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

I have a connection as a research collaborator with Dr. David Krabbenhoft. This research relationship is in no way related to this proposal, nor is it in any way financially connected.

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
XExcellent	**The proposal is scientifically sound, provides the opportunity for scientific advancements and will likely have considerable management implications. It is highly feasible, and involves a top-notch team of researchers. It is my opinion that it should be fully funded.**
-Good	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   In my opinion, the study of mercury speciation in tidal wetland systems is timely and important. Research effort has gone into the study of the mercury biogeochemistry of freshwater wetland systems. They have been shown to be important mediators of mercury and methylmercury export to the aquatic ecosystem due to their unique hydrogeomorphic position in the landscape and biogeochemistry. Their is little to no information about the role of tidal marsh systems in the cycling of mercury, yet their role in estuarine mercury processes may be very significant. Thus, the aim of this study to examine the environmental factors controlling Hg and MeHg distribution in sediments, water and selected biota of tidal marshes in North San Francisco Bay is timely and important. Moreover, the applicants overt

connection of this overall aim to the appropriateness and feasability of wetland restoration projects is reasonable.

The project hypotheses are clearly stated under the main headings of Mercury Distribution, Mercury Transformations and Mercury Bioaccumulations. In my opinion, some of the hypotheses under these headings have been fairly well demonstrated in the literature [e.g. multiple biogeochemical factors mediate MeHg production and degradation among and within wetlands (p.4); bioaccumulated Hg correlates with trophic level of an organism (p.6)], however their explicit statement provides a logical continuity and internal consistency which reveals a thoughtful conceptual foundation. Other hypotheses are novel, such as those that consider the spatial and temporal variability of mercury and methylmercury distributions in marsh systems. These types of questions are grossly understudied, yet provide fundamental information for management and modelling, in my opinion.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   The study is justified relative to existing knowledge. There is emerging information about the environmental parameters governing the speciation of mercury, however, as stated by the applicants, these effects of these parameters vary widely in magnitude and direction. Further research on these fundamental controls represents a major contribution to the scientific literature. Tidal marshes represent an ideal place to test the sensitvity of mercury speciation to environmental parameters, as they are a biogeochemically transitional environment.

   The conceptual model for the proposed study is clearly stated. Background information on factors controlling mercury speciation, previous research on mercury in biota in the area, and the importance of the information to be derived from the proposed project to tidal wetland restoration projects is provided. This information is thorough and provides a clear justification for the proposed work. Sufficient background data on mercury in this system, and the theoretical soundness of the hypotheses justify a full-scale implementation of the project.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   The research approach is well designed and appropriate for meeting the objectives. The site selection process is well thought out, particularly in the consideration of marsh age and position along the salinity gradient of the Petaluma River for the assessment of the distribution and biogeochemical controls. Mercury transformations are to be assesssed with isotopic incubations. I would prefer to see stable Hg isotopic assays, as they are becoming the de facto standard for these experiments due to the lower amount of added Hg that is generally required, however Dr. Marvin-Dipasquale's experience with the radioisotope methods lends considerable confidence. The photo-demethylation experiments have been perfected by Dr. Krabbenhoft.

   The project will very likely add to the base of knowledge through the generation of novel information. I particularly believe that the spatio-temporal aspects of this study will have profound implications on the understanding of mercury cycling in tidal systems. The results will undoubtedly be useful to decision-makers with respect to tidal wetland restoration approaches as indicated in the proposal.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   The approach is fully documented and is completely feasible. Proposed methods are proven in the scientific literature, and contingency plans are fully outlined in the proposal. The scale of the project is consistent with the objectives. I am confident that the project will fully satisfy the stated objectives.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The applicants indicate that high quality peer review is one of the best ways to ensure that the projects products successfully meet objectives. I fully agree. In addition to the peer-review of goals, final reports, and journal publications, the lab quality control is of great importance. The quantification of these performance measures through accepted QA/QC procedures is completely sufficient.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   The products of value from this project will be:

   1) the fundamental scientific information about mercury cycling in tidal wetland ecosystems that is so lacking in the literature, and;

   2) the description of these processes to wetland managers who will require this information in restoration efforts.

   I place considerable value on these products.

7. **Capabilities.** 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?

   The applicants are highly qualified to efficiently and effectively implement the proposed project. Drs. Collins, Davis and Yee have extensive experience in the region of interest and have considerable knowledge of wetlands, trace metals and mercury. Dr. Davis' involvement in previous CALFED projects and authorship in a CALFED whitepaper demonstrate a solid ability to undertake the project.

   Drs. Marvin-Dipasquale and Krabbenhoft are experts in the field of mercury fate and transport in the environment. Their involvement secures the success of this project. Their infrastructures at USGS Menlo Park, CA and Middleton, WI are second-to-none and can easily handle the demands of the project.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget appears to be reasonable and adequate. The expenses for the most significant component of the budget, field sampling, analyses and data reduction are very reasonable, given the scope of the project. The budget justification provided is exhaustive and comprehensive. The

accounting of proposed expenditures provided here is absolutely beyond reproach, and should be held up as an example of the level of detail that should be expected for a project proposal of this magnitude. I believe that the proposed budget is adequate for the work proposed, primarily because the two main labs involved are directed by Drs. Marvin-Dipasquale and Krabbenhoft and their cost assessments will be reasonable and realistic.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **129**

Applicant Organization: **San Francisco Estuary Institute**

Proposal Title: **Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

I work with D. Krabbenhoft on a number of Hg-related studies elsewhere in the US and Canada, and have published with him. We are currently co-investigators on two studies. I have worked and published with M. Marvin-DiPasquale in the recent past.

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**I rank this proposal between good and excellent.** **A new team has been assembled to examine an important question, control of net MeHg production in SF Bay marshes. The study will use most elements of a proven approach. The approach is based on detailed study of biogeochemical processes through time and space within an ecosystem, using a carefully selected a suite of sites across important biogeochemical gradients. The SFEI team will be trained by people working in this field. Success will depend on commitment from the outside experts.**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The goal of this project is to fill in some of the gaps in our knowledge of where Hg methylation occurs in San Francisco Bay/Delta, and what controls MeHg production, specifically: 1. Spatial and temporal variation of mercury (Hg) and methylmercury (MeHg)

in North San Francisco Bay tidal wetlands. 2. Environmental factors influencing the net methylation of Hg in these areas. 3. MeHg bioaccumulation and impacts in California clapper rails and other species at different trophic levels in these environments.

In this reviewers opinion, the key questions for Hg management in the Bay/Delta are: 1. What is the main source of Hg to the Bay Delta - historically polluted sediments, new releases from mine tailings or atmospheric deposition? 2. What is the main source of Hg for methylation? 3. What is the distribution of methylation activity within the Bay, Delta and tributaries?

This project addresses two of those key questions. Understanding what types of habitats support methylation may be useful to the design of restoration programs, particularly wetland and upland restoration.

The concept and goals of this study are clearly stated: How does MeHg production and bioaccumulation in marshes change with 1) salinity and 2) marsh development over time after restoration.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   A conceptual model of methylmercury production for the marshes is provided, although it is somewhat simplistic.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   This project will examine Hg and MeHg concentrations in the sediments, water and biota of five tidal marshes along a salinity gradient up the Petaluma River. The study aims to separate the effects of salinity and marsh development. The project will accomplish a fairly detailed study of Hg transport and transformation within these marshes. Examination of various habitats within the marsh is also key. Both Marvin-DiPasquale and especially Krabbenhoft have significant experience doing these types of studies. Since only 5 marshes will be studied, this will not provide much statistical power to resolve salinity and age effects.

   An important missing piece of information is the flux of MeHg from these marshes to the river. Measurement of tidal flux would provide an integrative measure of net MeHg production and export from the marsh to the rest of the ecosystem. Hg and MeHg concentrations through one or more full tidal cycles would need to be carried out at the outlet of each marsh.

   Hg transformations: Marvin-DiPasquale will carry out methylation/demethylation analyses, and is well qualified to do so. Krabbenhoft will examine photodemethylation using Hg stable isotopes as tracers. His is one of very few labs who do this work at this time.

   USGS/Middleton (Krabbenhoft) will do the Hg/MeHg analyses. They are one of the best Hg analysis in the US, with a long history of successful sampling and method development, method validation and successful sample intercalibration. They have a strong QA program in place, and this project will also incorporate a project-level QA program.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   The approach is well documented. The detailed examination of processes across marshes of varying salinity and marsh age is appropriate to the study goal, and consistent with successful approaches to understanding Hg biogeochemistry in other ecosystems.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   Yes, these are detailed and appropriately focus around publication and peer review of research results.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   Yes, see comments on justification.

7. **Capabilities.** 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?

   Krabbenhoft and Marvin-DiPasquale have excellent track records in Hg biogeochemistry, Both publish cutting-edge work in their fields, and both have significant successful experience in large process-based field projects like this one. The success of the project will depend on their availability to guide this work, since most of the SFEI group is new to this level of Hg research.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   Yes, the budget is reasonable for the large amount of detailed process work being proposed. The proposed study will provide a significant amount of new and critical information.

Miscellaneous comments:

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **129**

Applicant Organization: **San Francisco Estuary Institute**

Proposal Title: **Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

I have worked with DPK on several Hg cycing projects in the past. I have worked with MMdP on an Everglades project. i do not feel that these associations prevent me from giving an unbiased review of this proposal.

Review:

Please provide an overall evaluation summary rating:

<u>Excellent:</u> outstanding in all respects;
<u>Good:</u> quality but some deficiencies;
<u>Poor:</u> serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**This is an interesting proposal that focuses on a small study area to evaluate mercury transformations and bioaccumulation. The incorporation of studies affecting Hg bioaccumulation in a threatened specie is of great interest. A large portion of the success of the project will deal with defining links in bioaccumulation of Hg in the rail. A redsign to perform some mass balances and event-based sampling is warranted.**
XGood	
-Poor	

1. **<u>Goals.</u>** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The authors present a study of Hg cycling of a confined wetland watershed in the North San Francisco Bay area. The site is notable because elevated levels of Hg have been observed in the eggs of the endangered California clapper rail, which nests in the area. The PIs propose a detailed study of the Petaluma River and its associated wetlands along a tidal and salinity gradient. Unfortunately, the authors do not present a clear-cut identification of goals and hypotheses to be tested in this proposal. The goals are n the proposals, but intertwined

within the approach section.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   A study designed to evaluate the processes that lead to enhanced bioaccumulation of Hg in clapper rail eggs is worthwhile. The PIs present a research plan that evaluates geochemical and microbiological processes along a salinity gradient in the river system in an attempt to evaluate processes influencing the food webs of such marsh systems. It is truly a research project that may in fact, lead to management options.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   The PIs have addressed a specific concern at a marsh system within the Bay-Delta region. It is a site of enhanced bioaccumulation of Hg in nesting bird eggs. The study brings a geochemist, microbiologist and an ecologist to tackle the research. The choice of a confined system is interesting and the gradient of sites along a salinity gradient should prove a nice geochemical gradient. The PIs will use novel techniques, especially those related to stable isotopic techniques, to study transformations of Hg and MeHg in the system. As I review this proposal in the context of the others in this topic, I have a difficult time reconciling the observation on the East side of the Bay that export of MeHg from the watershed is the dominant input to the system and how this confined estuary relates to overall Hg and MeHg cycling. Since this is a confined river basin, it would be beneficial to better describe, in detail, the seasonal response of the watershed to the river Hg budget. The current sampling scheme is not designed to evaluate events or high flow periods. Is the river system entirely within the study unit? Other studies have gone so far as to attempt to construct a mass balance of a watershed. Could that not be done here? The simplicity of this system warrants mass balances, either over a tidal cycle or over seasonal or annual bases. On a side note, the aqueous sampling appears rather simplistic a grab sample collected at mid-stream. This appears inadequate in turbid system and standard USGS sampling protocols, albeit clean should be used.

   It is also imperative that the PIs develop a food web for the clapper rail. It appears that the feeding range of this study is quite local and that biota produced within the marshes of study is responsible for the Hg in rail eggs. That must be directly evaluated. There is slight mention of stable isotopic C and N work to be done at UC Davis, yet it appears to be a sidelight of the research. That should be stressed and incorporated.

   Are there other sites in the marsh that are possible sites of methylation? Bacterial-algal mats are observed in many regions of San Francisco Bay. One would think that the intense planktonic-bacterial cycling in the mats may be important in Hg cycling, especially in the sulfur cycle. Also, what happens to DOC, colloids and Hg as salinity increases? Might these be transition zones from highly complexed to more reactive Hg?

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

As documented, the approach appears feasible, but unless more detail is given to seasonal events and high flow periods, the likelihood of success is diminished. A simple mass balance is the first step in the process. That can help eliminate time spent in areas that will not affect the overall goals. The choice of stream sites based on order of stream is an interesting approach and should be expanded upon. A number of small mass balances could be coupled to clearly show Hg dynamic of this system.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The PIs present a clear number of steps as performance measures that involve peer review and QA. It might have been instructive to see accomplishment of specific project goals in Year 1 that would lead to specific tasks or alterations in forthcoming years.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   The PIs have a history of producing results for projects that involve management concerns. DPK and MMdP have had extensive interactions with management concerns in the Florida Everglades and should have success in this project addressing management concerns. A large level of success will depend on identifying routes of trophic transfer in the clapper rail. It is imperative that the research identify these pathways.

7. **Capabilities.** 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?

   I have no doubt that the PIs are well qualified to conduct this research. They have proven track records and are widely published in the peer-reviewed literature. They certainly have the laboratory capabilities and field experience to complete the project tasks.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget is rather high, but a result of the overhead costs of agencies. It would be nice to see involvement of postdoctoral and graduate students on individual research subprojects. Perhaps some costs can be diverted to field sampling of events. With such a confined study area, sampling of events at several sites would take no longer than a day.

Miscellaneous comments:

External Scientific: #4

Research and Restoration External Scientific Review Form

Proposal Number: **129**

Applicant Organization: **San Francisco Estuary Institute**

Proposal Title: **Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
XExcellent	**Proposal appears to address some critical question about mercury/methymercury contamination and bioaccumulation in restoring wetlands, with appropriate comparison to natural wetlands. This proposal would provide critical information for evaluation of CALFED restoration planning and monitoring.**
-Good	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   Goals and objective are not stated explicitly, but specific hypotheses are spelled out within the context of the sampling design. The topic is certainly timely, especially in terms of the consequences of tidal marsh restoration at the scale which CALFED is addressing.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

A detailed conceptual model in narrative form provides insight into the complex interactions of mercury, methylmercury and wetland environments. This provides ample justification and rationale for the proposed studies.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   From the viewpoint of a non-chemist, with the background of the conceptual model, the approach and methodologies appear to be quite complete. The distribution of sites of different ages along the Petaluma River salinity gradient is designed to accommodate both marsh restoration age and position along the salinity gradient.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   Feasibility is high. The chemical methodology is well described, although this reviewer is not qualified to evaluate the details.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   Performance measures are schedule and timeline based, with no real verification of scientific performance.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   The products are routine reporting of the results, in technical reports and meeting presentations.

7. **Capabilities.** 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?

   The investigators and institution have strong capabilities and a history of capable assessments and evaluations of contaminants in the Bay-Delta. Incorporation of results into the scientific literature is not one of their strong points, however.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   Cost ($1,108,380) is difficult to assess as a reviewer without experience in conducting complex studies of environmental contamination and toxicology.

Miscellaneous comments:

Prior Performance/Next Phase Funding: #1

New Proposal Number: 129

New Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

1. Prior CALFED project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   CALFED #99-B06, USBR #99-FC-20-0241 - San Jose State University Foundation - Assessment of Ecological and Human Health Impacts of Mercury in the Bay-Delta Watershed

2. Prior CVPIA project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   N/A

3. Have negotiations about contracts or contact amendments with this applicant proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

   -Yes -No **X**N/A

   If no, please explain any difficulties:

4. Are the status, progress, and accomplishments of the applicant's current CALFED or CVPIA project(s) accurately stated?

   -Yes -No **X**N/A

   If no, please explain any inaccuracies:

5. Is the applicant's progress towards these project(s)' milestones and outcomes to date satisfactory?

   -Yes -No **X**N/A

   If no, please explain deficiencies:

6. Is the applicant's reporting, records keeping, and financial management of these projects satisfactory?

   -Yes -No **X**N/A

   If no, please explain deficiencies:

7. Will the project(s) be ready for next phase funding in 2002, based on its current progress and expenditure rates?

-Yes -No **X**N/A

If no, please explain:

Other Comments:

While I administer CALFED Agreement 99-B06 with the San Jose State University Foundation, I have no direct knowledge of SFEIs performance on that project.

Did not have a copy of this project proposal sent over, so was unable to complete 2002 Proposal Title as part of the titles are covered in the copy of the table sent to us. * * *

Prior Performance/Next Phase Funding: #2

New Proposal Number: 129

New Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

1. Prior CALFED project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   ERP 99-N07 ? Chronic Toxicity of Environmental Contaminants in Sacramento Splittail- A Biomarker Approach

2. Prior CVPIA project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   N/A

3. Have negotiations about contracts or contact amendments with this applicant proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

   -Yes **-**No **-**N/A

   If no, please explain any difficulties:

4. Are the status, progress, and accomplishments of the applicant's current CALFED or CVPIA project(s) accurately stated?

   -Yes **-**No **-**N/A

   If no, please explain any inaccuracies:

5. Is the applicant's progress towards these project(s)' milestones and outcomes to date satisfactory?

   -Yes **-**No **-**N/A

   If no, please explain deficiencies:

6. Is the applicant's reporting, records keeping, and financial management of these projects satisfactory?

   -Yes **-**No **-**N/A

   If no, please explain deficiencies:

7. Will the project(s) be ready for next phase funding in 2002, based on its current progress and expenditure rates?

   XYes **-**No **-**N/A

If no, please explain:

Other Comments:

Environmental Compliance:

Proposal Number: 129

Applicant Organization: San Francisco Estuary Institute

Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

1. Are the legal or regulatory issues that affect the proposal identified adequately in the proposal?

   -Yes **X**No

   If no, please explain:

   Must obtain a Scientific Collecting Permit for sampling of fish and stilt eggs.

   Section 7 consultation with the US Fish and Wildlife Service is necessary.

   California Clapper Rail is a FULLY protected species and the Department of Fish and Game is not authorized to issue any permits for collecting or incidental take of this species.

2. Does the project's timeline and budget reflect adequate planning to address legal and regulatory issues that affect the proposal?

   -Yes **X**No

   If no, please explain:

   No permits were being sought for this project, so no budget or timeline were specified.

3. Do the legal and regulatory issues that affect the proposal significantly impair the project's feasibility?

   XYes **-**No

   If yes, please explain:

   Permits for California Clapper Rail collection cannot be issued by the State.

   Advise Section 7 consultation with USFWS for sampling and collection.

   Must obtain Scientific Collecting Permit for fish sampling and stilt egg collection.

Other Comments:

Budget:

Proposal Number: 129

Applicant Organization: San Francisco Estuary Institute

Proposal Title: Mercury and Methylmercury Processes in North San Francisco Bay Tidal Wetland Ecosystems

1. Does the proposal include a detailed budget for each year of requested support?

   XYes **-**No

   If no, please explain:

2. Does the proposal include a detailed budget for each task identified?

   XYes **-**No

   If no, please explain:

3. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs?

   XYes **-**No

   If no, please explain:

4. Are appropriate project management costs clearly identified?

   XYes **-**No

   If no, please explain:

5. Do the total funds requested (Form I, Question 17A) equal the combined total annual costs in the budget summary?

   -Yes **X**No

   If no, please explain (for example, are costs to be reimbursed by cost share funds included in the budget summary).

   17A is $1,037,307 and Budget Summary Grand Total is $1,108,380. No cost share funds identified.

6. Does the budget justification adequately explain major expenses?

   XYes **-**No

If no, please explain:

7. Are there other budget issues that warrant consideration?

   -Yes **X**No

   If yes, please explain:

Other Comments: