United States Department of the Interior

GEOLOGICAL SURVEY

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MEMORANDUM

To: Michael Delamore, Bureau of Reclamation, Fresno, CA and Joseph McGahan, Regional Drainage Coordinator, Summers Engineering, Inc., Hanford, CA,

From: Theresa S. Presser
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Subject: Comments on Draft Environmental Impact Statement/Environmental Impact Report for the nine-year renewal of the Grassland Bypass Project

**Background**

The Grassland Subarea, as defined by the San Joaquin Valley Drainage Program, historically has been able to drain to the San Joaquin River. This has afforded the agricultural area, in comparison to other subareas, the benefit of having less accumulated hydrologic imbalance. The area has worked towards managing an annual imbalance. Segments of the lower San Joaquin River, Mud Slough, and the San Francisco Bay-Delta Estuary (Bay-Delta), all downstream of the agricultural discharge from the Grassland Drainage Area, are listed by the state as water-quality impaired as part of required listing under the Clean Water Act. Several special status species utilize these aquatic habitats. The San Joaquin River acts as a receiving-water for agricultural drainage and, as such, is limited by selenium (Se) water-quality criteria, but violations have occurred. The river also acts as a source-water for discharge of Se downstream in the Bay-Delta. Threats to the estuary are occurring from selenium because of contamination of invertebrate food for predators (Luoma and Presser, 2000). Selenium impacts in the Bay-Delta could increase if water diversions increase or if San Joaquin River inflows increase with concomitant real-time discharge of Se that increases Se loading (i.e. the Se and the water management issues are tightly linked).

The use of the San Joaquin River as a de-facto drain generated environmental commitments as part of the 1995 Supplemental Environmental Assessment and Finding of No Significant Impact for interim use of a portion of the San Luis Drain (i.e., Grassland Bypass Project, GBP). The documentation of the GBP also specifically acknowledged that the project was not protective of the San Joaquin River during low flow months because Se loads were in excess of those modeled to meet a 5 µg Se/L objective. Threats to water bodies from Se are traditionally greatest during low flows and dry years (Luoma and Presser, 2000). Biological damage during only one season can limit populations of species with a generation time of more than a year; biological damage incurred once per year can be carried over into the remainder of the year. The environmental commitments of 1995 also included obtaining a better understanding of Se's effects on impacted ecosystems. However, that commitment has lost importance in the latter years of the project as monitoring has been cutback. Most importantly, station H (San Joaquin River at Hill Ferry) has been eliminated, leaving unmonitored, under state and federal guidance, that area of the river that is most impacted

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by Se discharge from the GBP (*U.S. Geological Survey (USGS) Memorandum to Central Valley Regional Water Quality Control Board, 12/27/99*).

**Proposed Project**

For the next nine years, it is proposed that the GBP continue as an experiment that encompasses long-term drainage management and environmental protection through a series of Se load reductions. The proposed Se loads imposed by the project are based on negotiation. The *Draft Environmental Impact Statement/Environmental Impact Report* (EIS/EIR) calls for, but does not present, plans for development of (1) long-term drainage management; (2) sediment management; (3) storm management; (4) treatment of drainage; and (5) monitoring. Three alternative approaches are proposed in the EIS/EIR. The GBP alternative is similar to the current GBP. The Mud Slough Bypass alternative goes a step further and would extend the San Luis Drain (or an equivalent closed pipe system) to the San Joaquin River. Construction would delay this option for several years. Additional regulatory documentation will be required for parts of these sub-projects. The in-valley treatment facility will include integrated-on-farm management that may be subject to ponding and construction of waste units for salts that would require approval by the state. The No-Action alternative is a theoretical construct that does not consider implementing comprehensive in-valley drainage management options because access to the San Joaquin River for out-of-valley drainage is denied. Although a major mitigation for all the proposed alternatives is monitoring, a detailed monitoring plan is not presented as part of this EIS/EIR.

**General Comments and Recommendations**

The EIS/EIR is mainly documentation of a process or strategy of Se load reduction, rather than documentation of a comprehensive plan. A reasonable plan should include evaluating the fate and impact of proposed Se discharges to presently impaired downstream water bodies–Mud Slough, the San Joaquin River, and the Bay-Delta. The current assessment of environmental risk, because of limited funding for monitoring, is limited to an analysis of the correlation of water-quality and Se concentrations in fish tissue. The guidelines for water (EIS/EIR, Table 6-4) do reflect water concentrations associated with threshold levels of food chain exposure. However, modeling trace contamination, from loads through foodwebs to predators, in a scientifically rigorous way that considers the full sequence of interacting links, reduces uncertainties in predicting ecosystem processes subjected to contaminants that bioaccumulate. Specifically from a scientific viewpoint, the EIS/EIR is outdated because it is not based on the current understanding of the biotransfer of Se. It fails to consider the environmental stresses imposed by present degraded conditions and the full complexity of Se bioaccumulation, ecological processes, and hydrodynamics that influence Se toxicity. The project, in the absence of rigorous documentation of specific plans and monitoring activities, leaves in doubt that the new nine-year experiment will document whether load manipulation actually protects vulnerable predators.

It has been recognized from the inception of protection of the San Joaquin River from Se in 1985 that bioaccumulation through the food web represents the greatest risk to aquatic ecosystems. Given the history of Se toxicity, the GBP EIS/EIR seems substantively incomplete without:

- an identification of vulnerable foodwebs;
- an effects analysis that includes foodweb components to predict effects on predators;
- an identification of elevated risk periods for effects based on hydrodynamics; and
- use of bioaccumulation as a basis for calculating protective loads or concentrations.

Credible protective criteria should be based on 1) contaminant concentrations in sources that most influence bioavailability and 2) concentrations in water, particulate material, and organisms relevant to vulnerable food webs. Existing criteria for water, particulate material, and tissue of prey and predators could be used in combination to evaluate risk or hazard.

Our recommendations, substantiated below, call for incorporating more rigorous technical and scientific monitoring and review as part of the chosen GBP alternative than is now given in the EIS/EIR. Such interim measures would incorporate into the GBP an understanding of the biotransfer of Se to help evaluate the fate and impact of proposed management changes. As with any predictive tool, monitoring is necessary to provide a check of the predicted with the actual impacts. Monitoring of vulnerable foodwebs specific to water bodies, such as the San Joaquin River ecosystem, affected by the GBP would enable site-specific measures of Se bioaccumulation (Luoma and Presser, 2000). Suggestions for a comprehensive monitoring and reporting program also are listed below. An independent review panel could analyze the progress of the project and make recommendations for its continuance based on monitoring results and adaptive management. This review would encompass the project's environmental and economic aspects and the success of drainage treatment facilities to better substantiate the load reduction process on technical and scientific merits.

Crucial to the progression of GBP project extension are:

1. the U.S. Environmental Protection Agency (USEPA) acceptance of the Total Maximum Monthly Load model. The TMDL model methodology may change to determine future load limits based on the capacity of the ecosystem to safely absorb pollutants.
2. the USEPA revision of the Se standard for the protection of aquatic life;
3. the oversight of mitigation monitoring for the GBP by the U.S. Fish and Wildlife Service (USFWS) through the Endangered Species Act Section 7 consultation and the biological opinion process
4. the USEPA response to the USFWS who, through its biological opinion and consultation for the USEPA's California Toxics Rule, are calling for a more stringent water-quality criteria than USEPA's 5 µg Se/L (see also Table 6-4, *Recommended Ecological Risk Guidelines Based Upon Selenium Concentrations,* level of concern for water: 2-5µg Se/L).

Adding interim re-evaluation would help assure that these decisions will become a part of the scientific base for the project. Explicitly defining the components of a site-specific standard in terms of a pathway bioaccumulation model for the San Joaquin River, its tributaries, and the Bay-Delta may be a useful endeavor because of the uncertainties remaining in a water-quality objective approach that is based solely on flow. Some aspects of restoration of Mud Slough and the San Joaquin River could be considered, especially in view of the level of current degradation and the fact that Se load reduction seems compatible with farm profit (see *Socioeconomic Resources*, page 8-13, $42,479,000 annual farm profit in 2009).

Refinements for Se water quality criteria for the Bay-Delta are also likely. Water-quality criteria may not be realistic indicators of ecological risk for estuaries because they were developed in freshwater systems. The technical limitations of the basis for the existing water quality criteria raise questions about their suitability as the sole standard to assure protection of the Bay-Delta. Selenium concentrations were below all recommended water quality guidelines in both the Delta and the Bay in the latest surveys in 1996. Nevertheless, Se in the food web was sufficient to be a threat to some species and a concern to human health if those species were consumed (Luoma and Presser, 2000). The Bay-Delta is probably best suited for site-specific Se guidelines, but the details of such guidelines have yet to be identified. If water quality criteria are to be employed in managing Se inputs, the elevated Se concentrations in clams and fish of the Bay-Delta found under current conditions should be considered in order to protect aquatic birds and fish from reproductive effects.

**Specific Comments**

Loads

As noted above, Se loads imposed by the project to meet scheduled water quality criteria are based on negotiation. Achievability of load reduction through management is to be documented later through development of a long-term management plan. Concern remains for control of loads during wet years and the overall effectiveness of planned actions because of the basin-wide nature of ground-water degradation in the western San Joaquin Valley (*USGS comments on GBP Long-Term Management Plan for the Grassland Drainage Area,* 11/6/98 and *Memorandum to Members of the GBP Oversight Committee and Technical and Policy Review Team,* 1/21/99; Luoma and Presser, 2000). Modeling and measurement of annual loads discharged from the Grassland Drainage Area sumps, as differentiated from released area discharge to surface waters, indicate approximately 10,000 lbs Se per year has been generated. Recent data from GBP annual reports shows annual tile sump discharge remains at approximately 10,000 lbs Se for water years 1999 and 2000. As depicted in GBP annual reports (e.g. Figure 4, Chapter 2, 1998-99 Annual Report), displacement and conservation methods have led to storage, mainly in groundwater aquifers and on land, to meet load limits. Therefore, the control activities are mainly a re-distribution of a constant load among ground water, surface water, and land degradation. Flooding in water-year 1998 caused flows of subsurface drainage into surface waters and loads exceeded monthly load limits by two-fold during March and April. The annual total was exceeded by approximately 2,500 lbs Se (see also Storms and Discharges to Wetland Channels).

As written, the EIS/EIR, does not specifically state that meeting load limits is an objective of the project (Chapter 1), but rather refers generally to the Use Agreement (Appendix A). A table that clearly compares all load values, both sump and annual release, derived or negotiated as part of the proposed project would be helpful to rationalize the limits imposed by the use of incentive fees for the project. Since loads in the *Use Agreement* are shown through 2009, it is only though implication that loads meet annual limits listed in the existing *waste discharge requirement* for the GBP. This includes that for a dry year in 2010 of 1,001 lbs Se. During 2001 to 2007 proposed wet and dry year loads are the same, affording little protection for the San Joaquin River in dry years based on TMML modeling. Tradeoffs between concentration and volume and thus load to achieve load targets done through management of sources waters are also a consideration for rating the significance of adverse effects for Mud Slough and the San Joaquin River at station H.

Water Quality Criteria for the Protection of Aquatic Life

Several models have been used to link loads to concentrations of Se in the San Joaquin River at Crows Landing. Each of these methodologies considers different flow regime histories, groupings of water year classification, averaging periods, and violation rates. Negotiation of proposed load limits adds a fourth set of data to those delineated through the TMDL, TMML, and an alternative TMML models. The results of the models (hundreds of pounds of Se) remain statistically un-documented in terms of predictive power or accuracy (see Appendix C, figures depicting measured versus modeled Se concentrations). As noted before, acceptance of the TMDL model, or in this case the TMML model, by the USEPA is an important part of the overall cleanup of Clean Water Act listed water bodies such as the San Joaquin River. Acceptance of a revised or alternative TMML model load limits as part of a new waste discharge requirement also may be considered by the state in the future. A chronology of regulatory events by the state and by federal agencies could be added to the EIS/EIR to document the connections to regulatory and contractual obligations of the project including those of the *Use Agreement* (Appendix A).

Using the water quality scenarios presented in the EIE/EIR, in some months of critically dry years concentrations in the San Joaquin River above the Merced River approach a monthly average of 24 μg Se/L and concentrations in Mud Slough approach a monthly average 60 μg Se/L. Dry-year water-quality standards for the San Joaquin River below the Merced River are not met through the nine-year process of this EIS/EIR. Loads in 2009 remain over 2-fold above those proposed by the state to meet a 5-μg Se/L objective in 2010. The USEPA's criterion of 5 μg Se/L cannot be met in Mud Slough and the San Joaquin River above the Merced River by the proposed GBP alternative (Figure 4-24). Concentrations in these water bodies remain above water-quality objectives for the life of the project.

Environmental Impacts

For the GBP scenario depicted under alternative load targets for a critically dry years, 95% of fish are predicted to have Se concentrations in the zone of concern or of toxicity for Mud Slough and 65% or more of fish are in the zone of concern for the San Joaquin River above the Merced River. Figure 4-27 indicates that in all above normal, dry, below normal, and critically dry years the 4 μg Se/L benchmark will be continuously violated in the reach of the San Joaquin River (note: I understand that 4 μg Se/L has been designated as the benchmark water quality standard based on monthly averages instead of 5 μg Se/L because of the lack of sufficient data on which to base 4-day averages). Only under the Mud Slough Bypass alternative are the 5 μg Se/L objectives met for Mud Slough.

Scope of Effects and Criteria for Determining Significant Impacts

No recognition of potential downstream effects in the Bay-Delta is given in the impact/effect summary tables. As noted below in Monitoring, a *site* is defined by all components of a hydrologic unit. In the GBP case, the *site* would include connection to the Bay-Delta. With the same compartmentalized thinking, the proposed alternatives are determined (1) as *beneficial or having a less-than-significant adverse effect* for the category of *bioaccumulation and food chain* (Table ES-1), (2) as *neutral* in terms of *Se in wetlands during storm events,* and (3) as of *no impact, neutral, or potentially positive* in terms of groundwater degradation. In light of history of the western San Joaquin Valley and the current understanding of Se bioaccumulation, it takes a leap of faith for the EIS/EIR to reach such conclusions, even with the narrowly focused comparisons in the EIS/EIR. Tables 6-5 does make note of Se loading to Mud Slough and the San Joaquin River as actions with potential biological resource impacts and Table 14-1 notes that mitigation for Se bioaccumulation is yet to be determined by the USFWS. As noted before, the type of assessment for bioaccumulation presented in the EIS/EIR (e.g., *Other Effects* section, page 13-2) seems almost an afterthought and lacks an up-to-date analysis of potential Se biotransfer. The documentation also should not neglect significant involvement of water, salt, Se storage as long-term impacts.

The ranking of the significance of impacts is presented as a complex series of gradations that includes *less than significant and neutral.* Different criteria used to derive the significance of impacts are listed in Tables ES-1, ES-2, 4-2, 5-2, 6-5, 6-6, and 14-1. A clearly derived list of criteria for significance for each impact would be a helpful addition to the EIS/EIR. Inclusion of baseline impacts and the number of years applicable for determining the baseline and impacts would also help assure equable comparisons and rankings. For example, a qualitative evaluation based on flow and water temperature was used to evaluate impacts to aquatic habitat. An adverse impact was considered as significant if a long-term (more than five-year) reduction in the population of native aquatic species was seen. On this basis, Table ES-1 rates all alternative as having *no adverse impact or neutral* for aquatic habitat. As discussed in this comment memorandum, an analysis of bioaccumulation and its effects would be appropriate here and throughout the EIS/EIR

In some cases, comparison of alternatives is to a hypothetically constructed *No-action* alternative and to existing conditions based on one-year of data—water year 1999. Comparison to a reference site that is already experiencing an elevated response or risk may lead to a determination of a lack of significance for an exposed site. For example, the current Lemly index rating for Mud Slough given in GBP annual reports is for high hazard. Populations of fish in the SJR and adjacent sloughs are now dominated by introduced species having broad environmental tolerances. Recognition of the quality of the affected habitat and fish community (index of biological integrity rating of poor for sites E, G, and H) in a more quantified way could be a factor in development of an overall long-term indicator of significance.

According to the biological data for the EIS/EIR alternatives (Figures 6-7 to 6-10, 6-12, 6-13), the Mud Slough Bypass alternative scenario, which is grouped for "all years", results in a decrease in the number of fish predicted in the concern zone from > 90% to < 20% for sites D and H. However, the Grassland Bypass and Mud Slough Bypass alternatives receive the same ranking of *beneficial* in the "Se in sloughs and the San Joaquin River upstream of the Merced River" category (Table ES-1). Both the Grassland Bypass and Mud Slough Bypass alternatives in this effects category in the summary of water quality impacts (Table 4-20) are ranked as *less-than-significant or beneficial.* The EIS/EIR should explain this apparent contradiction when the Mud Slough Bypass alternative based on risk to fish seems environmentally superior.

<u>Sediments</u>

The rate of accumulation of sediment in the San Luis Drain as a result of the proposed alternative is considered significant (Tables ES-1 and 4-20). Mitigation calls for a *Sediment Management Plan.* See the attached letter dated 4/23/97 to the San Luis Delta Mendota Water Authority concerning recommendations in developing such a plan that includes sediment removal and disposal. Although written approximately four years ago, no response or updated plan has been received by the USGS. Most comments are still relevant and some comments have been further elaborated on in Presser and Piper, 1998. Among these is the fact that samples of bed sediment from the SLD contain elevated concentrations of Se that approach hazardous waste levels (100 ppm, wet weight). During the course of the current GBP, sediment samples reached 150 ppm Se, dry weight (see table 6-4 for sediment risk guidelines). However, the elevated Se levels cannot be explained, as implied in the EIS/EIR, by geologic source material. Seleniferous rocks in the California Coast Ranges average 8.9 ppm Se, dry weight. Western SJV soils average 0.14 ppm Se. Soils from the most contaminated alluvial fan, Panoche Fan, average 0.68 ppm Se, with a maximum of 4.5 ppm Se. Stream sediments from Panoche Creek during runoff contain 1 to 2 ppm. The San Luis Drain, in the past, has acted as a biological reactor to remove Se from the drainage water as it flowed in the drain and to concentrate it in the sediment and biota of the drain. Therefore, analyses of bed sediment of the SLD may provide a continuing history of Se partitioning and flux occurring in the sediment during static, controlled flow, and flooding regimes.

<u>Storms and Discharges to Wetland Channels</u>

Flood management issues include emergency discharges to wetland channels and potential movement of sediment into and out of the San Luis Drain. As noted above, concern remains that long-term drainage management planning (USGS comments on the *GBP Long Term Drainage Management Plan for the Grassland Drainage Area* dated 11/6/98 and *Memorandum to Members* *of the GBP Oversight Committee and Technical and Policy Review Team* dated 1/21/99) will continue to be limited without development of information relating to groundwater conditions and to concentrations of Se in the regional system that influence Se discharges. This, in turn, helps address the management capability to manage loads in the future, especially during floods. Information developed as part of the on-going *Sources of Selenium* project could be integrated into the periodic analysis and review of the GBP in order to further understand the hydrologic processes controlling the distribution and transport of Se on a regional scale. This type of analysis is relevant to updating both the *high rainfall exemption* (Use Agreement, Appendix F) and the *upper watershed exemption* (Use Agreement, Appendix G). The surface water component of load from runoff from Panoche Creek measured as part of the GBP discharge constituted a small proportion of the total load (approximately 5.5%) in WY 1998, a year in which the project area had higher than normal rainfall.

The average concentration of Se in Agatha Canal during the flood event of WY 1998 was 27 µg/L, far exceeding the 2 µg/L objective currently in-place. Management for floods could include determining the feasibility of keeping flood and drainage water separate, further quantifying the amounts of Se from the upper watershed and in rainfall runoff, and developing adequate biological monitoring to determine the impacts in the wetland channels if agricultural drainage water is discharged in the future.

Selenium, Boron, and Molybdenum Threshold Effects Tables

Without addition of a table of recommended ecological risk guidelines for boron and molybdenum, it is difficult to substantiate potential beneficial effects to ecosystems (Table ES-1). A table similar to that for Se would be useful for assessment of risk from boron and molybdenum. Molybdenum guidelines are part of the National Irrigation Water Quality Guideline published in 1998. Both the effects of boron and molybdenum were considered in the San Joaquin Valley Drainage Program documentation for elements of concern.

Economics

Additional information could be given to substantiate farm profits in the project area. This would include a history of profit prior to 2000 and information on the cost of subsidies for water and crops.

Monitoring

A major mitigation for the proposed alternatives is monitoring. A systematic long-term monitoring program is crucial to understanding the fate and impact of management changes in regards to protection of ecosystems receiving Se discharges. In addition to loads and water column concentrations, risk is affected by speciation, transformation to particulate forms, particulate concentrations, bioaccumulation, and trophic transfer to predators (Luoma and Presser, 2000). These linked processes provide the necessary framework for monitoring. Given below is a sampling plan that includes sampling of water, particulate material, and organisms that are specific to vulnerable food webs. The linked processes, excerpted below, are more fully documented in Luoma and Presser, 2000. The principles of bioaccumulation and the approach used are applicable to modeling the San Joaquin River ecosystem and predicting effects to birds and fish.

Monitoring, as conceptualized below, would sample critical environmental components at a frequency relevant to each process to determine trends in Se contamination or changes in processes that determine fate and effects of Se.

- In any site-specific analysis of Se impacts it is important that "site" be defined by all components of its hydrologic unit (e.g., Lemly, 1999b). Hydrologic models would serve as a basis for developing the infrastructure of this hydrologic unit. Specifically, the Bay-Delta ecosystem is connected to the San Joaquin River ecosystem, thus warranting consideration of the vulnerability of downstream water bodies when considering evaluation of upstream source waters. Toxicity problems may not appear equally in all components of a hydrologic unit because some components may be more sensitive than others. For example, the San Joaquin River, as a flowing water system may be less sensitive to Se effects (especially if selenate dominates inputs) than adjacent wetlands, the Delta or the Bay, where residence times and biogeochemical transformations of selenate are more likely.

- Multiple-media guidelines provide, in combination, a feasible reference point for monitoring. A linked or combined approach would include all considerations that cause systems to respond differently to Se contamination. The critical media defined here are water, particulate material, and prey and predator tissue. Monitoring plan components necessary for a mass balance approach include source loads of Se; concentrations of dissolved Se and suspended Se; Se speciation in water and sediment; assimilation capacities of indicator food chain organisms; and Se concentrations in tissues of prey and predator species. Determination of transformation efficiency and processes that determine Kd's (distribution or partitioning coefficients) of Se in Bay-Delta and SJR are crucial to relate loads to bioaccumulation, rates of transfer, and effects. Trace elements sequestered in bed sediments and in algal mats would be a part of recommended mass balance considerations.
- Invertebrates may be the optimal indicator to use in monitoring Se because they are practical to sample and are most closely linked to predator exposure. Knowledge of optimal indicators in the Bay-Delta and San Joaquin River are necessary to fully explore feeding relationships. Resultant correlations with Se bioaccumulation in food webs are a part of this process.
- Determination of food web inter-relations will help identify the most vulnerable species. Specific protocols that include life cycles of vulnerable predators including migratory and mobile species would then document Se effects for the species most threatened.
- As noted previously, selenium impacts in the Bay-Delta could increase if water diversions increase or if San Joaquin River inflows increase with concomitant real-time discharge of Se that increases Se loading (i.e. the Se issue and the water management issues are tightly linked). The most significant impacts of irrigation drainage disposal into the Bay-Delta will occur during low flow seasons and especially during low-river flow conditions in dry or critically dry years. Dry or critically dry years have occurred in 31 of the past 92 years with critically dry years comprising 15 of those years. Any analysis of Se effects must take the influences of variable river inflows into account.
- Little is known about Se concentrations in the Delta, yet this is the system that could be most impacted by Se discharges from the San Joaquin Valley. This is the transition zone between the Bay and the largest potential source of Se. It is an area of great biological value itself and an area of great emphasis in CALFED's restoration effort. The fate of Se in the Delta will be a key in determining the extent to which Se contamination will impede restoration of the estuary.
- The fate and effects of Se in the San Joaquin River are not well known. In short, if management and regulatory measures to restore the San Joaquin River ecological resources to their former level of abundance are to be effective, then the biogeochemistry of Se, ecological processes, and hydrodynamics in this system must be further investigated and understood.

- A mass balance of Se through the estuary is crucial because internal (oil refinery) and external (agricultural drainage) sources of Se are changing as a result of management. In the past (1986 to 1995), cumulative agricultural loading to the San Joaquin River was estimated at approximately 100,000 lbs Se (Presser and Piper, 1998). Currently, Se is discharged through Mud Slough to the San Joaquin River at the rate of approximately 6,000 to 8,000 lbs per year. The ultimate fate of Se from these past and current agricultural discharges is not known. At a minimum, a mechanism for tracking Se loading via oil refineries and the SJR is needed based on San Joaquin River, Sacramento River, and Bay-Delta hydrodynamics. Monitoring needs to measure the on-going status of the system in terms of inputs, storage in sediment, through-put south via the Delta-Mendota Canal and California Aqueduct, and throughput north to the Bay.
- Storms and high flow years will be times of increased regional discharge of drainage containing high concentrations and loads of Se. Violations of water quality criteria and load targets could result on a re-occurring basis, if the precipitation-dependence of the Se inflows is not recognized. The long-term effects of such occurrences on wetlands, wetland channels, the Delta and the Bay need to be better understood. The possibilities of long-term storage after such conditions and the efficiency of bioaccumulation during varying conditions of flow should be studied.
- In view of the analysis of the existing Se reservoir in the San Joaquin Valley, consideration of the degradation of groundwater aquifers needs to be a factor in management scenarios. Short-term management that results in more storage than leaching will result in more degradation of aquifers. Mass balance considerations should include a "storage" term, not only input and output terms. Monitoring and assessment of storage also will show if treating discharge on an annual basis will suffice to manage the current regional imbalance of water, salt, and Se.
- Treatment also may be important in determining source loads impacts. Treatment technologies applied to source waters may affect both the concentration and speciation of the effluent. For example, a treatment process could decrease the concentration of Se in the influent, but result in enhanced Se food chain concentrations if speciation in the effluent changes to increase the efficiency of uptake.

<u>Mitigation Monitoring and Reporting Program</u>

As stated on page 14-1, mitigation measures must be fully enforceable through permit conditions, agreements, or other measures. As noted before, a clearer recitation, perhaps in the form of a chart or chronology, is needed of linkages between all relevant regulations and contracts such as the *Use Agreement*. A reporting program for the Monitoring Plan and other mitigation measures is noted as "if required". The document is unclear as to the scope of the monitoring plan and monitoring plan reporting, but refers instead to the *Use Agreement* requirements. As noted before, the *1996 Compliance Monitoring Program for Use and Operation of the Grassland Bypass Project* has recently been cutback. The USGS reviewed this plan at the request of the Bureau of Reclamation in 1996 and found inadequacies in a number of components (Presser et al., 1996). Many of those deficiencies were not addressed in the 1996 program and the monitoring program now on record monitors a minimum of sites and components. Definitions of "unacceptable" problems or impacts that necessitate mitigation could be added to the EIS/EIR based on site-specific baseline documentation.

**Specific Questions**

Loads and Water Quality

1. Reconcile data tables in regard to amount of Waste Load Allocation or of discharge to the San Joaquin River at Crows Landing. For example, Table 4-2 shows amounts at Crows Landing while Tables 4-4, 4-13, and Appendix C of the Use Agreement show Waste Load Allocations. The difference between these amounts is the addition of a modeled background and a margin of safety to the Waste Load Allocation for the Grassland Area Farmers to obtain the larger amount of discharge to the SJR at Crows Landing. Similarly, the *Use Agreement* should clearly state the compliance site for the proposed loads.
2. If this TMML revision is an integral part of proposed bypass use, then it should be clearly integrated into the documentation for the alternatives. Alternative TMML model loads are substantially higher than proposed loads. Appendix D of the *Use Agreement* is unclear as to relation of the *TMML revisions* to adoption of proposed loads.
3. Check addition for Appendix B (Recent Total Maximum Monthly Load Calculations for Se on the San Joaquin River, Table 21 (see Table 22 for derivation). Sums listed are Critical 1067 lbs Se; Dry/Below Normal 2233 lbs; Above Normal 3052 lbs; and Wet 3941 lbs. Sums calculated are: Critical 1219 lbs; Dry/Below Normal 2558 lbs; Above Normal 3463 lbs; and Wet 4156 lbs.
4. Quantify regrouping and ungrouping of water year types. For example, even though the EIS/EIR states that the lowest flows were used to calculate allowable loads for each water year type within a grouped dry-year or wet-year classification, the values for the originally derived TMDL are below those given in the TMML submitted to the USEPA by the CVRWQCB in 1996 (i.e., 2010 compliance for wet year, 2598 lbs Se, TMDL versus 3087 lbs Se, Table 4, TMML). In a regroup of dry years, the TMDL model derived higher values than those derived from the TMML (i.e., 2010 compliance for dry year, 1163 to 2504 lbs TMDL versus 1001 lbs TMML). As noted above, a table that clearly compares all load values derived and negotiated as part of the proposed project would be helpful to justify the limits imposed by the use of incentive fees for the project.
5. The "glide path" nature of the proposed alternative should be noted, especially in the case of critically dry years. Clarify the number of violations of the water-quality standard that have been determined based on the loads for each water-year classification. The background for the TMML model derivation emphasizes one violation will occur once in every three years. Figure 4-27 shows five months per year of violation for a critically dry year at the San Joaquin River at Crows Landing through 2008. Similarly, site H appears to exceed water quality criterion (i.e., benchmark because of monthly averages) in above normal, dry, below normal, and critically dry years in multiple months of multiple years.

Thank you for affording me the opportunity to review the GBP extension EIS/EIR. I look forward to receiving a detailed response to our comments. If there are any questions, do not hesitate to contact me (650-329-4512 or tpresser@usgs.gov).

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Attachment (1)

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