Proposal Reviews

#136: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

San Francisco State University

Initial Selection Panel Review	
Research and Restoration Technical Panel Review	
Bay Regional Review	
Delta Regional Review	
External Scientific Review	#1 #2 #3 #4 #5 #6
Environmental Compliance	
Budget	

Initial Selection Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Initial Selection Panel Review

Proposal Number: 136

Applicant Organization: San Francisco State University

Proposal Title: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

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	**-**
Not Recommended	**X**

Amount: **$0**

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

None

Provide a brief explanation of your rating:

This proposed project would develop analytical methods and perform field and laboratory studies to examine the speciation of selenium in sediments at contaminated sites in the Bay-Delta system. The investigators are well qualified, and the goals, objectives, hypotheses, and methods are clearly described in the proposal.

Regional and Panel support for the proposal was weak. Selenium contamination is a significant problem in the Bay-Delta system; however, the investigators did not convincingly demonstrate in the proposal that information on selenium speciation in sediments would contribute significantly to understanding and mitigating the problem. Existing information indicates that biological exposure pathways in the Bay-Delta system largely involve uptake of waterborne selenium by phytoplankton, trophic transfer to filter-feeding bivalves, and dietary uptake by fish and aquatic birds that feed on bivalves. Reviewers were also critical that the proposed bioavailability work was based strictly on speciation of selenium, and did not include elimination of implications for uptake by aquatic biota.

Research and Restoration Technical Panel Review:

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

Proposal Number: 136

Applicant Organization: San Francisco State University

Proposal Title: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

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	**A very strong analytical chemical proposal but lacking a biological component. Greater connection to other projects would be an advantage as would more direct connection to implications for management. The panel considers this a very good proposal with the potential to produce valuable information on a complex chemical problem, but recommends a phased approach with a less expensive project that focuses initially on the field component only.**
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 goals and objectives are very clear. The project is well justified in that there is a significant knowledge gap as to the residence of Se in solid components (i.e., sediment and biota) of the SF Bay ecosystem. One reviewer was concerned with the size of the project related to the fact that it focused entirely on analytical data with no other connections to how these data could be used either here or in connection with other projects. For example there appears to be no linkage to direct measures of bioavailability.

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?

Overall the applicants have presented a well planned and detailed project description. The project will provide unique and novel information about a pertinent problem.

The analytical chemistry is considered to be highly feasible. Likelihood of success for most of the tasks is considered by the panel to be high. However re. Task 5, the applicants will not be addressing Se uptake and bioavailability in sediments directly. The project could have been improved by including a biologist.

Capabilities and experience of the team for doing this kind of analytical chemistry are clearly sufficient.

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?

   It was suggested that more assurance should be provided that the data will be of use to others. Clearly the analytical developments will be very useful. The project would be even more valuable if it were more explicitly coupled to other studies/activities (e.g., on fate and/or bioavailability).

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

   This 3 year project has a total budget of $1,042,987. Three of the reviews considered the size of the project too large; two felt that it was reasonable.

   The panel considers the costs to be high relative to the likely benefits largely due to no synergy with other projects. One approach to addressing this could be to fund a smaller project that focused initially on Task 1. On the basis of the field results a next phase project could address the laboratory mesocosm work and preferably involve more direct assessments of bioavailability.

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?

   Bay Regional Review ranked the project medium largely because it did not make a clear case that Se work is essential to action-oriented projects and because the panel considers Hg a higher priority at this time.

   Delta Regional Review ranked the project low because it did not demonstrate practical clean water protection policy relevance. Also it is not tied to other Se studies and discharge reduction efforts by regulatory agencies. This review indicated a need for better reporting mechanisms to answer management questions and coordination with other restoration activities.

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?

   A 1603 Agreement and corresponding CEQA documentation required. State Lands Commission land use lease may be required. No time or funds allocated for these.

Re: Budget project management costs included in PI salaries. Some discrepancy in the amount requested.

Miscellaneous comments:

None

Bay Regional Review:

Proposal Number: 136

Applicant Organization: San Francisco State University

Proposal Title: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

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

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

The regional panel favors action-oriented projects that secure and restore critical habitats in the Bay and Suisun Marsh. Although scientific investigations will help restoration projects in the long run, the proposal did not make a clear case that this Selenium work is essential to action-oriented projects in the short term. The regional panel also considers mercury a more important pollutant to study at this time. Consequently, this proposal did not secure a "high" rating.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   Three sediment sampling sites selected, no access arrangement and/or constraints mentioned in the Proposal (see Task 1 and c.2.g). As these sites are in waterways, it appears that they are accessible sampling sites.

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 is not threatened by degraded environmental water quality; Se studies to dtmn fate & transp of Se w/in food web. They propose to determine biologically available Se fate & transp

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?

   N/A This type of science project does not need to be tightly linked to specific implementation projects and/or regional planning efforts. Nonetheless, this project could provide good information to avoid selenium toxicity in future projects.

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

   XYes **-**No

   How?

   The applicant is local. They are involving high school and college students in this program to foment interest in science professions.

Other Comments:

None.

Delta Regional Review:

Proposal Number: 136

Proposal Title: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

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

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

The regional panel favors environmental water quality projects that demonstrate practical clean water protection and that provide the information most likely to be helpful in making decisions about clean water policy and action in the Delta.

The proposed study does not seem to be tied well to other selenium studies and the selenium discharge reduction efforts by regulatory agencies.

Needs better reporting mechanisms to answer managment questions on selenium toxicity.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   There are no problems getting samples for this type of study.

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

   -Yes **X**No

   How?

   Strategic Goal 6, Sed/WQ Reg. Priority 5 (ensure that restoration is not hreatened by degraded WQ.)

   Much of the reporting they propose is in the form of Masters theses. The students are ENCOURAGED to present findings at CALFED and other conferences. A web site will contain the data and findings. They also propose presentations to CALFED management. There does not seem to be a direct involvement in answering management questions and reducing effects of selenium on the environment.

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

   -Yes **X**No

   How?

They have looked at other CALFED studies but they dont seem to be working with the other study participants. They name the studies but dont tell how they are coordinating and how their work is original.

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

   XYes **-**No

   How?

   They are a local university and they propose to use (or work with) local high school students and community groups.

Other Comments:

Does not consider the changing levels of Selenium proposed by the RWQCB TMDL efforts. Does not explain how they will treat the decreased levels of Selenium in the Bay and how hot spot sampling ties into whole estuary health. They should be anticipating a degradation of Se flux in the hot spot areas.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **136**

Applicant Organization: **San Francisco State University**

Proposal Title: **Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments**

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**
-Excellent	**Parts are excellent - the speciation chemistry. Parts are overkill, too much data generation. Parts may be useful: the mesocosms.**
XGood	
-Poor	

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

   They are all clearly stated. The goal of being able to predict future Se biavailability is important and timely. Presumably the analytical chemistry and lab experimental mesocosms are a route to this end. However it is clear that the major thrust is chemical speciation in the water column and sediment.

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?

My problem with this proposal is that the bulk of the work is purely chemical speciation of Se in the water column and sediment. The bulk of the analytical chemistry, as detailed in Table 1, is devoted to the cores and peepers. This level of effort would make sense if this project were coupled in some way to a larger effort that would make use of these data. However there is no evidence that this is the case. Also this is a large effort, exceeding 1 million dollars. It would seem that a more detailed justification for this level of sampling should be included. Only a passing comment to other projects is made.

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?

   If the purpose of this project were to investigate the chemical speciation of Se, then the project is well designed. But the bioavailability part is not addressed at all. There appears to be new analytical methodology being developed.

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 analytical chemistry appears to be quite feasible. This is a big project so the question is: is all this necessary for analytical speciation work. It appears to be two projects rolled into one. A purely field investigation, and a mesocosm laboratory exercise.

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?

   Peer reviewed publications and a web site for data dissimation are proposed. More assurance should be provided that in fact the data will be of use to others

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 development of analytical capability will be useful. If all the chemistry data were to be coupled to other studies that were looking at fate and bioavailability at a larger scale it would be much more useful.

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 PIs appear to be well qualified to perform the chemistry and interpretation of the data. The infrastructure and experience are clearly sufficient. They have published this sort of data before.

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

The cost and scope of the project seems to be very large relative to the benefits. There is no synergy with other projects. The goals could be achieved with a considerably smaller effort that would be focused only on the chemical speciation. There appears to be no need for multiple cores to be analyzed in each of three years. At this level of data generation, the benefit would need to be linked to other uses.

<u>Miscellaneous comments:</u>

I have no doubts that these are competent and talented analytical geochemists. It is the scale and cost of the project that seems out of proportion to the ends. It is not clear how the data will be interpreted. A lot of data will be generated. And the bioavailability part of the project is not at all reasonable. For example, no organisms are being sampled or introduced into the mesocosms, or exposed to the various forms of Se. The same project at one-half or one-third scale, or a clear justification that such a large project would produce data that is clearly of use to other projects seems more reasonable.

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **136**

Applicant Organization: **San Francisco State University**

Proposal Title: **Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments**

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**
-Excellent	**Overall, this is a pretty good proposal by two solid geochemists but one lacking a biological component and one focusing on a component of the SF Bay ecosystem that may not be of primary importance in understanding Se bioaccumulation and impacts on resident organisms.**
XGood	
-Poor	

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

   The goals, objectives and hypotheses are clearly stated and internally consistent, however I am not convinced that the PIs have focused on goals that are of the highest importance in understanding the significance of increased selenium loadings in SF Bay. Specifically, they are focusing on the association and speciation of selenium in SF Bay sediments. This is of some interest, but most of the work conducted in this ecosystem has already shown that the routes by which this element enters into resident organisms is through uptake by phytoplankton followed by consumption by herbivores, principally the resident bivalve molluscs. The significance of the speciation changes of selenium in sediments is less obviously critical in understanding the fate of this element in the bay. This is not to say this is not a potentially important problem, but I do not think that the PIs made the case very

convincingly.

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?

   It is not entirely clear to me that the proposed research is fully justified. On the one hand, the PIs correctly point out that selenium contamination in SF Bay is a recognized problem with potentially important consequences. They also indicate that it is necessary that a clearer picture of the fate, transport, and bioavailability of this element in the bay is necessary and will require analytical skills capable of detecting changes in chemical speciation. However, the focus on the sediments is not fully justified, in my opinion, and it is not evident why the PIs have chosen to examine this component of the ecosystem. The PIs come closest to providing this justification on page 3 of their proposal, where they indicate that "An assessment of the overall status of Se in the Bay-Delta ecosystem will require a detailed understanding of the concentration of Se in the sediment, as well as knowledge of the environmental factors which control recycling of sediment Se to form dissolved or suspended Se." Because many of the processes governing Se interactions with sediment particles have been studied (see the references on pp. 2-3, as well as the excellent microbiology work of Oremland and colleagues), it is not clear that any important new areas of research will be addressed in the proposed work.

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 what I can understand (please not that I am not an analytical chemist, and hence some of the proposed work is outside my area of expertise), the approach descried in the proposal seems solid, although as stated above it is not clear what new science or novel ideas will emerge from this study. However, I do think that the information that will be generated by this project could ultimately be useful to decision-makers and coastal zone managers.

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 seems to be well documented and I believe that the likelihood of success is high for most of the tasks that are laid out in this proposal. However, I am concerned that for Task 5 (Objective 2, as described on p. 12 of the proposal), the PIs will not directly be addressing Se uptake and bioavailability in sediments. I do not see any indication that in fact they will be addressing bioavailability, reflecting in part, the lack of a biologist associated with this overall project. The desorption of Se (in different species) from sediment particles under different conditions would provide information that may ultimately be related to the potential bioavailability of Se from sediments, but this would need to be tested with experimental organisms (both planktonic and benthic). As well, no inidcations are given in the proposal that the PIs will consider the bioavailability of sedimentary Se to deposit-feeding benthic invertebrates, a potentially important issue but one not dealt with in this proposal.

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?

This was not clear to me from the text of the proposal.

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?

   Addressed above.

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 PIs have the capability of handling the field work and the chemistry described in the proposal, but as noted above, I believe this porject would have been far more effective had the PIs included a biologist specifically addressing the bioavailability of different Se species and from different sedimentary regimes. Ultimately, the reason there is interest in the first place in selenium is because of its potential impacts on resident organisms, yet there is nothing directly dealing with that in this proposal.

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

   No specific comments on this.

Miscellaneous comments:

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **136**

Applicant Organization: **San Francisco State University**

Proposal Title: **Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments**

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	**This is an extremely well thought out and detailed project description on an important topic. The project includes in situ field measurements, controlled laboratory experiments and a strong educational/outreach component. Whereas both PIs are relatively junior they clearly have the expertise necessary to conduct this work successfully.**
-Good	
-Poor	

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

   The overall objectives of this project are to quantify and examine speciation of Se in San Francisco Bay and San Joaquin River - Delta field sites, conduct laboratory experiments to investigate Se uptake and bioavailability in sediments under controlled conditions, apply advance analytical techniques to determine the chemical speciation of aqueous and solid phase Se, and involve Bay Area students (high school and university).

   The applicants have described 4 specific hypotheses and they describe clearly and how each will be tested.

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 proposal documents reasons for concern with Se in the Bay-Delta area (e.g., historical input, evidence for biomagnification, accumulation in sediments, expectations of continuing inputs). They also make a case for the complexity of Se speciation and its importance in controlling Se fate and effects.

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 approach involves a combination of in situ field observations (provided by continuous monitoring devices) and laboratory microcosm investigations. The former will provide spatial and seasonal changes in Se speciation the latter be designed to address specific uncertainties in the factors believed to control Se speciation. The field work will be focussed at three sites chosen on the basis of CALFED restoration priorities (inlet of San Joaquin River-Delta, San Francisco Bay, Suisun Bay).

   The approach consists of several tasks. Under objective 1 (above) the following tasks were outlined: 1) to establish field sites and characterize both the solid and aqueous phase sediment-water environment at these locations; 2) to examine selenium distribution within Bay sediments; 3) to measure Se speciation in aqueous and solid phase extracts; 4) determination of Se speciation in directly the field. Under objective 2 the primary tasks will be laboratory microcosm experiments which will address hypotheses 3 and 4 (by manipulating the concentrations of specific dissolved Se species and redox conditions and application of X-ray absorption spectroscopy that will provide complementary information on Se speciation in the solid phase.

   No discussion of tasks under objective 3???

   Under objective 4 activities are described to involve students in field work and other activities.

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 extremely well documented and it is clear that the PIs have experience in the approaches to be used, have already put a substantial amount of effort into planning the details of the project and will be actively engaged in the practical work. Although ambitious, I think the project has a high likelihood of success.

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 intend to maintain a real-time Web site to track project performance. The project also has a strong educational component. The project will provide detailed monitoring information on water quality at the three study sites that will be updated and made available to

the public on a monthly basis.

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?

   On p. 5 (section on Adaptive Management) the applicants highlight several important questions, the answers to which if provided by their studies would be of importance to decision makers. The monitoring data will be an important product and the educational component. Also the usual production of peer-reviewed publications and reports will be produced.

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 PIs are both assistant professors at SFSU. They have demonstrated experience in the techniques to be used and all of the necessary infrastructure appears to be available for the project. The applicants provide detailed descriptions of the laboratory facilities available for use in the project and they are adequate.

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

   This 3 year project has a total budget of $1,042,987. The only large equipment is the dataloggers.

   No costs for shiptime?

Miscellaneous comments:

None

External Scientific: #4

Research and Restoration External Scientific Review Form

Proposal Number: **136**

Applicant Organization: **San Francisco State University**

Proposal Title: **Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments**

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):

Co PI La Force know each other from the time were were graduate students at Stanford University; CO PI Manning and I are distantly aquainted through professional activites. I have never collaborated on scientific endeavors with either PI.

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**
XExcellent	**The PIs have presented a well planned and feasible project that will provide unique and novel information about a pertinent and pressing environmental problem. They have the prior experience to execute the project, and have incorporated subtantial outreach, student training, coordination with other local agencies, and performance measures into the proposed work. I recommend that the project be funded at the level requested.**
-Good	
-Poor	

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

   The goals and objectives are clearly stated and internally consistent, but hypotheses are only partially so. The planned activity and the questions addressed are both timely and important to knowledge of Se speciation in solid phases, a topic which has received relatively little research attention.

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 proposed study is well justified, as there exists a significant knowledge gap as to the residence of Se in the solid components of the SF bay ecosystem, including biota and sediments. The conceptual models underpinning the work are clearly stated. The scope and scale of the research project is appropriate for the type of question posed.

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 approach seems well-designed and considered, and appears appropriate for meeting project objectives. The results of the project will add to the knowledge base on Se cycling and sequestration in the SF Bay, especially since the PIs plan to offer a website where many results can be easily obtained. Novel and useful information is very likely to be generated by the project.

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 and appears feasible, though I believe the PIs have overstated the typical bulk concentration of Se in SF bay sediments and therefore the type of XAFS analysis that can be undertaken. Sources I was able to aquire over the WWW (see "http://www.sfei.org/rmp/1997/figures/f04-17h.htm" and other figures in that report) indicate that Se concentrations are typically below 5 ppm; the stated XAFS detection limit is 25 ppm. However, I believe from my own substantital experience with XAFS that the detection limits are lower, on the order of 5 ppm, and that the local concentrations of Se in sediment, as would be probed with spatially-resolved XAFS proposed by the PIs is higher than the detection limits. Even with these improvements, I believe that only XANES data collection and analysis will be feasible, and the PIs should have mentioned that. Still, even this type of analyis will probably provide information that cannot be obtained by other means, and therefore will have high value.

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. Quarterly or annual data reports will be submitted to CALFED to monitor project performance with respect to adherence to proposed work schedule and quality of results. This project is a research project, and as such the main product of the work will be publications in the peer-reviewed research literature.

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 project is likely to result in the publication of several research articles, which will likely have high reference value for others working on Se and trace metals in the SF Bay.

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 have substantial experience in the analysis of trace dissolved and solid-phase species by the techniques proposed here. PI La Force has prior knowledge of techniques for field sampling of dissolved and solid-phase trace metals, PI Manning has extensive experience in method development and analysis of dissolved Se and As species, and both PIs have experience in XAFS analysis (PI Manning primarily on laboratory samples, and PI La Force on natural samples, to my knowledge). The PIs either have the infrastructure needed to complete the project tasks in their laboratories or have access to the infrastructure locally through collaborations and/or through successful proposals to outside research facilities in the Bay area.

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

   The budget appears to be reasonable and adequate for the work proposed.

Miscellaneous comments:

External Scientific: #5

Research and Restoration External Scientific Review Form

Proposal Number: **136**

Applicant Organization: **San Francisco State University**

Proposal Title: **Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments**

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:

<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	**Parts of this proposal are excellent and the proposed research would aid in our understanding of the complex Se biogeochemical cycle. Se and other metals are known to be found in toxic concentrations in the Delta's biota and the pathways associated with this toxicity are complex. The proposed research advances aspects of the geochemical Se cycle, but lacks explicit connections to the Delta's biota. In addition, the predictive capabilities of the proposed work appears weak in terms of the CALFED Restoration Program. The budget is very large considering the limited insight into the Delta's Se cycling. I would discourage the funding of Objectives #2 and #3, until the completion of #1 were complete. However, the authors' ability to predict future Se bioavailability would require a thoughtful biological component to be added. The authors do not adequately describe how they would implement Objective #4. In summary, parts of the proposal are EXCELLENT, but the overall value to CALFED in its present state is only GOOD.**
XGood	
-Poor	

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

The goals and objectives are clearly stated and the authors present thoughtful testable hypotheses. The authors aim to 1) quantify the chemical state of Se in solution and in solid phases, 2) conduct laboratory experiments to examine uptake and bioavailability of Se, 3) apply advanced analytical techniques to help determine exact chemical speciation, and 4) increase awareness of community organizations. The general approach is timely and important because the SF-Bay-Delta, especially the San Joaquin River catchment,has experienced high Se inputs and the fate of these inputs is poorly understood.

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 biogeochemistry of Se is extremely complex and includes multiple stable chemical states, multiple physical compartments, and multiple microbial and biological interactions. The authors present a thorough conceptual model and fully recognize the inherent difficulties in quantifying Se pools and transformations.

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 approach is well designed for examining concentrations and forms of Se associated with sediments, pore waters, and the water column. Environmental variables collected at these stations will enable the authors to model predicted Se speciation. There is some disconnect between the detailed core work and the real-time water quality monitoring. "Bioavailability" may be predicted from the proposed lab work, but these experiments do not relate to bioavailability of Delta biota. The proposed work may generate novel information and methodology concerning the Se-cycle, but predictions of future impacts of Se inputs are limited and thus the proposed work is not highly useful to decision makers.

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 authors do an excellent job of detailing their experimental designs and methodology and they have an excellent track-record at conducting similar research. Likelihood of success appears extremely high in regards to the Se sampling, lab experimets, and over-arching analytical chemistry.

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 authors' track records suggest that the proposed work will be conducted in a thorough and timely manner. Table 1 provides a reasonable research plan.

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 authors' publishcation records are strong and the project includes several graduate students, therefore thoughtful and authoritative publications are extremely likely to emerge from this project. Direct connections to CALFED Bay Delta Restoration Program are uncertain. Predictive models may aid planners, but this part of the proposal is weak.

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?

   Excellent, fully qualified

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

   The budget seems very high considering that the proposed work will only advance our knowledge of a sub-set of Se biogeochemistry in the Delta and biological fate is only infered.

Miscellaneous comments:

I admire the authors' desire to include students of all ages and involve community organizations. CALFED should place high priority in such extension. The ultimate success of the CALFED Restoration Program may depend in part on broad public education. I have tried to interface my own research in the Delta with educational programs, and I have found it is extremely difficult and requires a great deal of work. The authors' stated extension and education as one of their main objectives (Overall objective #4), but did not deal with this Objective in any detail. It requires the detail found in analytical methods to be executed with success.

External Scientific: #6

Research and Restoration External Scientific Review Form

Proposal Number: **136**

Applicant Organization: **San Francisco State University**

Proposal Title: **Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments**

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	**This proposal is excellent in terms of relevance, timeliness, methodology, and qualifications of the principal investigators. It has a high probability of yielding valuable understand of selenium in the San Francisco Bay and Delta.**
-Good	
-Poor	

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

   The proposal goals, objectives, and hypotheses are alll clearly indicated and consistent. The issue of selenium cycling in San Francisco Bay-Delta remains timely and important. The involvement of Bay Area students, from high schools through masters programs will provide excellent educational opportunities.

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 proposed study is justified, since the existing literature on Se in the Bay sediments remains limited in the critical areas of speciation, cycling, and flux rates. The conceptual model is clear, and the proposed research is compatible with this.

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 approaches are very well designed. Results obtained will add significantly to the knowledge base, and will be useful to decision-makers.

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?

   All aspects of the proposed research are fully documented and feasible. The likelihood of success is high, especially given the experience of the two PIs. The scale of the project is consistent with 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?

   Performance measures were not explicitly stated. However, since the procedures are clearly outlined, and the PIs have maintained high levels of scientific productivity, I am confident that they can complete the proposed work in a timely manner.

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 final products are associated with improving understanding of selenium cycling in SF Bay sediments. This contribution can be of broad value through improving the scientific basis for decision making related to water management. The educational component of the proposal should also be regarded as valuable "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 PIs are each individually qualified to carry out this research. Together, they are certainly qualified. Both Drs. Manning and La Force conduct research efficiently and effective, as evidenced through their publication record. In addition, they will be making good use of facilities at SF State University, and the Stanford Synchrotron Radiation Laboratory.

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

   The budget for the proposed research is very reasonable. A comparable effort from some other federal or state agency could easily cost more, with less likelihood of success. Benefits of student involvement and education add strongly to the appeal of this proposal.

Miscellaneous comments:

A few additional notes: 1. The authors may find that additional experiments are needed with respect to adjusting amounts of potassium persulfate, especially when encountering wide ranges of organic carbon. 2. The work of Zawislanski et al. 2001, J. Environ. Qual. is relevant to the proposed study.

Environmental Compliance:

Proposal Number: 136

Applicant Organization: San Francisco State University

Proposal Title: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

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

   -Yes **X**No

   If no, please explain:

   Depends:

   Suisun Marsh access, sediment core samples, and installation of water quality monitoring devices would require a 1603 agreement and corresponding CEQA documentation. Activities may require a State Lands Commission land use lease.

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 time or funds are allocated for environmental compliance requirements.

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

   -Yes **X**No

   If yes, please explain:

Other Comments:

Budget:

Proposal Number: 136

Applicant Organization: San Francisco State University

Proposal Title: Field and Laboratory Investigation of Selenium Cycling and Speciation in San Francisco Bay and the San Joaquin River-Delta Sediments

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?

   -Yes **X**No

   If no, please explain:

   PM accounted for in the compensation for PI salaries. No separate task for PM.

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).

   Requesting $1,003,467; Grand Total of 3-Year Budget Summary is $$1,042,987.

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: