

Individual Review Form

Proposal number: F217-2

Short Proposal Title: Panoche Se Removal Treatment

1a) Are the objectives and hypotheses clearly stated? Yes and No

The objectives are straight forward and quantitative, i.e., “remove at least 400 lbs per year of total selenium...”; “treat drainage water for a total cost of less \$220/AF...”; etc..

No hypotheses were explicitly formulated or listed in the proposal.

Apparently there’s an implied hypothesis that the selenium removal rates associated with a 20,000 gallon/day demonstration facility (>80%) will also apply to a scaled-up 1.5 million gallon/day facility.

1b1) Does the conceptual model clearly explain the underlying basis for the proposed work? Yes and No, but mostly No.

The conceptual model for Se treatment closely follows the conceptual model for a demonstration treatment facility previously funded. This proposal is put forward as simply the next step of that continuum. The engineering concepts appear to be well validated via prior application to more conventional sewage water treatment scenarios. The bio-chemical basis for the algal-bacterial process is clearly explained and demonstrated.

No conceptual model is presented to indicate how the economic evaluations of the proposed treatment facility are going to be conducted. There is also no conceptual explanation for the target cost ceiling of \$220/AF, i.e., what assumptions are involved in determining that a drainage cost of up to \$220/AF would be economically feasible for agricultural operators in the Panoche area over the amortization period (20 years) for the treatment facility?

No conceptual model is presented to support how the objective of demonstrating reduced bioaccumulation potential is going to be achieved. In fact it is not even clear that the authors of the proposal are themselves conceptually clear on the differences between the processes of bioaccumulation and bioconcentration. It is stated that caged organisms will be used at upstream and downstream sites relative to treatment, but the specific organisms are not identified and it is never stated how the crucial step of dietary exposure of the caged organisms is going to be assured and quantified. The one class of organism that is identified, periphyton, would measure bioconcentration, not bioaccumulation. This is not to say that the general approach suggested is invalid, just that explicit presentation of critical details is lacking.

Generally, conceptual models are built on existing knowledge as accumulated in the technical literature. This proposal includes a Literature Cited section that lists 34 citations, yet only 4 of those citations are actually cited anywhere in the proposal. Judging from the titles of the papers listed in the Literature Cited section of this proposal, there is an adequate literature basis for a substantively more fully developed conceptual presentation.

1b2) Is the approach well designed and appropriate for meeting the objectives of the project? Yes and No.

As above for question 1b1, the approach seems well supported and appropriate for meeting the Se removal objective (but maybe not the most appropriate, see below). Uncertainties regarding how well the performance parameters for a pilot-scale demonstration project can be expected to apply once the project is scaled-up 75-fold, as is being proposed, received scant attention (One sentence about having to re-calculate surface-volume ratios??). The cost effectiveness of the proposed treatment process depends, in part, on the potential for utilizing the solid wastes generated by the process as a soil amendment for agricultural lands. However, such use has not been demonstrated and the authors of the proposal do not address the issue that the solid wastes generated are

likely to be high in boron content (SJVDP final report, 1990), a chemical constituent that most agricultural crops are extremely sensitive to (Boron final report to CRWQCB, Central Valley Region, January, 1994). It seems that the neighboring Broadview Water District is achieving similar levels of Se reduction with a much lower tech, i.e., less expensive (??) approach (Broadview Annual Report, 2000), and therefore without some discussion of alternative approaches it is not clear that the Algal-Bacterial process as configured in this proposal is the most appropriate approach at an implementation scale.

No approach is provided for how economic evaluations of the treatment facility will be conducted.

Only a general outline of an approach is provided for evaluating reduction in bioaccumulation potential of treated water, i.e., a caged-organism biomonitoring approach. Without the complete details of how this approach is going to be implemented (such as exact species of organisms to be used, what life stages of organisms will be used, exact design of the cages, sample sizes to be employed, criteria for placement of cages within a water channel such as depth, temperature, and flow rate, etc.) it is difficult to assess the appropriateness of the approach. In general, such an approach could be appropriate, but not necessarily the most appropriate.

1c1) Has the applicant justified the selection of research, pilot or demonstration project, or a full-scale implementation project? Mostly Yes.

The Appendix summarized in some detail the demonstration project basis for moving to an implementation project. However, the demonstration project summaries provided virtually no documentation of economic parameters or feasibility.

1c2) Is the project likely to generate information that can be used to inform future decision making? Yes.

There have been numerous demonstration-scale Se reduction and treatment projects, but none tested at full-scale implementation level. This project would be either the first, or among the first, implementation level treatment projects and as such would provide substantial information to inform future decision making.

2a) Are the monitoring and information assessment plans adequate to assess the outcome of the project? Yes and Undetermined.

The Se reduction objective is adequately covered with regard to monitoring and information assessment. Estimating how many pounds of selenium have been removed from the water column is straight forward and uncomplicated, with minimal data collection efforts (but see USGS review (1996) of Grasslands Bypass Project monitoring plan for important details... details that were not discussed in this proposal).

Essentially, no monitoring or information assessment plans were presented in this proposal with regard to evaluating the economic parameters of the project or the bioaccumulation segment of the project.

2b) Are data collection, data management, data analysis, and reporting plans well-described, scientifically sound and adequate to meet the proposed objectives? No.

The specifics of data collection are largely absent. For example, "The data required to perform selenium, nitrogen, phosphorus, and carbon mass balances on the systems will be collected (possibly by the U.C. Berkeley research group...)" This tells one what is going to be done, and maybe who is going to do it, but not how it is going to be done. Perhaps the authors already presented this information in their previous proposal for demonstration project funding, but no citations to unpublished documents or published papers are given as a source for methodological details.

No general or specific plans for data analysis are presented. Probably the bioaccumulation objective would be the only one requiring statistical hypothesis testing.

The reporting plan schedule is well-described, however, it is unclear from this proposal whether appropriate expertise for report preparation will be available (see response to question 4 below).

3) Is the proposed work likely to be technically feasible? Mostly yes.

The treatment process has been fully demonstrated technically. In the absence of unexpected critical “scale-up” problems, it should be technically feasible.

Not enough information is provided with regard to the bioaccumulation monitoring via caged organisms to allow assessment of its technical feasibility. However, the general technique has been used before by other investigators, and is in theory technically feasible. The authors need to show some indication that they have researched the literature on this technique, and that they are aware of the potential pitfalls of the technique (i.e. sedimentation of cages, theft of cages, mass wasting of caged organisms, etc.).

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

Unknown.

It is not clear who the project team is. It is stated that “possibly” the U.C. Berkeley research group that was affiliated with the demonstration project would conduct the basic monitoring and data collection tasks. However, the proposal does not identify any principal investigators, research staff, nor provide any measures of qualifications for potential project staff such as curriculum vitae, or publication lists. If the project is not staffed by the U.C. Berkeley research group, then what other staffing alternatives is Panoche Water District considering??

Miscellaneous comments

The possible generation of solid wastes and consequent disposal requirements could be an important determinant of the feasibility of scaling-up the Algal-Bacterial Selenium Removal (ABSR) process. Accordingly, the statement that, “... disposal of the solids in a landfill should not be required for many years, if not decades.”, needs to be supported with data and/or literature citations.

It is noted in the proposal that the source water will originate from a “desilting basin” connected to the Buick Drain. It is unclear whether the desilting step is a necessary or important part of the treatment process. In any event, depending on the characteristics of the desilting basin, it may be the most vulnerable link with regard to potential for adverse effects on wildlife. More information regarding the role of the desilting basin and its design and operational characteristics should be included in the proposal.

Boron is increasingly becoming a toxicity concern associated with agricultural drainage water and Table 1 should present data for boron, especially since the proposal ends with an assertion that the ASBR infrastructure will facilitate research on and demonstration of boron removal technologies.

Selenium concentrations in pond sediments are typically extremely heterogeneous and therefore require fairly sophisticated statistical sampling designs in order to obtain useful monitoring data. The proposal states that selenium concentrations in the pond sediments will be determined semi-annually, but does not present any details of what kind of sampling protocol will be employed. One gets the impression that the authors expect the selenium in sediments to be homogeneously distributed. Until a homogeneous distribution is confirmed, plans for dealing with a heterogeneous distribution should be in place. The sampling protocols that assume heterogeneous distributions will provide valid results even if the distribution proves to be homogeneous, however sampling protocols that assume homogeneous distribution will not provide valid data if the distribution proves to be heterogeneous.

An offer of only 2% cost-sharing on a project that is at the center of Panoche Water District's efforts to meet the regulatory conditions necessary for continued drainage service, i.e., for continued farming, does not engender much confidence in the economic feasibility of the project in the long term. As noted in response to other questions above, the economic side of the equation is essentially undocumented and not addressed in this proposal even though one of the stated objectives is an economic objective.

**Overall Evaluation
Summary Rating**

- Excellent
- Very Good
- Good
- Fair
- Poor

Provide a brief explanation of your summary rating

The general outline for the project is promising, and implementation of treatment processes deserves priority attention, but this proposal is missing too much methodological detail and is lacking too much documentation for statements of fact to be rated any higher than a "Good" proposal on scientific merit. A good example of the scientific shortcomings of this proposal is the total absence in the proposal text of most of the literature citations listed in the Literature Cited section of the proposal.