Memo To Files

From: A. L. Riley

Subject: San Francisquito Creek Flood Control Project

Date: January 9, 2014

I have prepared the following comments in response to your request to provide a written review of project design issues Water Board staff should consider as we receive more project alternatives from the San Francisquito Creek JPA. Our hydraulic modeler at Region 2 has agreed to help me review future submitted hydraulic models.

The JPA has been directed to get back to the federal and State resource agencies with a revised alternatives analysis and to address, in particular, why it did not pursue the bypass alternative preferred by the resource agencies. In a phone meeting in December, Kevin Murray said the JPA was considering another alternative to lower the flood protection objective to less than the 100 year discharge so that the project would avoid impacts on the Faber Marsh. At this time it appears that the design is in a period of flux.

The following comments result from a review of all of the information contained in the JPA's section 401 application and various associated reports given to us so the resource agencies can be best prepared to identify questions we need to pose in this next round of project review.

Hydraulic Issues

1. The original PWA alternatives report used a boundary condition of a 7.1 (NAVD 88) elevation for Bay tide waters for a mean high higher high water tide as its modeling assumption. However, the final modeling of the proposed project, as received, used a tide elevation of 12.52, which is significantly higher. We could reasonably assume this may be the reason for the JPA's findings that it cannot get flows out to the Bay no matter how wide apart the levees are set. They do integrate some conservative assumptions, which include the effects of climate change, and planning for climate change is good practice. However, it makes sense to ask why these boundary assumptions are so far apart. These conservative assumptions also resulted in raised levees and floodwall elevations. The JPA references a USACE shoreline study and cites an estimated 100 year tidal elevation of 11.3 in response to sea level rise.

2. The only modeling information we have received is a 2010 draft hydraulics report. The modeling seems to be focused on only one flow, which is the 100 year design discharge. Modeling of intermediate discharges for the 10, 25, and 50 year flows may show a benefit for moving the levees back in the golf course and or indicate the viability of a bypass channel alternative to lower water surface elevations (wse) for these more frequent discharges even if a benefit does not show for a 100 year discharge. Likewise, less rare tidal events will probably show significant benefits for setting back levees to contain the most commonly occurring flows.

3. The project cross-sections submitted with the permit application use surveys that stop at the boundary of the Faber Marsh. The water surface elevations and ground elevations are merely extended as straight lines. The changes in flood elevations shown on these cross-sections indicate a 5 foot difference for the 100 year flood. We can't evaluate what may happen to the marsh conditions or even propose better restoration options for the marsh without having cross-sections indicating the topography of the marsh and estimated wse for different flows on this topography.

4. The project calls for "excavating sediment in the existing channel to maximize conveyance." From station 44+00 to 55+00, (over a thousand feet), a new low channel is designed below existing grade. The current channel most likely is "graded" or stable at its current elevation. One of the greatest engineering legacy errors in flood control channel design in the Bay Area is to design a channel grade that is not sustainable. This causes chronic conflict between public works agencies and resource agencies over the constant need for expensive, disruptive maintenance dredging of the channels.

5. In some parts of the plan, the design shows retaining an existing low flow channel, which seems to vary in dimension throughout the project areas. At other times, there is a proposed excavated low flow channel. Typically, Water Board staff request an explanation for the design of low flow channels in a project application. The dimensions of the low flow (bankfull or effective discharge) channel are critical to the function of sediment transport. Therefore, Water Board staff should review the basis of design for these channels so as to avoid excessive erosion or sedimentation and future expensive and disruptive maintenance activities.

6. The project roughness value was changed from the PWA alternatives report at .050 to .030. The reports describe existing conditions with low habitat values and the channel characterized by weed species. The SFEI 2.0 Flood Alternatives Report recommends more robust riparian planting on the landside of the levees. As such, the levees should be moved farther apart and the roughness coefficient raised to the .05 value to protect the ability for more plant growth between the levees and avoid future maintenance activities that the .03 value suggests may be the case.

7. Do the Friendship Bridge piers, as built, create a hydraulic constriction that is not compensated for in the design of this area?

8. The Need to Address Hydraulic Constrictions at the Mouth of the Creek

According to the JPA, setting back the levees through the golf course provides little benefit hydraulically because the channel must still enter the Bay where it is constricted by the City of Palo Alto's airport runway. This is a critical location in the watershed, and it controls future upstream options for flood damage reduction and ecological benefits.

The most pressing hydraulics issue therefore is the hydraulic constriction at the mouth of the creek as it enters the Bay and its marshes. Experiences of other flood control agencies around the Bay Area indicate that the most import component of flood control design is to open up any channel constrictions, in particular those nearest the Bay. Examples include the Pinole, Wildcat, and San Pablo creek projects and the Napa River project. This is where effective financial investments are made in such projects as removing hydraulic constrictions at the end of a stream system creates the most extensive flood risk reduction benefits for upstream locations and is the best way to provide for sustainable, long-term protection. For the San Francisquito Creek project to provide sustainable, long-term protection, the JPA should coordinate amongst its members to remove the constriction with the golf course or airport. The City of Palo Alto and the County of Santa Clara need to be made aware of this issue, and it would be prudent for the resource agencies to have this discussion with them.

Plant Establishment and Project Mitigation Issues

The JPA has submitted its plan based on it being self-mitigating. There is quite a lot of outstanding information needed in addition to likely project design changes before we could determine if the project can be self-mitigating. Marshplain restoration is a part of the design, but we do not have the basis of design for this concept. Will they be established at sustainable elevations? As part of our review, we will need cross-sections of the channel with the ranges of wse and the placement of plants within these ranges. The resource agencies have prescriptions for marshplain inundation periods. Marshplain plants are very sensitive to periods of inundation, and we won't know of the viability of the marshplain habitat unless the designers submit this information.

The plant list appears good for tidal marsh habitats but needs to be improved for upland habitat. We have consulted with experts who practice marsh restoration to review this project. Their feedback is that standard levee flanks do not revegetate well even with great effort, and low quality upland habitat is an issue in this area. The JPA should submit a levee design with an inside flank with more gradual elevation changes that can better support upland habitat as well as marshplain in order to meet the intended project objectives.

Restoration Potential for the Marsh Needs to be Part of the Plan

Under existing conditions, floodflows spill to the golf course between stations 24+00 and 30+00. The proposed project puts a levee in to protect the golf course and now refers to this as a restoration area because it is wider. Downstream of this, the berms currently protecting the marsh are proposed to be removed and replaced with a lower weir and the golf course side would have new levees. While it may be beneficial to restore some flow to the marsh, the additional discharges from an added culvert under Highway 101, now confined by a new levee to the south, presumably has expected velocities of 8-11.5 fps. This merits close examination of the potential flow impacts to the marsh. As noted below, we still do not know the level of increase to downstream areas because of the new culvert under Highway 101.

After examining the concern of the impacts of more frequent flows of greater magnitude to the marsh, we need to resolve the question of how can we actually achieve an environmental benefit to the marsh rather than just trying to avoid impacts to the marsh? This may be where the project finds mitigation. This is an important opportunity to get this project design right. Marshes can benefit from freshwater contributions and sediment inputs from fluvial systems to recreate the disturbance regimes they need to support the habitat complexity necessary for endangered species and other marsh dependent ecosystems. There are a variety of Searsville Dam management scenarios currently under discussion, and all of them portend a future of greater sediment contributions to downstream. However, the design report remains silent on this issue. This project should be designed to take advantage of future sediment contributions to the marsh.

Stream Corridor Project Width Compared to Watershed Size and Design Discharges

The stream corridor width for the size of the watershed is comparable to an old fashioned conventional flood control channelization project we might have seen over 50 years ago. The San Francisquito Creek watershed drains 45 square miles, and the project design discharge at this point in time is 9,400 cfs. The new proposed project right of way (ROW) increases the average project width up to a maximum of about 300 feet and describes a project benefit of widening the existing ROW by 25 to 125 feet. This situation needs to be compared to other watersheds with similar downstream, low-gradient flood control projects influenced by tides involving leveed rights of way.

The Army Corps' flood control channelization project on lower Pinole Creek that dates from the 1960s drains 15 square miles (one third the size of this watershed), has a design discharge of 2400 cfs, and has a project ROW of 110-150 feet. This old fashioned Pinole channelization

project accommodates 25% of the flood flows designed for in the San Francisquito Creek Project but provides 50% of the proposed ROW of the San Francisquito Creek Project. The Army Corps does not usually accept velocities that exceed 8 ft per secondm which helped determine the width of the Pinole project. The Army Corps project on Wildcat Creek has a 250 foot ROW for a watershed area of 11 square miles (25% of the San Francisquito Creek watershed) and a discharge of 2300 cfs, about 22% of the design discharge on San Francisquito Creek. The Wildcat Creek Project has an average channel-floodplain bottom width between levees of 100-130 feet. This is about 67% of the San Francisquito average creek bottom width of 185 feet even though it is designed for less than a quarter of the San Francisquito Creek discharge.

The proposed added ROW of 25-125 feet for San Francisquito Creek is taken up mostly for accommodating the new levees. The bottom widths only increase by 10-30 feet in most of the project's reach and up to 60 feet at the widest levee widening in the middle reach. The new channel has to accommodate greater discharges than the existing conditions because the new bore under Highway 101 will deliver more flows. We have asked the project proponents for the existing condition discharges and the expected additional discharges from the added bore, but we were told this will take a few weeks to get the information. PWA (personal communication) estimates that the discharges are increasing by at least 3000 cfs over current discharges. This means that the project has about ten feet deep water between the levees, deeper at the floodwalls at high flood flows, and that the additional bottom width does not offset the need for greater capacity at the greater flows. The higher levees and floodwalls go the higher the risks of catastrophic failure to the surrounding community. Good engineering finds ways to reduce these types of risks.

Project Funding

This project is being supported by State funds including a $10 million Caltrans project to add the Highway 101 bore. The project does not currently meet the definition of a multi-objective flood risk reduction project, and the permanent hydraulic constriction at the mouth and the changes in design necessary to benefit, rather than impact, Faber Marsh, need to be resolved. The State is not only a partner in this project in its regulatory role but as a project funder. We need to have a clear breakdown of how agencies are sharing the costs. The permit application to the Army Corps states, "The project will be funded entirely with State funds." More detail on funding is needed.