

Draft Individual Review Form

Proposal number: 2001-F206-2

Short Proposal Title: Assessing the relative contribution of nutrient sources... (Standley)

1a) Are the objectives and hypotheses clearly stated?

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

The stated objective is to develop a method for using molecular tracers of nutrient sources to identify and quantify the sources of nutrient loadings in the San Joaquin River. Two clearly stated hypotheses are central to this proposal: (1) that nutrients and various organic molecules can be utilized as tracers; and (2) that the use of multiple tracers will allow quantitation of source contributions. Both the objectives and hypotheses are well-formed and clearly stated (and would provide a very valuable contribution to knowledge of nutrients in the Delta).

1b1) Does the conceptual model clearly explain the underlying basis for the proposed work?

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

The discussion (both in the “conceptual model” and the “approach” sections) and the literature cited clearly indicate that there is precedent (including work by the co-Principal Investigators) for this type of work. The concept of using the referenced compounds as tracers is clearly presented, and the concept of using different source tracer compositions (even when there is overlap between tracer chemicals from different sources) is clearly explained. It is clear that the P.I.’s have a detailed understanding of the concepts and of the analytical methods required for this work.

Although a proposal is necessarily brief, it is nonetheless clear that the expected chemistry (i.e., non-conservative behavior) could be critical not just to understanding the sources of nutrients but to anticipating their behavior and effects within the system. Also, it is stated that such work in the past has generally been qualitative (rather than quantitative). This work apparently differs from the past qualitative work in the analysis of a larger number of possible tracers. Thus, it is more likely that this project will achieve the goal of being quantitative, although the number of samples collected will be relatively small (see discussion below), and there are a large number of potential sources within this large study area.

1b2) Is the approach well designed and appropriate for meeting the objectives of the project?

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

The objectives, hypotheses, and concepts of the proposed work are clearly presented in the proposal. As currently envisioned, this work would likely contribute greatly to the understanding of nutrients in the South Delta, in the rivers and waterways leading to this area, and in several potentially significant sources of nutrients to the San Joaquin River. The sampling locations for in-stream sampling are clearly and logically defined (although a couple more could be added – see comments below). The study of the chemistry of key nutrients (and associated tracers) is essential if this work is to succeed; the need for this study is clearly recognized, and the plan to study the chemistry is sufficiently constrained so as not to be over-ambitious. Thus, this work would provide valuable information that would contribute to our understanding of nutrients in the South Delta and perhaps in the larger Delta area.

There are several issues, however, that are not extensively addressed by the proposal and that may prove important to the success of the proposed study. Briefly, some of these issues include:

1. The number of samples is small (only 94 (or 138, for veterinary medicines) for year 1, including samples for two seasons from 4 sources and 21 in-stream sampling locations). The concern is not for the quality of the analytical work, but that such a small number of samples will sufficiently characterize both the sources and the in-stream waters. Although sampling events (max 10 days duration) will occur during both the dry and wet seasons, there are no plans to sample during storm runoff events, which may have significantly different characteristics and compound concentrations than non-runoff events. Additionally, when sampling in the Delta, past research has shown that it is important to collect composite samples (composited over time). Additionally, additional in-stream sampling locations in the South Delta (e.g., between Mossdale Landing and Stockton) could be helpful due to the complex nature of flows in the South Delta (see item 2 below)

Adequately characterizing the compositions of the sources of nutrients (and other organic compounds) is essential. I am unclear just how many samples from how many sources will be collected. Also, I am not familiar enough with some of the analytes listed to know how they could vary over time. While I would intuitively expect WWTP effluent to have a relatively constant composition, I would expect the composition of urban runoff and of agricultural runoff (both absolute and relative compound concentrations) to vary significantly over time and perhaps with location. (Note that it will be important to sample agricultural subsurface runoff as well as surface runoff.) As currently written, this proposal will not evaluate changes in source compositions beyond year 1. There may be adequate reason to believe that the characteristics of these sources will remain distinct from each other over time, but the proposal is not clear on this point.

2. In the South Delta (i.e., downstream of Mossdale Landing), Delta hydrodynamics can be quite complex and vary significantly as barriers in the South Delta are installed/removed and with changes in export pumping. This complexity could significantly affect both the path of the water that reaches Stockton (and the path that water in the San Joaquin River takes upon entering the Delta) and the time it takes water to travel from the entrance point to the Delta to

Stockton. Also, localized hydrodynamics (e.g., stagnant areas within the waterway) could play a significant role in the development of oxygen-depleted areas near Stockton. Sufficient expertise is available to assist with these issues (e.g., from USGS or DWR), and the investigators should recognize their importance.

3. It is unclear what decomposition method will be used to distinguish between the sources of compounds of interest in samples collected in-stream. The proposal states that “end-member mixing analysis” will be conducted. There are a number of models available that could be used for this analysis, including models that incorporate decay of tracers and have the ability to evaluate the suitability and “uniqueness” of potential tracer compounds (and of “fingerprint vectors” constructed from these compounds). One such model is EPA’s publicly available CMB (Chemical Mass Balance) model.
4. It seems that it would be useful, if possible, to identify and utilize tracers that behave conservatively.

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

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

I assume that this proposal is for a full-scale implementation project. This seems appropriate to address the issues raised in the proposal.

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

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

Information on nutrient loading on the San Joaquin River would be very useful in understanding and perhaps anticipating the presence of conditions that could lead to oxygen-depletion problems within the Delta. This work potentially has broader application to Delta water quality in that organic carbon can seriously impact export water quality and usability. If it is determined that the source tracer characterization is applicable to a broader range of sources (e.g., agricultural runoff or WWTP effluent in general, rather than just for the particular sources characterized), it also has broader implications for assessing water quality in the greater Delta.

The issue of San Joaquin River water quality has been persistent, and many significant questions have not been addressed to date. This proposal could potentially answer some of these questions and provide a means for addressing and mitigating them more quantitatively than has been possible in the past. The proposed work potentially has significant implications for water quality management in the San Joaquin River and in the Delta.

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

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

See comments in 1(b)2 above. In general, this study seems well-planned, although additional attention to a few sampling and field study design issues could improve its chance for success. One important thing to note with an exploratory study of this type is that the information gathered will be useful, even if the study objectives must be modified over time. Even if quantitative delineation of nutrient sources were not to prove possible through this study, the qualitative information the study would generate would be very helpful in understanding nutrient issues in the San Joaquin River and in the Delta, and the monitoring and assessment plans are adequate to assure success in this respect.

2b) Are data collection, data management, data analysis, and reporting plans well-described, scientifically sound and adequate to meet the proposed objectives?

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

Again, see item 1(b)2 above.

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

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

Yes, although I am not sure that all the objectives can be met in their entirety (see comments in 1(b)2). The proposed analytes can clearly be measured in all the sources and samples that would be collected, and it is likely, based upon the information provided in the proposal, that the sources can be adequately characterized using the proposed work plan. It is also clear that there is precedent for the use of many of these tracers, as they have been used in a more limited fashion in other work. The combination of many tracers in one project increases the probability that this project will be successful and, hopefully, more quantitative than past work. It is clear that even if the project fails to meet some of its objectives completely, it will yield valuable and useful information.

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

Provide detailed comments in support of your conclusion [Note: in the electronic version, this will be an expandable field]

Yes. Both of the co-P.I.'s have extensive experience in areas essential to the success of this project. It is clear from their experience and from the people with whom they have worked that both P.I.'s have sufficient expertise with analytical organic chemistry, field sampling and studies, source apportionment modeling, and with the behavior of nutrients in natural aquatic

environments. In addition, both P.I.'s have extensive education and training from well-respected universities and from people who are leaders in this field.

Miscellaneous comments

[Note: in the electronic version, this will be an expandable field]

**Overall Evaluation
Summary Rating**

- Excellent
- Very Good
- Good
- Fair
- Poor

Provide a brief explanation of your summary rating

[Note: in the electronic version, this will be an expandable field]

This proposal is well-written and well-conceived. The information it would generate would be useful in understanding nutrient sources and budgets in the San Joaquin River (and in the larger Delta area) and would provide a valuable contribution to this area of research generally. This information would be valuable to decision-making regarding nutrient sources and management within the system. Both of the P.I.'s are highly qualified to conduct this study.