SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

East Palo Alto, Menlo Park, Palo Alto, San Mateo County Flood Control District, and the Santa Clara Valley Water District

May 26, 2015

Lisa Mangione
U.S. Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street, 16th Floor
San Francisco, CA 94130-1398

Dear Ms. Mangione,

Thank you for providing to the San Francisquito Creek Joint Powers Authority (SFCJPA) a copy of the letter sent to Ms. Jane Hicks on November 3, 2014 by the National Marine Fisheries Service (NMFS). The November 3, 2014 letter was prepared in response to an Amended Biological Assessment submitted to NMFS for the San Francisquito Creek Flood Protection, Ecosystem Restoration, and Recreation Project (Project) based on changes that the SFCJPA made to the Project features as a result of requests from U.S. Fish and Wildlife Service and the Regional Water Quality Control Board.

Additionally, on April 24 2015 NMFS Staff members met with the SFCJPA, Santa Clara Valley Water District, and Regional Water Quality Control Board staff to discuss the Project and the potential for the Project to include specific improvements for fish.

The purpose of this letter is to offer specific responses to the questions and requests made by NMFS in its November 3 letter, and to provide feedback on the additional habitat features discussed at the April 24 meeting.

RESPONSES TO NOVEMBER 3, 2014 LETTER

The November 3, 2014 letter contains a total of 19 requests for information. To identify each request and organize responses, we have pulled those requests out of their text format and have listed and numbered them as individual questions or requests below in *italics*. SFCJPA responses to each question or request follow immediately in **bold.**

1. *How was the Project's design flood conveyance capacity selected?*

The Project's design flow capacity was established to provide 100-year creek flow, coincident with 100-year tide plus 26 inches of Sea Level Rise in accordance with NRC Curve III projections for 50 years of SLR. This aggressive design standard was established to provide current and future protection against flooding from both fluvial and tidal inundation, in accordance with current FEMA standards and to accommodate potential changes in FEMA requirements. This level of conveyance also provides adequate freeboard for all contemplated future upstream projects, both for flow and sediment transport, to maximize opportunities for upstream management decisions and not preclude any options for removal of flow constrictions upstream, and maximizes flexibility for future management decisions for Searsville Dam.

2. *Are there structures that limit channel capacity upstream for the project reach? If yes, describe these structures and their limits on channel capacity.*

<u>Middlefield Road Bridge</u> - The abutments at the Middlefield Road crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 6,800 cfs. Maximum bridge capacity is approximately 6,700 cfs.

<u>Pope-Chaucer Street Bridge</u> - The abutments at the Pope/Chaucer Street crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 5,600 cfs. Maximum bridge capacity is approximately 6,000 cfs.

<u>McCaul Pedestrian Bridge</u> - The abutments at the McCaul pedestrian bridge crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 6,200 cfs. Maximum bridge capacity is approximately 6,000 cfs.

<u>Saldich Pedestrian Bridge</u> - The abutments at the Saldich pedestrian bridge crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 6,200 cfs. Maximum bridge capacity is approximately 6,000 cfs.

<u>University Avenue</u> - The abutments at the University Avenue crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 5,800 cfs. Maximum bridge capacity is approximately 6,800 cfs.

<u>Newell Road</u> - The abutments at the Newell Road crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 6,200 cfs. Maximum bridge capacity is approximately 6,500 cfs.

<u>Highway 101</u> - The abutments at the Hwy 101 crossing extend into the channel and constrict high flows. Maximum creek capacity just upstream from the bridge is approximately 4,400 cfs. Maximum bridge capacity is approximately 4,700 cfs.

3. *Describe any reasonably foreseeable upstream actions that my increase or alter patterns of flow and sediment entering the Project reach. How does this project design address future changes in channel capacities that could result if these actions are implemented?*

   The project is designed to convey up to 9,400 cfs with freeboard. As such, additional flow resulting from the future removal of the capacity constrictions listed in item 2 above will be accommodated.

   The lake behind Searsville Dam is expected to completely fill with sediment in the next 15-40 years (NHC 2010). When the dam fills, additional sediment is expected to spill over the dam crest. USACE (2011) investigated sediment deposition in San Francisquito Creek and suggests that the average bed elevation between the Bay and Hwy 101 will increase by 1.24 feet over the next 70 years based on existing conditions. Post project conditions will provide more efficient sediment transport than existing conditions.

The project also includes levee crests which account for sea level rise conservatively and three feet of freeboard. As a result, additional channel volume will be available to accommodate sediment deposition in the years before expected sea level rise is fully realized and within the safety margin provided by freeboard. This extra room will allow for careful monitoring of the project area and will provide flexibility to track potentially transient sediment deposition which may move through the system to exit at the bay. To account for potential loss of channel capacity, the project will be monitored to determine if adaptive management, which could include structural solutions or sediment removal, is warranted to maintain flood conveyance in the project area, though it is not expected. An example of a structural solution is adding a curb on the levee top.

4. *Provide any sediment modeling studies that have been conducted to predict the sediment transport characteristics of the stream post-construction.*

No new sediment modeling studies are available. The Project was designed to convey sediments as described in the response to Question 3 above and will not introduce new sediment to the system.

The Project has been designed to improve the purging of upstream fluvial sediments by maintaining the stable low-flow channel, flanked by marshplain terraces sloped towards that low-flow channel at an elevation that will be maintained by tidal action. The Project does not result in the introduction of sediment to the channel. Any future, and as yet undefined, project upstream that may introduce changes to the watershed's sediment regime will be required to mitigate its impacts, just as this Project has done.

The Project reach is not utilized by steelhead for nesting, so there is no risk of redds being affected by stream sediments.

The Project has been designed so that the creek can contain an unprecedented flow concurrent with an extreme tide and Sea Level Rise, with the required freeboard to remove properties from the creek's FEMA floodplain. Freeboard serves as a factor of safety against uncertainty associated with storm or tidal events, as well as the geomorphology of the system. If, in the future, sediment deposition reduces channel capacity, then adaptive management measures such as structural solutions or sediment removal could be implemented.

5. *Provide a description of historical and anticipated sediment deposition patterns, and the channel maintenance procedures necessary to deal with depositional events.*

Deposition has occurred between the Bay and East Bayshore Road for a distance of approximately 7,500 feet. In 1958, this reach was lowered to an elevation of -3 to -4 feet and widened (San Francisquito Creek CRMP 1998). The excavated channel has since filled to a typical invert elevation of -1 foot, with bars or berms of silty clay along the channel margins. The excavated section varies along the channel but we have roughly estimated a total deposition of 35,000 yd^3. The grain size of the deposited sediment has not been measured but is believed to be roughly three-quarters sand and one-quarter fine sediment carried in from San Francisco Bay (NHC 2004).

The Santa Clara Valley Water District removed approximately 1,700 cubic yards of sediment

(every three years on average) between 1997 and 2007 from the creek in the vicinity of East Bayshore Road. Sediment removal was performed in the vicinity of U.S. Hwy 101 to maintain the City of Palo Alto stormdrain pipeline which outlets with a flap gate just downstream from East Bayshore Road. In 2009, the City of Palo Alto completed construction of a new pump station and the existing flap gate was converted from a primary outlet to a backup outlet. This backup outlet will be moved to a new location within the new bridge that will be constructed as part of the Caltrans bridge replacement project at U.S. Hwy 101. As a result, District staff anticipates no need for future sediment removal at the bridges or pipe outlet.

Deposition patterns in the Project reach are anticipated to improve greatly post project, as the existing channel was designed in the 1950s as a trapezoidal channel, with a flat bottom, that encourages the fall out of suspended sediments. The Project will improve sediment transport function by maintaining the stable low-flow channel, flanked by marshplain terraces sloped towards that low-flow channel at an elevation that will be maintained by tidal action. The Project does not introduce new sediment sources or change the sediment regime of the Project reach or watershed.

Future, as of yet undetermined actions upstream of the Project will need to fully mitigate for the impacts of those actions.

6. *Describe current sedimentation conditions in the project reach including the physical characteristics and volume of sediments transported from the upper watershed to the project reach.*

   Phillips (2000) reported measurements of the deposition on the delta at the mouth of San Francisquito Creek in San Francisco Bay based on detailed coring. His results show five distinct fining-upward layers that are spread extensively over the delta, which he associated with the five largest floods since 1930, when the mouth of the creek was moved north. The individual layers are not dated and cannot be readily assigned to specific storms; however, the uppermost layer is certainly a result of the 1997-98 storm (NHC, 2004).

   The volumes deposited during each event can be roughly estimated from the mapped area and the cores. It appears that the layer deposited on the delta during the 1997-98 El Nino storms averaged about 6 inches thick; based on the observed distribution of the flood deposits about 30,000 to 40,000 cubic yards appears to have been deposited. The volumes deposited during earlier floods are more difficult to interpret than from the 1997-98 storm. Significant deposition appears to have occurred during the 1982 storm. Total deposition since the late 1950s appear to be about one foot, or 80,000 cubic yards. We assume that this sediment is about three-quarters sand, providing an annual deposition rate of 2,300 cubic yards. Some of the fine sediment may be carried to the delta by tidal currents rather than deposited from San Francisquito Creek (NHC, 2004).

   The grain size of the deposited sediment has not been measured but it is believed to be roughly three-quarters sand and one-quarter fine sediment carried in from San Francisco Bay (NHC 2004).

7. *How often is the channel accessed for sediment removal and what is the frequency and volume of sediments removed?*

   The creek has not been accessed for sediment removal since 2007. Since the abandonment of the Palo Alto storm drain outfall, access for sediment removal has not been needed and will not be needed post project. Post project, we do not anticipate the need to access the channel for sediment removal as the project has been designed to optimize sediment transport.

8. *Provide a longitudinal survey of existing conditions and proposed project channel profile, noting channel slope, tidal elevations, the Friendship Bridge crossing, and the Highway 101 crossing.*

   See attached profile plot

9. *Provide historical hydrograph for the project reach of San Francisquito Creek, including a flow duration curve for the period of December through April.*

   See attached hydrograph plot;
   See attached flow-duration plot; as above

10. *Stage discharge relationships, cross sectional velocity profiles, magnitude and duration of expected high velocities during storm events, etc.*

    See attached velocity distribution and rating curve plots; as above

11. *Are there any sites in the project reach where there is a potential for hydraulic jumps, or abrupt elevation changes resulting from repeated scour or deposition events?*

    There are no anticipated hydraulic jumps or abrupt elevations changes expected within this reach. The overall slope in the project reach is 0.06% (see item 8 longitudinal profile). The project profile includes longitudinal slopes that closely match existing conditions. The proposed and existing longitudinal profiles both include slopes of up to 1.4 % at localized locations (e.g. between cross sections 7240 and 7419) however, these variations do not induce hydraulic jumps for the 5 year, 10 year, and design flow events.

12. *Are there features that offer hydraulic refugia for fish passage during flood flow events or in stream habitat structure that can be utilized as temporary habitat cover during juvenile outmigration?*

    On October 22 2014, staff from the SFCJPA and SCVWD met on site with NMFS representatives to discuss the Project's potential impacts to fish species. During that site visit, NMFS suggested several potential add-on features that would provide hydraulic refugia during flood flow events. These features included the strategic placement of appropriate sized boulders within the channel at locations that would lie along the likely migration course, as long as those features did not compromise the conveyance capacity of the channel. It's important to note that the Project will result in lower velocities than existing conditions for all events, even

when considering potential future upstream actions that would increase flow deliverance to the Project during large flows. Also, the system is flashy and high flows / high velocities do not last for extended periods of time (see hydrographs from item 9).

13. *NMFS would like to discuss hydraulic modeling performed for this project, including available information to assess the channel response to future sediment transport events and how such a response could affect fish passage and habitat conditions.*

The HEC-RAS model prepared for the project is attached. We would be happy to answer any questions NMFS has during preparation of their Biological Opinion and further discuss fish passage and habitat conditions.

14. Complete description of O'Connor Pump Station and Palo Alto Pump Station operations and maintenance activities

We have requested this information from the City of East Palo Alto for the O'Connor Pump Station and the City of Palo Alto for the Palo Alto Pump Station, and will provide this information to NMFS when we receive it .

15. *NMFS would like to review the Hydraulic Review Technical Memorandum*

SFCJPA provided the Hydraulic Review Technical Memorandum to NMFS prior to the April 24 meeting.

16. What future maintenance is planned for the Project reach and will these maintenance activities be conducted by SCVWD in accordance with their Stream Maintenance Program?

Expected maintenance activities will be limited to vegetation maintenance and other incidental actions resulting from periodic inspections. Maintenance activities will be conducted by the SCVWD and City of East Palo Alto, and will adhere to the standards established in the Stream Maintenance Program, but will be covered separately under the Project permits and therefore Biological Opinions. Any future unanticipated maintenance that requires more substantial in-channel work will be subject to its own permitting.

17. Present additional information on marshplain restoration goals (i.e. maps depicting existing and post-project wetland and water body types.

See attached habitat maps from recent mapping performed for the USFWS that specifically shows usable habitat for salt marsh harvest mouse and Ridgway's rail.

The Project's restoration goal is to expand and restore the San Francisquito Creek channel marshplain. Tidal benches will be restored on both sides of the low flow channel. As shown

in the profile plots submitted as requested under item 8, the marshplain will be graded to an elevation between 6 and 8 feet NAVD88. The landscaping plans show the two plant palettes proposed for the marshplain: high marsh planting (typically between 6 feet and 7 feet), and high marsh transition planting (typically between 7 feet and 8 feet). A third planting palette will be utilized for higher areas, especially along the Faber Tract levee.

18. *Describe how wetland vegetation success criteria will be assessed following maintenance activities.*

    The final details of monitoring for vegetation success will be established in the final MMP, but should be similar to that proposed in the draft MMP. Those criteria include qualitative and quantitative assessments over five years with a minimum coverage of 60 percent restored vegetation by year 5.

19. *Provide Landscape Sheets (Appendix B of the Mitigation and Monitoring Plan.*

    See the attached landscape sheets.

ADDITIONAL PROJECT DESIGN FEATURES RAISED AT APRIL 24, 2015 MEETING

Staff from the San Francisquito Creek Joint Powers Authority (JPA), Santa Clara Valley Water District (District), National Marine Fisheries Service (NMFS), U.S. Army Corps of Engineers and State Regional Water Quality Control Board held a meeting on April 24, 2015 to discuss questions and issues raised by NMFS in response to the Biological Assessment for the San Francisquito Creek Flood Protection, Ecosystem Restoration, and Recreation Project (Project). At the meeting NMFS made three specific recommendations for the JPA to include in the Project design to minimize impacts and improve conditions for steelhead and essential fish habitat. The JPA agreed to investigate the feasibility of the following three recommendations:

1) Hydraulic velocity breaks every 500 to 1000 feet of a scale that would provide high flow refuge without significantly impacting hydraulic performance;

2) Pre-cut tidal channels within the in-channel high marsh perpendicular and at angles to the low flow channel to improve inter-tidal habitat complexity;

3) Grading to maximize function of existing mitigation area near and downstream of the Palo Alto stormwater pump station as riparian habitat.

The results of the JPA investigations are below.

1) Hydraulic velocity breaks are useful in sections of a stream with little in-channel structure, vegetative cover, or undercut banks as found in the Project area, and the JPA agrees with NMFS' suggestion to include them as a habitat feature of the Project. The boulders will be of sufficient size to remain in place during high flow events. Base on the modeled velocities, boulders up to 5 feet by 5 feet in dimension (minimum of 2 tons and 27 cubic yards) are proposed along inboard bank bends, spaced 500 to 1000 feet apart to be added at the following locations:

Bank Stationing	River Stationing	Condition	Structure
Friendship Island/ Boardwalk	27+50	RSP island, piers	Rock barrier at island d/s toe
31+00 L	34+00	Levee	Rock barrier
41+00 R	41+00	Levee	Rock barrier
46+50 L	51+00	Electric Tower	Tower foundation (may not require additional rock)
54+00 R	54+00	Levee/RSP	Rock barrier
63+50 R	66+00	Floodwall	Rock barrier

Angular and irregular shaped boulders (e.g., quarried rock) will be used to provide hydraulic complexity and cover. Angular rock is less likely to roll and, therefore, offers greater resistance to shear. It is anticipated the boulders will not require maintenance or adjustment. However, periodic inspections will be conducted to determine if there is any movement, scour, or sediment deposition associated with the rock that may not afford high flow refugia for fish.

2) In researching pre-cut tidal channels within the high marsh perpendicular to the main channel, the JPA has found that this is appropriate for tidal marshes but could find no example of such channels installed into marsh benches in a river system. Such channels serve to drain high tides from the tidal marsh. In larger marshes these lower order channels form naturally as drainage patterns develop. Although the proposed San Francisquito Creek channel will be wider than pre-project, and the benches will be at a lower elevation to allow marsh plain development, there is not likely enough area and tidal runoff to support the type of tidal channels recommended by NMFS, at least not with sufficient depth to provide groundfish habitat. Excavating marshplain areas that are proposed to be vegetated with restoration plantings would reduce benefits to Ridgeway's Rail and Salt Marsh Harvest Mouse without providing any apparent benefit for groundfish or steelhead.

   There is also a concern that such perpendicular channels could erode during high flow river events and fill with tidal sediments, requiring continual intrusive maintenance, which could be damaging to surrounding mitigation plantings. Tidal channels in a natural marsh setting are not subject to strong flows such as those that will occur in the Project area. The JPA does not believe there would be a benefit to fish species from this recommendation.

3) The JPA also further investigated the idea of degrading the mitigation area downstream of the Palo Alto stormwater pump station down to an elevation that could be regularly connected to the creek and support riparian vegetation; either in full or in part. District fishery biologists considered the need for such an area for steelhead migrating through the reach. Based on their knowledge of migration patterns for steelhead in south bay rivers, the biologists believe that fish will not be moving in extreme high flows, but rather at approximately the 50% recurrence intervals of bank-full discharge, which is much lower than the project capacity of 9,400 cfs and associated velocities. Adult fish will be readily moving past the site heading upstream, and juvenile fish will not be rearing there before migration to the ocean. Steelhead smolts will be directly migrating to the Bay proper, based on the sizes and conditions of smolts found in other South Bay streams. Harm done to the established and functioning mitigation habitat would be greater than the benefits that could be provided by this action. In preliminary discussions with the regulatory agencies for which the mitigation site was established, they expressed concern about the loss of mitigation lands, and in particular, mitigation land that is established and performing well.

   Given these issues the JPA is not proposing to degrade the mitigation area to a lower grade. District biologists believe the velocity breaks suggested by NMFS will be a more effective habitat feature for improving conditions for fish migration. With the small size of the mitigation site, and migrating patterns of steelhead, re-grading the site could only provide marginal benefit to steelhead and would not contribute significantly to the population, while damaging the existing beneficial habitat.

It is our belief that the responses above and the files attached to this letter represents the complete suite of materials requested by NMFS to initiate their work on a Biological Opinion for the Project and the 135-day period allotted for them to do so. Should the Corps or NMFS wish to discuss these responses or any of the materials provided, please do not hesitate to contact me directly.

Sincerely,

Kevin Murray
SFCJPA Project Manager