NON-AGENDA

September 13, 2019

Board Policy EL-7 Communication and Support to the Board
The BAOs shall inform and support the Board in its work.

Board correspondence has been removed from the on line posting of the Non-Agenda to protect personal contact information. Lengthy reports/attachments may also be removed due to file size limitations. Copies of board correspondence and/or reports/attachments are available by submitting a public records request to publicrecords@valleywater.org.

Santa Clara Valley Water District | 5750 Almaden Expressway, San Jose, CA 95118-3686 | (408) 265-2600 | www.valleywater.org

CEO BULLETIN

CEO BULLETIN

To: Board of Directors
From: Norma J. Camacho, CEO

Week of September 6 – September 12, 2019

Board Executive Limitation Policy EL-7:
The Board Appointed Officers shall inform and support the Board in its work. Further, a BAO shall 1) inform the Board of relevant trends, anticipated adverse media coverage, or material external and internal changes, particularly changes in the assumptions upon which any Board policy has previously been established and 2) report in a timely manner an actual or anticipated noncompliance with any policy of the Board.

Item	IN THIS ISSUE
1	Anderson Dam Seismic Retrofit Project Board of Consultants Report #10
2	Bay Area Regional Reliability (BARR) Partnership - Regional Water Market Program Kickoff Meeting
3	Crest Building Weatherproofing Update
4	Governor's Water Policy Appointments
5	September 2019 Penitencia Water Treatment Plant Shutdown Schedule
6	Santos Staff to investigate a water leak from an unknown source at the City of San Jose's Penitencia Creek Park to determine if it's a District raw water pipeline I-19-0016

1. Anderson Dam Seismic Retrofit Project Board of Consultants Report #10

On August 11, 2019, Valley Water received the tenth report from the Anderson Dam Seismic Retrofit Project's Board of Consultants. This report will be transmitted to the Board of Directors via non-agenda memorandum on September 13, 2019.

For further information, please contact Christopher Hakes at (408) 630-3796.

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2. Bay Area Regional Reliability (BARR) Partnership - Regional Water Market Program Kickoff Meeting

In September 2015, eight agencies came together to form the Bay Area Regional Reliability (BARR) Partnership (www.bayareareliability.com). The agencies are the Alameda County Water District, Zone 7, San Francisco Public Utilities Commission, the Bay Area Water Supply and Conservation Agency, Contra Costa Water District, East Bay Municipal Utility District, Marin Municipal Water District, and the Santa Clara Valley Water District (Valley Water), referred collectively as the BARR Partners. In 2017, the BARR Partners published the Drought Contingency Plan, which identified fifteen drought mitigation measures. One of the measures was the implementation of a Regional Water Market Program (Program) to help facilitate regional transfers and exchanges. In 2018, the BARR Partners secured a $400,000 WaterSMART grant from U.S. Bureau of Reclamation to support the development of the Program.

On August 26, 2019, Valley Water participated in the Regional Water Market Program 'kickoff meeting'. The goal of this effort is to establish a formalized process to evaluate and facilitate water transfer and exchange opportunities which support sustainable Bay Area water management and better prepare the region for future droughts or emergencies. This meeting focused on establishing a process to select pilot project(s), identify regional benefits, and to evaluate the feasibility of water transfer and exchange concepts. BARR Partners are expected to select two pilot project candidates by end of 2019; focused on support of existing and planned infrastructure projects, such as Los Vaqueros Expansion, and which tests coordinated use of conveyance and storage facilities for future water transfers and exchanges. Approval(s) for Central Valley Project and/or State Water Project transfers are targeted for summer of 2020 to adhere with deadlines of the grant funding.

BARR Partners anticipate follow-up meetings in the coming months to develop tools and data which help identify opportunities and restrictions used in the pilot project(s) selection process. Valley Water will continue to participate and provide updates as the BARR Partnership moves forward.

For further information, please contact Jerry De La Piedra (408) 630-2257.

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3. Crest Building Weatherproofing Update

During rain events in February and March of 2019, weak spots in the weather proofing along the exterior base of the Crest Building contributed to multiple reports of water intrusion into the building. Water intrusion primarily affected the Child Development Center and the lower level parking garage.

Valley Water took steps to temporarily repair the areas to prevent further water intrusion. The water intrusion also contributed to mold growth along the interior of east wall behind the floor coving, and on the ceiling of the parking garage. Valley Water acted promptly to assess the indoor air quality of the entirety of the Crest Building and verified there was no increased risk to the respiratory health of building occupants due to mold growth. Additionally, areas affected by mold were quickly cleaned and the affected building materials were removed from the facility.

Valley Water has now initiated work aimed to leak and moisture proof the exterior east wall of the Crest Building. Long-term leak proofing measures consist of sloping and resealing the foundation away from the base of the wall, so that water may drain away from the building during rain events instead of pooling in place. At the current phase of repairs, workers have begun chipping away the existing stucco at the base of the wall to allow for the formation of the downward slope and resealing. Repairs are expected to run through the month of September.

For further information, please contact Tina Yoke at (408) 630-2385.

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4. Governor's Water Policy Appointments

Last week, the California Senate confirmed several gubernatorial water policy appointments.

<u>State Water Resources Control Board (State Water Board)</u>
The confirmations included two State Water Board members: Sean Maguire and Laurel Firestone. Mr. Maguire, a registered civil engineer, was appointed in December 2018 by Governor Brown.

Maguire has worked for the State Water Board since 2015 as a Storm Water Grant Program and Division of Water Rights Manager. Prior to joining the Board, he worked for an engineering consulting firm from 2003-2015. Ms. Firestone was appointed to the State Water Board by the Governor Newsom in February 2019. From 2006-2019 she co-founded and co-directed the Community Water Center. Maguire and Firestone now join Chair Joaquin Esquivel, Vice Chair Dorene D'Adamo, and Tam M. Doduc as Senate-confirmed members of the State Water Board.

California Water Commission (CWC)
The Senate also confirmed the appointment of Maria Gallegos Herrera as a member of the CWC. Ms. Herrera has served on the CWC since 2015 and was reappointed by Governor Newsom in March 2019. She has been working in community development with Self-Help Enterprises since 2014. Before that, she was the Director of Community Advocacy at the Community Water Center from 2008 to 2014. Herrera is a native of Visalia.

Regional Water Quality Control Boards
Jane M. Gray was unanimously confirmed by the Senate as a member of the Central Coast Regional Water Quality Control Board. She was reappointed by Governor Brown in November 2018, is a native of Goleta, and has been working for Dudek since 2006 as a Regional Planner and Project Manager. Before that, she was a Planner at the Santa Barbara County Long Range Planning Division from 2004 to 2006, and a Policy Planner for the County of Fresno from 2003 to 2004.

Governor Newsom will have the opportunity to make several regional water board appointments this year. The Central Coast Regional Water Quality Control Board has seven members, two of whom have terms expiring on September 30, 2019: Board Chair Jean-Pierre Wolff and Michael Johnston. The San Francisco Bay Regional Water Quality Control Board is intended to have seven members, one of which is the vacancy created by the resignation of Board Chair Terry Young earlier this year, and two of whom have terms expiring on September 30, 2019, including William Kissinger and Cecilia Ogbu.

California Environmental Protection Agency (Cal-EPA)
The Office of Governor Newsom announced the appointment of Kristin Peer as Deputy Secretary and Special Counsel for Water Policy at Cal-EPA. Before joining Cal-EPA as an Assistant General Counsel in 2015, Peer served as a Deputy Attorney General in the Office of the Attorney General from 2010 to 2015. Kristin Peer was an Associate at the law firm of Miller, Starr, Regalia from 2007 to 2019, and a Credit Analyst at Union Bank from 2002 to 2004. No Senate confirmation is required for her position.

For further information, please contact Rachael Gibson at (408) 630-2884.

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5. September 2019 Penitencia Water Treatment Plant Shutdown Schedule

On September 23, 2019, the Penitencia Water Treatment Plant (PWTP) will be shut down for two (2) weeks for our annual maintenance projects, which for this year include, treated water clearwell interior coating inspection, sludge pond relining, and biennial electrical testing among other plant-wide inspection and preventive maintenance work. During this period, when PWTP is off-line, we do not anticipate any impact to our east pipeline treated water retailers. The Santa Teresa Water Treatment Plant (STWTP) has enough production capacity to supply and meet peak treated water demand. In addition, the joint Valley Water-San Francisco Public Utilities Commission intertie facility will be on standby should any unforeseen operational constraints or emergencies occur.

This year's maintenance shut down period for the PWTP is outside of the normal winter maintenance period (November to March), so as to stagger the shut down windows to allow for the completion of the Cross Valley and Calero Pipelines Inspection and Rehabilitation project which will impact the STWTP operations between November 2019 and February 2020.

PWTP is scheduled to return to service by the end of the workday on Thursday, October 10, 2019.

For further information, please contact Bhavani Yerrapotu at (408) 630-2735.

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6. <u>Santos</u>
Staff to investigate a water leak from an unknown source at the City of San Jose's Penitencia Creek Park to determine if it's a District raw water pipeline
I-19-0016

On the morning of September 5, 2019, Valley Water staff went to the City of San Jose's Penitencia Creek Park to investigate the reported water leak. Staff determined that Valley Water's raw water pipeline was not leaking and found a broken City of San Jose irrigation supply line that was leaking. Staff notified the City of San Jose and they turned off the water to that irrigation supply line, thereby stopping the leak that afternoon. City of San Jose staff are currently repairing the irrigation supply line and it's estimated that the repair will be completed and the irrigation supply line back in service by September 12, 2019.

For further information, please contact Aaron Baker at (408) 630-2135.

BOARD MEMBER REQUESTS and Informational Items

Report Name: Board Member Requests

Request	Request Date	Director	BAO/Chief	Staff	Description	20 Days Due Date	Expected Completion Date	Disposition
I-19-0016	09/05/19	Santos	Hawk	Baker	Director Santos request,Staff to investigate a water leak from an unknown source at the City of San Jose's Penitencia Creek Park to determine if it's a District raw water pipeline. .	09/25/19		
R-19-0012	08/27/19	Lezotte	Yoke	Gordon	Staff is to coordinate a mock active shooter exercise replicating an active shooter at a Board Meeting scenario, and investigate, bringing on-site CERT Training (Community Emergency Response Team)	09/25/19		

September 2019

Water Tracker

Valley Water

A monthly assessment of trends in water supply and use for Santa Clara County, California

Outlook as of September 1, 2019

We began calendar year 2019 with groundwater storage well within Stage 1 (Normal) of Valley Water's Water Shortage Contingency Plan despite below-normal local rainfall and statewide snow pack in calendar year 2018. In 2019, the statewide average snowpack water equivalent was well above normal and valley floor precipitation was also above normal. Countywide, groundwater storage remains healthy due to the wet winter and continued water use reduction by the community. In northern Santa Clara County, groundwater levels in many monitoring wells reached historic highs this spring and the basin is essentially full.

Weather

Rainfall in San Jose:

- Month of August, City of San Jose = 0.0 inches
- The average daily high temperature for August was 84.4 degrees Fahrenheit. Temperature was above normal for the month

Local Reservoirs

- Total September 1 storage = 85,223 acre-feet
  - » 98% of 20-year average for that date
  - » 51% of total capacity
  - » 76% of restricted capacity (166,808 acre-feet total storage capacity limited by seismic restrictions to 111,963 acre-feet)
- Approximately 804 acre-feet of imported water delivered into local reservoirs during August 2019
- Total estimated releases to streams (local and imported water) during August was 8,087 acre-feet (based on preliminary hydrologic data)

Treated Water

- Above average demands of 12,511 acre-feet delivered in August
- This total is 108% of the five-year average for the month of August
- Year-to-date deliveries = 66,542 acre-feet or 100% of the five-year average

Groundwater

- Groundwater conditions are very healthy, with total storage at the end of 2019 predicted to fall well within Stage 1 (Normal) of Valley Water's Water Shortage Contingency Plan.

	Santa Clara Subbasin		Llagas Subbasin
	Santa Clara Plain	Coyote Valley	
August managed recharge estimate (AF)	4,800	1,400	3,100
January to August managed recharge estimate (AF)	29,600	8,500	17,000
January to August managed recharge, % of 5-year average	79%	137%	152%
July pumping estimate (AF)	6,100	1,500	4,600
January to July pumping estimate (AF)	27,900	6,600	20,400
January to July pumping, % of 5-year average	66%	105%	94%
GW index well level compared to last August	Same	Increase	Increase

AF = acre-feet

continued on back ▸

Imported Water

- 2019 State Water Project (SWP) and Central Valley Project (CVP) allocations:
  - 2019 SWP allocation of 75%, which provides 75,000 acre-feet to Valley Water
  - 2019 South-of-Delta CVP allocations are 100% for M&I and 75% for Agriculture, which provides 122,325 acre-feet to Valley Water
- Statewide reservoir storage information, as of September 2, 2019:
  - Shasta Reservoir at 80% of capacity (127% of average for this date)
  - Oroville Reservoir at 74% of capacity (113% of average for this date)
  - San Luis Reservoir at 60% of capacity (142% of average for this date)
- Valley Water's Semitropic groundwater bank reserves are at 94% of capacity, or 327,721 acre-feet, as of July 31, 2019
- Estimated SFPUC deliveries to Santa Clara County:
  - Month of July = 4,919 acre-feet
  - 2019 Total to Date = 24,312 acre-feet
  - Five-year annual average is 48,700 acre-feet
- Board Governance Policy No. EL-5.3.3 includes keeping the Board informed of imported water management activities on an ongoing basis. In calendar year 2019, three imported water management agreements were executed as of September 3, 2019

Conserved Water

- Saved 75,687 acre-feet in FY18 from long-term program (baseline year is 1992)
- Long-term program goal is to save nearly 100,000 acre-feet by 2030
- The Board continues its call for a 20% reduction and a limit of three days per week for irrigation of ornamental landscape with potable water
- Through July, achieved a 24% reduction in water use in calendar year 2019, compared to 2013

Recycled Water

- Estimated August 2019 production = 2,000 acre-feet
- Estimated Year-to-Date through August = 11,240 acre-feet or 85% of the five-year average
- Silicon Valley Advanced Water Purification Center produced an estimated 1.3 billion gallons (4,100 acre-feet) of purified water in 2018. Since the beginning of 2019, about 3,000 acre-feet of purified water has been produced. The purified water is blended with existing tertiary recycled water for South Bay Water Recycling Program's customers

CONTACT US

For more information, contact **Customer Relations** at **(408) 630-2880**, or visit our website at valleywater.org and use our **Access Valley Water** customer request and information system. With three easy steps, you can use this service to find out the latest information on district projects or to submit questions, complaints or compliments directly to a district staff person.

Follow us on: /scvwd /valleywater /valleywater

To get eNews, drop an email to: info@valleywater.org

Valley Water

MEMORANDUM

FC 14 (08-21-19)

TO:	Board of Directors	**FROM:**	Nina Hawk
SUBJECT:	U.S. Bureau of Reclamation Request to Modify Operation of the Central Valley Project during Fall of 2019	**DATE:**	9/10/2019

On September 4th, the U.S Bureau of Reclamation (Reclamation) submitted a request to the U.S. Fish and Wildlife Service to modify the Fall X2 action for Delta Smelt. X2 is a measure of where the bay salinity mixes with fresh river flows in the estuary and has been used as a surrogate for Delta Smelt habitat. In the fall following above normal and wet years, the 2008 biological opinion requires that X2 be located further west by providing additional outflow from the Delta. New science developed since 2008 has shed additional insight on the habitat needs of Delta Smelt, and Reclamation cites this information as justification for the modification.

Reclamation is proposing the same modification as was proposed and approved following the 2017 wet year. The California Department of Water Resources (DWR) is not planning to request a modification for their operations, which could result in a situation similar to 2017 when the projects operated to different standards. Staff anticipates a water supply benefit for the Central Valley Project if their modification is approved. Currently, staff does not anticipate an additional impact on the State Water Project (SWP) allocations for 2019, which were already based on meeting the X2 location specified in the 2008 biological opinion; however, it is still unclear if this will impact allocation in 2020.

Similar to the 2017 action, Reclamation, DWR, and the State Water Contractors are planning to implement significant monitoring efforts to accompany this year's proposed action that will provide valuable information toward further understanding the habitat needs of Delta Smelt.

For: Nina Hawk
Chief Operating Officer
Water Utility Enterprise

Attachment 1: Reclamation Letter to U.S. Fish and Wildlife Service, dated September 4, 2019

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Region
2800 Cottage Way
Sacramento, California 95825-1898

IN REPLY REFER TO:

BDO-400
2.2.1.06

SEP 04 2019

VIA ELECTRONIC MAIL ONLY

MEMORANDUM

To: Regional Director, U.S. Fish and Wildlife Office, Sacramento, California

From: Area Manager, U.S. Bureau of Reclamation, Bay-Delta Office, Sacramento, California

Subject: Request for Reinitiation of Consultation on the 2008 Biological Opinion for the Coordinated Long-term Operation of the Central Valley Project and State Water Project Biological Opinion for the Proposed Change in Implementation of Reasonable and Prudent Alternative Component 3 – Action 4 (Fall X2)

The Bureau of Reclamation submits this letter to satisfy requirements to reinitiate consultation, consistent with Section 7 of the Endangered Species Act (ESA) and the 2008 Biological Opinion (2008 BiOp), regarding the effects of the Coordinated Long-term Operation of the Central Valley Project (CVP) and State Water Project (SWP) on delta smelt (*Hypomesus transpacificus*) and its designated critical habitat. ESA regulations require action agencies to reinitiate consultation when the action is modified in a manner that may affect listed species or critical habitat in a way that was not considered in the biological opinion and when new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered. Based upon new delta smelt science and monitoring information, Reclamation proposes to modify the manner in which the CVP/SWP operates Fall X2 in September and October of 2019. This modification would fall under the adaptive management component of the 2008 Reasonable and Prudent Alternative Component 3 – Action 4 (Fall X2) and may have an effect not considered in the 2008 BiOp . Therefore, Reclamation requests reinitiation of consultation to determine the effects associated with the proposed modifications to Fall X2.

This reinitiation request is specific to operation of Fall X2 in September and October of 2019. It is separate and apart from Reclamation's August 2, 2016, request for reinitation of consultation on the Coordinated Long-term Operation of the CVP and SWP (ROC on LTO), which will address system-wide operations. The ROC on LTO will explore alternatives to current operation under the National Environmental Policy Act (NEPA) prior to submitting the proposed action under ESA. That effort, once complete, is expected to supersede previous consultations and reinitiations, including this one.

Adaptive Management

The 2008 BiOp expressly requires Fall X2 to be adaptively managed, under the supervision of the U.S. Fish and Wildlife Service (the Service), to ensure the implementation of the action addresses the "uncertainties about the efficiency of the action" (page 369 of 2008 BiOp). The action also states that as new information is developed and as circumstances warrant, changes by the Service to Fall X2 may be necessary. Modifications by the Service may be "in consideration of the needs of other species" and "other CVP/SWP obligations" (page 283 of 2008 BiOp). Reclamation seeks to adaptively manage and modify its operation of the CVP/SWP of Fall X2 in September and October of 2019.

In August 2011, Reclamation transmitted to the Service the Adaptive Management of Fall Outflow for Delta Smelt and Water Supply Reliability (AMP), which the Service found consistent with the RPA. Although the AMP did not establish specific management actions beyond 2011, it provided a framework that could be used for adaptively managing the action in future years. In 2011, the daily average X2 values from DAYFLOW for September and October 2011 were 75 km and 74 km, respectively (pers. comm. D. Hilts). Thus, the initial management requirement of Fall X2 was met. See the attachment for further information concerning Water Year 2011 and synthesis studies analyzing the fall habitat management.

The AMP considers the available information on: delta smelt habitat; X2 as a surrogate for delta smelt habitat; correlations between habitat and abundance; Delta hydrology; X2 and delta smelt habitat in the fall; and the specific X2 action prescribed in the BiOp. The AMP concluded that outflow affects the quality and extent of abiotic delta smelt habitat and that restoring lost abiotic habitat availability is likely to produce subsequent-abundance benefits to delta smelt, probably by raising the carrying capacity. However, AMP identified unanswered questions that can only be addressed by adaptive management. Those are: 1) what are the key underlying ecological mechanisms that link outflow to delta smelt abundance, and how important and manageable is each link?, 2) how does fall outflow fit in with other drivers of delta smelt abundance?, and 3) are there more water-efficient ways to provide the necessary benefits? The proposed action will help address these unanswered questions.

Delta Smelt Adaptive Habitat Management in 2017

After 2011, there was an extended multi-year drought. Since Fall X2 is only triggered in wet and above-normal water years, it was not triggered again until 2017. In 2017, Reclamation proposed and operated to 74 km in September and 80 km in October. The adaptive management plan for 2017 evaluated the conceptual models described in the AMP and made predictions as to the expected outcomes. Adaptive management in 2017 represented an X2 location upstream of the initial management requirement for a wet year of 74 km. Upstream CVP reservoir releases and storage did not change due to the adaptive management in 2017. The only operational changes to CVP that occurred were differences in south Delta exports in October; whereas, the export levels for September did not change. According to California Data Exchange Center (CDEC) data in 2017, adaptive management resulted in average X2 locations at 74 km in September and 77 km in October. This variation from the proposed action was due to DWR's inability to obtain approval to operate Fall X2 to 80 km --instead operating to 74 km. It is anticipated the same divergent operations of CVP and SWP will occur in September and October of 2019.

Proposed Action

Reclamation will operate the CVP to no more eastward than 80 km in September and October of 2019, and DWR is expected to operate the SWP to achieve its proportional share of a combined 74 km CVP/SWP operation during the same time period. It is anticipated that the monthly average X2 will be similar to conditions experienced in October of 2017 (i.e. 77 km). Although it is expected that actual conditions during September and October of 2019 will be similar to October of 2017, Reclamation's proposed action is to maintain the monthly average X2 no more eastward than 80 km in September and October of 2019 in the context of the adaptive management provisions of Fall X2.

The proposed action and its effects, including designated critical habitat and biotic and abiotic factors, are further described in the attachment. This effects analysis considers the 2008 consultation, the current hydrology in 2019, monitoring needs, and the needs of other species, including Sacramento River winter-run Chinook salmon. This document attempts to update the analysis that formed the basis for Fall X2 with data from the past decade.

The species account for delta smelt and its designated critical habitat, which was recently developed for Reclamation's 2018 Biological Assessment on the ROC on LTO, represents a more current account from that utilized in the 2008 BiOp. We are incorporating it by reference for this reinitiation.

In addition to the attached effects analysis, operational modeling from DWR on the location of X2 from August 1 through December 1, 2019, is also included. These simulations include forecasted daily X2 locations in the existing wet condition under the initial management requirement of 74 km and locations in a wet condition under this proposal of 80 km. The effects analysis uses 80 km as an upper bound to estimate the effects of the proposed adjustment.

Reclamation will utilize existing monitoring programs such as the Enhanced Delta Smelt Monitoring (EDSM) program and the Interagency Ecological Program (IEP) to monitor resulting parameters relevant to delta smelt from the proposed action to inform future adaptive management.

Conclusion

As described in the attached effects analysis, Reclamation has determined that the proposed action may affect but is not like to adversely affect threatened delta smelt. Additionally, Reclamation has determined the proposed action would adversely affect Delta smelt designated critical habitat. Effects to critical habitat primary constituent elements (PCEs) would specifically consist of decreased river flow and increased salinity affecting the low salinity zone (PCEs 3 and 4 respectively). Reclamation understands recent guidance to move toward physical and biological features in relation to critical habitat, however, PCEs were evaluated to ensure consistency with the 2008 BiOp. Reclamation seeks concurrence on this determination.

If you have any questions or concerns please contact me at dmmooney@usbr.gov or 916-414-2400. Thank you for your time and attention to this important matter. Reclamation has appreciated your staff's willingness to work with us in the past and looks forward to continuing to work together as we navigate the challenges the Delta ecosystem faces.

Attachment

cc: Mr. John Leahigh
Operations Control Office
California Department of Water Resources
3310 El Camino Avenue, Suite 300
Sacramento, CA 95821

Mr. Jeffrey Rieker
Operations Manager
Central Valley Operations Office
Bureau of Reclamation
3310 El Camino Avenue, Suite 300
Sacramento, CA 95821

Ms. Maria Rea
Assistant Regional Administrator
California Central Valley Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Ms. Michelle Banonis
Assistant Chief Deputy Director
California Department of Water Resources
1416 9th Street
Sacramento, CA 95814

Mr. Carl Wilcox
Policy Advisor on the Delta
California Department of Fish and Wildlife
1416 9th Street
Sacramento, CA 95814

(w/encl to each)

Valley Water

MEMORANDUM

FC 14 (08-21-19)

TO: Board of Directors

FROM: Nina Hawk

SUBJECT: Partnership Between Palo Alto, Mountain View and the Santa Clara Valley Water District to Advance Resilient Water Reuse Programs in Santa Clara County

DATE: September 9, 2019

The purpose of this memorandum is to provide the Board of Directors (Board) with an update to ongoing discussions between the City of Palo Alto, City of Mountain View and Santa Clara Valley Water District (Valley Water) to advance resilient water reuse in the county.

Valley Water is currently in the process of updating its Water Supply Master Plan (Master Plan), which recommends investment decisions to meet the county's 2040 water supply reliability goals in a cost-effective manner. The Master Plan has identified a goal of developing 24,000 acre-feet per year of potable reuse capacity by 2028. In addition, Valley Water has established a goal that 10 percent of total countywide demands be met from water reuse by 2025. To assist in meeting these goals, Valley Water has been in discussions with the cities of Palo Alto and Mountain View on a partnership. These discussions have focused on the development of a local plant (owned and operated by Palo Alto) to provide a higher quality of recycled water, primarily for irrigation and cooling towers, and a regional plant/program (owned and operated by Valley Water) to provide advanced purified water for potable reuse.

Discussions have been ongoing for over two years, and although they are not complete, staff is providing the Board with an update on the discussions' current status. A draft term sheet for the proposed partnership is provided (Attachment 1). It should be noted that although significant progress has been made over the last couple of years, not all terms have been agreed upon by staff. The goal is to complete these discussions by October 2019 for City Council and Valley Water Board consideration in November/December 2019.

Staff from Palo Alto and Valley Water are also in the process of reaching out to the other agencies that send wastewater to the Palo Alto Regional Water Quality Control Plant to discuss key terms in the proposed agreement that apply to them and to determine their level of interest in this agreement.

ATTACHMENTS:
Attachment 1: Draft Partnership Term Sheet to Expand Water Reuse

For further information, please contact Nina Hawk at (408) 630-2736.

for: Nina Hawk
Chief Operating Officer
Water Utility Enterprise

cc: G. Hall, J. De La Piedra; H. Ashktorab

PARTNERSHIP BETWEEN PALO ALTO, MOUNTAIN VIEW, AND THE SANTA CLARA VALLEY WATER DISTRICT TO ADVANCE RESILIENT WATER REUSE PROGRAMS IN SANTA CLARA COUNTY

WORKING DRAFT – All Terms Still Under Discussion

A. WHEREAS, the governing bodies of the Santa Clara Valley Water District (Valley Water) and the Cities of Palo Alto and Mountain View (collectively, the Parties) have established policy goals for long term sustainability, which include maintaining effective use of existing infrastructure, lowering the carbon footprint of energy use, deploying water use efficiency programs, capturing local storm water, managing groundwater basins, and expanding use of recycled water; and

B. WHEREAS, the Parties have long-standing responsibilities and services to supply water to their customers in Santa Clara County (County) under both normal and drought conditions; and

C. WHEREAS, the Parties seek to develop locally reliable water supply sources to offset supplies of water that would otherwise have to be imported via the Sacramento-San Joaquin River Delta and its tributaries, including the Tuolumne River and other mountain streams; and

D. WHEREAS, the Parties together are finalizing the Northwest County Recycled Water Strategic Plan to inform their respective policy makers of opportunities in the north-west portion of Santa Clara County, including Palo Alto and Mountain View, for groundwater recharge, further recycled water development, and deployment of highly purified wastewater to supplement drinking water; and

E. WHEREAS, increasing the use of Recycled Water decreases contaminants discharged to San Francisco Bay where harm to wildlife can occur; and

F. WHEREAS, Valley Water has established a goal that at least 10 percent of total County water demands be supplied by recycled water by 2025; and

G. WHEREAS, decreasing the salinity of the treated wastewater from the Palo Alto Regional Water Quality Control Plant (RWQCP) through further treatment will allow it to be used on more types of flora, especially redwood trees, thereby increasing its overall use, and further reducing the need to import water from mountain streams including the Tuolumne River; and

H. WHEREAS, decreasing the salinity in Recycled Water used for irrigation keeps that salt out of the soil and ultimately out of the ground water; and

I. WHEREAS, the Parties recognize that well-purposed and managed partnerships can serve the public interest more effectively than their individual efforts to develop and manage water supplies; and

J. WHEREAS, the Parties desire to cooperate to achieve the most cost effective, environmentally beneficial utilization of treated wastewater in the County.

DEFINITIONS

Agreement: This Agreement between the Santa Clara Valley Water District, Palo Alto, and Mountain View.

Designated Representatives: Employees or officials designated in writing by each of the respective Parties to serve as representatives for purposes of this Agreement. In the absence of such written notice, the Designated Representatives shall be the Valley Water Chief Executive Officer, the Mountain View City Manager, and the Palo Alto City Manager.

Dispute Resolution Procedure: The alternative dispute resolution process to be used for disputes arising out of this Agreement. The procedure is set forth in more detail in Article 26 below.

Effluent: Tertiary treated wastewater from the RWQCP.

Enhanced Recycled Water: Non-potable water produced by the Local Plant which is blended with Recycled Water from the RWQCP.

Local Plant: A salinity removal unit to produce 1.25 MGD Enhanced Recycled Water for the RWQCP service area, for initial use within Palo Alto and Mountain View service areas.

MGD: million gallons per day.

Minimum Flow Delivery: the minimum amount of Effluent to be supplied by the RWQCP to Valley Water, consistent with Appendix 1.

Effluent Transfer Option: Valley Water's option to secure Effluent, as described in Article 13 of this Agreement.

Parties: The City of Palo Alto ("Palo Alto"), the City of Mountain View ("Mountain View"), and the Santa Clara Valley Water District ("Valley Water").

Recycled Water: Effluent that is treated to meet Title 22 regulations for non-potable water.

Regional Plant: A purification treatment facility capable of treating Effluent flows of 9 MGD or greater for the purpose of regional water supply benefit.

Regional Program: Valley Water's program to derive benefits from the Effluent under the terms of this Agreement.

Responsible Agencies: Responsible Agencies are agencies other than the lead agency, that have some discretionary authority for carrying out or approving a project, as defined in the California Environmental Quality Act and its associated regulations.

RWQCP: The Palo Alto Regional Water Quality Control Plant.

RWQCP Partners: The cities of Palo Alto, Mountain View and Los Altos; the Town of Los Altos Hills; the East Palo Alto Sanitary District; and Stanford University.

RWQCP Partner Agreements: Agreements between Palo Alto and one or more of the RWQCP Partners regarding provision of Effluent to Valley Water for its Regional Program.

RWQCP Service Area: RWQCP Service Area includes the cities of Palo Alto, Mountain View, and Los Altos; the service area of the East Palo Alto Sanitary District; the Town of Los Altos; and Stanford University.

Startup: The point in time when Valley Water begins to receive regular Effluent flows. If at the Regional Plant, Startup will occur following initial testing and commissioning. Startup can alternatively mean the point in time when Valley Water begins to pay for the Effluent as part of its Regional Program, pursuant to this Agreement.

SECTION A - General Provisions

1. Term.

This Agreement shall be in effect upon execution by the Parties. The Term of the Agreement shall be 43 years from date of execution; however, if Valley Water exercises its Effluent Transfer Option as described in Section C, the Term of this Agreement shall be extended to 63 years from Startup.

2. Termination.

This Agreement may be terminated by the Parties as follows:

a. Termination by Valley Water. At any time after Valley Water has exercised its Effluent Transfer Option as set forth in Section C, it may terminate this Agreement at its sole discretion by providing Palo Alto and Mountain View with at least five years' written notice if Valley Water has commenced receiving Effluent or at least two years' written notice if Valley Water has not commenced receiving Effluent. Its Annual Payment for Effluent shall be prorated based upon the proportion of the fiscal year it continues to receive Effluent through the designated termination date.

b. Termination by Palo Alto or Mountain View. [Proposed language to be provided – to include force majeure occurrences such as if compliance with the Agreement would result in a violation of state/federal law or regulatory permits; also to include if Valley Water does not utilize the Effluent within X years.]

3. Governance.

A joint committee comprised of elected officials from Valley Water, Palo Alto and Mountain View will be established to review and accept updates on the design, construction, operation and regulatory compliance of the Local Plant and the Regional Plant if the Regional Plant is located in Palo Alto. If the Regional Plant is not located in Palo Alto then the aforementioned committee will operate only with respect to the Local Plant. The committee's role will be advisory to staff and governing bodies of the Parties.

SECTION B - Local Plant

4. Local Plant Beneficiaries

The Parties agree that the Local Plant will be developed by Palo Alto and operated for the benefit of recycled water customers of Palo Alto, Mountain View, and potentially other RWQCP Partners. Palo Alto and Mountain View shall ensure that the recycled water production arising from the Local Plant shall be applied or utilized in Santa Clara County in proportion to the amount of capital contributed by Valley Water to the Local Plant. The Parties intend that recycled water customers of the RWQCP Partners will benefit from the lowered salinity of recycled water blended with treated water from the Local Plant. The Parties intend that, once a Local Plant has been brought into operation, redwood trees and other plantings may be safely irrigated with recycled water sourced from the RWQCP.

5. Local Plant Ownership, Operation and Maintenance, and Location

The Parties agree that Palo Alto shall own the Local Plant and be responsible for its design, construction, operation, maintenance, ultimate decommissioning, and site restoration. The Local Plant shall be located within the RWQCP site.

6. Local Plant Capital Costs

a. Valley Water's Contribution: The total project capital cost is estimated to be $20 Million. Valley Water's contribution shall be $16 Million (2019 dollars), escalated annually based on Valley Water's Yield-to-Maturity Rate as published in Valley Water's Quarterly Performance Reports to the Board of Directors for the fourth quarter of each fiscal year. Monthly, Palo Alto shall invoice Valley Water for capital project costs expended including documentation of work performed. Invoices shall not include Parties' own staff costs and administrative overhead. Valley Water shall pay such valid invoices within thirty days of receiving them. Valley Water's $16 Million (2019 dollars) contribution towards the Local Plant in conjunction with the Annual Option Payments set forth in Article 7 shall constitute full and final consideration for its right to secure the Minimum Flow Delivery.

b. Palo Alto's and Mountain View's combined contribution shall be the difference between the actual project cost and Valley Water's contribution. Upon completion of the Local Plant, if the expended capital project cost is less than $16 Million, Palo Alto shall invoice Valley Water for the difference of the $16 Million and the actual capital project cost, excluding Parties' own staff costs and administrative overhead, of the Local Plant. Any of the $16 Million that is not utilized for the Local Plant shall be utilized for Recycled Water projects within the cities of Palo Alto or Mountain View, or both. The benefits of any grant funding for the Local Plant shall be split by Palo Alto and Mountain View as determined by a separate agreement between Palo Alto and Mountain View. The grant funding sought by Palo Alto or Mountain View or both shall not include the San Jose Area Water Reclamation and Reuse Program under the Title XVI Program.

c. Should the construction low bid, or any unforeseen circumstance, drive the total project cost above the $20 Million estimate, Palo Alto and/or Mountain View may elect to cover the increase (above Valley Water's $16 Million contribution) themselves, without an additional contribution from Valley Water. If Palo Alto and/or Mountain View are unable to identify a funding source to cover costs above the $20 Million total project cost estimate, Palo Alto and/or Mountain View may request a meet and confer with Valley Water to potentially modify this Agreement. However, absent such a modification to the Agreement, Valley Water's contribution shall be limited to $16 Million (2019 dollars).

d. If Palo Alto and Mountain View elect not to proceed with construction of the Local Plant because (a) the low bid was above $20 Million, and (b) they are unable to identify an alternate source for the amount above $20 Million, then they shall provide written notice to Valley Water and may still receive the $16 Million (2019 dollars) contribution from Valley Water so long as such funds are utilized exclusively for Recycled Water projects within the cities of Palo Alto or Mountain View or both within X years of execution of this Agreement (Valley Water's proposed language. Palo Alto and Mountain View disagree with the time limit associated with the funds). Valley Water shall be invoiced for capital project costs expended including documentation of work performed. Invoices shall not include Parties' own staff costs and administrative overhead. Valley Water shall pay such valid invoices within thirty days of receiving them.

7. Annual Option Payments Prior to Startup of Regional Plant

a. Amount of Payment. Valley Water agrees to pay to Palo Alto $200,000 per year (2019 dollars) ("Annual Option Payment") from the date of execution of this Agreement by the Parties, to culminate (a) at the thirteen-year calendar milestone of execution of this Agreement by the Parties, or (b) at Startup, whichever occurs first. The amount of the Annual Option Payment (which in 2019 dollars is $200,000) shall be increased annually based on the annual average (previous twelve months) of the CPI-All Items for the San Francisco-Oakland-Hayward, California area published by the United States Department of Labor-Bureau of Labor Statistics (https://data.bls.gov/PDQWeb/cu), beginning on the first anniversary of the execution of this Agreement.

b. Timing of Payment. Valley Water shall provide the Annual Option Payment to Palo Alto by June 1 of each year beginning June 1, 2020.

c. Allocation of Payment. (1) Fifty percent (50%) of the Annual Option Payment will be allocated to Palo Alto and Mountain View for their use, at their discretion, for water supply related projects within their jurisdictions. (2) Palo Alto will distribute the remaining 50% of the Annual Option Payment to the RWQCP Partners (other than Palo Alto and Mountain View) that have committed their Effluent by January 31 of the year that the Annual Option Payment is made so long as such funds are used for water supply projects within the RWQCP Partners' respective jurisdictions. Palo Alto shall ensure that RWQCP Partners use of these funds complies with the restrictions in this subparagraph (c). If no other RWQCP Partners commit their Effluent by January 31 of that year, this 50% of the Annual Option Payment will be allocated to Palo Alto and Mountain View for their use, at their discretion, for water supply related projects within their jurisdictions.

8. Local Plant Project Management – Valley Water's proposed language. Palo Alto and Mountain View disagree with the principle of repayment.

a. If, for any reason within Palo Alto's reasonable control, the Local Plant does not start operation within X years of the date of execution of this Agreement by the Parties, Valley Water shall have the right to recover from Palo Alto and Mountain View all of its contributions towards the Local Plant under this Agreement, plus interest at Valley Water's Yield-to-Maturity Rate, except any amounts paid as the Annual Option Payment which shall not be recoverable by Valley Water. If the Parties are unable to reach agreement for reimbursement of the contributions, they shall follow the Dispute Resolution Procedure. If the Local Plant does not start operation within ten years of execution of this Agreement due to certain circumstances outside of Palo Alto's control, this milestone may be extended at the request of Palo Alto for up to three years. The provisions of this paragraph shall not apply where Palo Alto and Mountain View have provided written notice to Valley Water that they will not proceed with the Local Plant as set forth in Article 6(d).

b. If, for any reason under Palo Alto's reasonable control and without prior agreement by Valley Water, the Local Plant, once beginning operation, does not meet the performance standards in the bid documents based on the Advanced Water Purification Feasibility Study (May 2017) for a specified period, Valley Water may request to negotiate a financial settlement between the Parties to compensate Valley Water for its share of funding for the Local Plant that does not produce the specified amount of water and/or water quality. The parties shall initiate Dispute Resolution Procedures in the event they fail to achieve a settlement.

c. For purposes of this Agreement, reasons and circumstances outside Palo Alto's reasonable control include the following: an act of God or public enemy; an act of civil or military authorities; a fire, flood, earthquake or other natural disaster; an explosion; a war or act of terrorism; an epidemic or pandemic; a national emergency; a strike; a lockout; a riot or civil unrest; a freight embargo; delays of common carriers; acts or orders of governmental authorities; impact of governmental statutes, regulations, permits or orders imposed or issued after the effective date of this Agreement; unavailability of required labor or materials; inability to obtain funding due to a financial crisis; a regulatory agency's failure to issue a required permit or other approval despite submittal of a complete application; litigation not initiated by Palo Alto; and other similar circumstances or causes. If Palo Alto is required to take or forego certain actions to maintain compliance with its NPDES permit and other regulatory requirements, such acts or omissions shall not be considered to be within Palo Alto's reasonable control.

d. If the Local Plant does not start operation within thirteen years of execution of this Agreement, Valley Water may terminate this Agreement or may notify Palo Alto and Mountain View in writing of its intent to continue to provide the funding specified in Article 6 or Article 7 or both, or a portion thereof, for alternative Recycled Water projects in Santa Clara County rather than terminate this Agreement. Upon such notification, Valley Water shall provide the funding as specified in its notification and the Parties shall continue to implement the terms of this Agreement.

9. Reverse Osmosis Concentrate Produced by the Local Plant

Palo Alto is responsible for securing any necessary changes in its National Pollution Discharge Elimination System (NPDES) permit to accommodate reverse osmosis concentrate discharge from the Local Plant to receiving waters under the jurisdiction of federal and state agencies.

10. Local Plant Naming and Tours

a. Valley Water reserves the right to name the Local Plant, including signage on site. Signage may be subject to approval by the appropriate Palo Alto decision maker or body, of which will not be unreasonably withheld.

b. With 48-hour advance notice to the RWQCP plant manager or his/her designee, designated Valley Water personnel may lead tours of the Local Plant by Valley Water employees or members of the public. Valley Water-led tours shall be subject to prior and ongoing review by the RWQCP plant manager or his/her designee to ensure that the tours are conducted safely and with minimal disruption to other RWQCP activities, and that parking of private vehicles by tour attendees is consistent with RWQCP requirements. Valley Water will submit a plan or program for tours of the Local Plant for the RWQCP plant manager's review and approval, and shall conduct tours consistently with the approved plan or program.

11. On-site Research at the Local Plant

Valley Water may desire to conduct research work on treatment processes at the Local Plant, including installation of pilot test equipment. Valley Water-managed research teams may include personnel from RWQCP Partners, universities, private companies engaged in research, or other research laboratories. Palo Alto agrees that it will make its best effort to enable research at the Local Plant and to not unreasonably deny or constrain Valley Water proposals to conduct such research. Valley Water agrees to share results of such research with Parties, upon request. Such research work will not significantly disrupt operation of the Local Plant or the RWQCP, nor result in significantly decreased flows, RWQCP upsets, or permit violations.

12. Term of Local Plant Operation Valley Water's proposed language. Palo Alto and Mountain View disagree with the principle of repayment.
Palo Alto agrees to operate the Local Plant for a continual period of at least 30 years, unless the Parties agree to cease operations sooner.

In the event the Local Plant is not operated for 30 years but a shorter amount of time that Valley Water did not agree to, and the cessation of operation is due to a reason within the reasonable control of Palo Alto, Valley Water may request to negotiate a financial settlement between the Parties to compensate Valley Water for its share of funding for the Local Plant that does not produce the specified amount of water. Any reimbursement to Valley Water shall be limited to the capital cost contributed by Valley Water minus the accumulated depreciated value based on a project life of 30 years, compounded annually based on annual average (previous 12 months) of the CPI-All Items for the San Francisco-Oakland-Hayward, California area published by the United States Department of Labor-Bureau of Labor Statistics (https://data.bls.gov/PDQWeb/cu) plus interest at Valley Water's Yield-to-Maturity Rate, to calculate the future value of such payment.

SECTION C - Effluent Delivery to Valley Water

13. Effluent Transfer Option

a. Valley Water shall have the right to exercise an exclusive Effluent Transfer Option to secure from Palo Alto and Mountain View (or from the RWQCP Partners in aggregate) a Minimum Flow Delivery of an annual average of 9 million gallons per day (MGD)(10,000 AFY), as described in Appendix 1, of Effluent. Valley Water's exercise of this Effluent Transfer Option shall be subject to CEQA review. Valley Water may elect to develop a Regional Plant to receive and treat such Effluent or may instead receive the Effluent for development of other beneficial use in Santa Clara County as part of its Regional Program.
b. This Agreement shall not bind or commit Valley Water to any definite course of action with respect to the Effluent Transfer Option and shall not restrict Valley Water from considering any alternatives, including a no-action alternative, or requiring any feasible mitigation measures when considering whether to receive Effluent delivery.

14. Timing of Valley Water's Effluent Transfer Option

a. Valley Water's period to exercise the Effluent Transfer Option and to accomplish Startup extends for thirteen years from the date on which this Agreement is executed by the Parties. Valley Water may exercise the Effluent Transfer Option by written notification by its Designated Representative to the Designated Representatives of Palo Alto and Mountain View. Before Startup, as needed, Valley Water and Palo Alto will work together to determine and provide adequate Effluent for testing and commissioning purposes.

b. Notwithstanding Article 14 (a), Valley Water may elect to defer implementation of a Regional Program until after Startup. However, at any time after Startup, if Valley Water has not implemented a Regional Program and begun taking the Effluent, any Party may request to meet and confer among the Parties to determine an alternative use of the Effluent and amend this Agreement. After 10 years from Startup, if the Parties have not agreed to amend this Agreement and Valley Water has not begun taking the Effluent, the Agreement shall terminate.

15. Effluent to Valley Water if Valley Water Exercises its Effluent Transfer Option

a. The Minimum Flow Delivery is defined as at least 9 million gallons per day (MGD) of annual average flow of Effluent that will be secured by Valley Water, predicated upon Valley Water exercising its Effluent Transfer Option, from Startup through the Term of this Agreement, consistent with the parameters described in Appendix 1. During the planning and/or design phases of a Valley Water project, Valley Water may identify one or more other Effluent flow parameters required for operation of said project. In this case, these flow parameters shall be developed consistent with RWQCP data provided by Palo Alto, and Appendix 1 will be updated accordingly with approval by Palo Alto's and Valley Water's Designated Representatives.

b. If Valley Water exercises its Effluent Transfer Option, Palo Alto and Mountain View will take certain actions to increase the volume of Effluent delivered to Valley Water during droughts, described as follows: During water supply shortages caused by drought, Palo Alto will use best efforts to temporarily modify operations to maximize the volume of Effluent delivered to Valley Water, while complying with all legal and federal, state, and local regulatory requirements and completing any legally mandated environmental review. Such modifications may include temporary decreases to environmental flows. In addition, Palo Alto and Mountain View will implement the appropriate stages of their Water Shortage Contingency Plans and will use best efforts to reduce non-critical use of non-potable Recycled Water.

c. Palo Alto will seek and make good faith efforts to sign separate agreements with remaining RWQCP Partners to commit their shares of Effluent to Palo Alto for delivery to Valley Water for a period consistent with the Term of this Agreement. Palo Alto will also make good faith efforts to work with the RWQCP Partners to modify the RWQCP Partner Agreements to be consistent with the termination date of this Agreement. Good faith efforts include sending letters to city manager and/or clerk of the city of Los Altos; the X of the East Palo Sanitary District; the town manager of the Town of Los Altos Hills; and the X for Stanford University. These letters shall be sent within 3 months of execution of this Agreement. If one or more of the remaining RWQCP Partners does not sign a separate agreement with Palo Alto within 12 months of execution of the Agreement by the Parties, or if such separate agreements contain only limited commitments (in amount or duration) of Effluent, Palo Alto and Mountain View will ensure that the 9 MGD Minimum Flow Delivery will be met through an alternative method or methods, which will be immediately described by Palo Alto's and Mountain View's Designated Representatives in writing to Valley Water.

d. Each year following Startup, Palo Alto and/or Mountain View will notify Valley Water by November 30 to determine what, if any, amount of Effluent will be available to deliver to Valley Water in excess of the 9 MGD Minimum Flow Delivery in the following fiscal year and to describe any conditions that may apply to such delivery. On an annual basis, by November 30, any commitments for delivery in excess of 9 MGD for the upcoming fiscal year shall be made in writing by the Designated Representatives of Mountain View and/or Palo Alto.

e. At any time, the Parties' Designated Representatives may determine that the Minimum Flow Delivery can be increased beyond 9 MGD for a definitive number of years in the future within the Term of this Agreement. The Parties agree they will consider such increases at the request of any Party, and this Agreement may be amended to implement such increases.

f. Subject to Article 15(a)-(b), Mountain View shall at all times receive sufficient Effluent to receive a minimum supply of 2.5 MGD of Enhanced Recycled Water and Palo Alto shall at all times receive a minimum supply of 1.0 MGD of Enhance Recycled Water from the RWQCP. This supply shall supersede Mountain View and Palo Alto's obligation to meet Valley Water's Minimum Flow Delivery. Mountain View and Palo Alto shall make available the unused portion of their minimum Recycled Water flows to Valley Water.

16. Regional Plant Location

a. If Valley Water pursues a Regional Plant as part of its Regional Program, it is the preference of the Parties to locate the Regional Plant in Palo Alto. As such, Valley Water and Palo Alto shall evaluate the feasibility of all potential locations in Palo Alto, including: within the fence line of the RWQCP; at the Measure E site; or a yet to be determined location. If it is determined by Valley Water that it is not feasible or economical to locate the Regional Plant in Palo Alto, the Effluent may be conveyed for reuse by Valley Water to another location. The point of delivery of the Effluent to Valley Water shall be at the RWQCP, or another location mutually agreed between Valley Water and Palo Alto.

b. If Valley Water notifies Palo Alto that it intends to locate a Regional Plant in Palo Alto, Palo Alto shall cooperate with Valley Water in identifying ways to accommodate a Regional Plant to the maximum extent possible within the boundary of the RWQCP or adjacent to the RWQCP boundary pending siting evaluation results. Palo Alto will also cooperate with Valley Water as it explores siting an appropriate sized water tank, to balance inbound fluctuating flows and produce a steady flow for treatment. Valley Water shall negotiate with Palo Alto to share costs between Palo Alto and Valley Water for use of the RWQCP site, including modification of existing facilities, based on the guiding principle that beneficiaries pay their shares of the costs commensurate with the benefits received.

c. In the event that Valley Water determines that the Measure E site adjacent to the RWQCP facility is the best location for a Regional Plant, and no extenuating circumstances (including, but not limited to, any environmental impacts identified through CEQA review) have been identified by Palo Alto, Palo Alto's staff will recommend to Palo Alto Council that the Council place a measure on the ballot to allow this use. If a Regional Plant is located, at least in part, on the Measure E site, Valley Water may lease the land from Palo Alto at a rate based on the then-current zoning, anticipated to be for "public facilities." A separate lease agreement may be required subject to approval by the Palo Alto City Council or Designated Representative.

d. Palo Alto and Mountain View agree to process expeditiously, in accordance with regular city processes, Valley Water's complete non-discretionary permit applications for a Regional Plant.

17. Regional Plant and/or Conveyance Facilities Ownership, Capital, Operation and Maintenance Costs

Subject to Valley Water exercising the Effluent Transfer Option, Valley Water may own and construct a Regional Plant and conveyance facilities to and from the Regional Plant (preliminary cost of $300 Million based on a comparison of like projects), or conveyance facilities to take the Effluent elsewhere. Valley Water will be responsible for all capital and O&M costs for a Regional Plant and conveyance facilities.

18. Other Development Commitments by the Parties

a. In the event that a Regional Plant is to be located in Palo Alto, Palo Alto shall accommodate Valley Water's chosen development and operation & maintenance (O&M) approach for the Regional Plant. Approaches under consideration by Valley Water include, but are not limited to, a design-build method with Valley Water responsibility for O&M; or a public-private partnership in which, for example, Valley Water may partner with one or more private entities to provide financing, design, construction, and O&M.

b. Additionally, in the event that Valley Water notifies Palo Alto and Mountain View that it intends to develop a Regional Plant in Palo Alto, Palo Alto and Mountain View shall provide, when requested by Valley Water, written support to State and federal agencies to which Valley Water seeks grant funding or low-interest loans for the Regional Plant, and city staff shall participate in meetings with State and federal agencies for these purposes.

c. The Parties to this Agreement anticipate that Valley Water will be the Lead Agency and Palo Alto and Mountain View will be Responsible Agencies under CEQA/NEPA for a Regional Plant. Any legally mandated environmental review shall be completed prior to approval and development of the Regional Plant. The Parties shall work together to facilitate compliance under CEQA (and NEPA if applicable) for the development of the Regional Plant. As part of this process, the Parties agree to provide timely notice, review, and responses.

19. Annual Payments for Effluent

a. Upon Startup, Valley Water will pay Palo Alto $1,000,000 per year for the Minimum Flow Delivery, consistent with Articles 13 through 15 and Appendix 1, during the Term of this Agreement. Valley Water shall make payments on a fiscal year basis (July – June). Following Startup, Valley Water's first payment shall be prorated based on Effluent received or, if the Regional Program is not yet implemented, shall be based on the Minimum Flow Delivery. Valley Water's payments will be made by August 31 for the preceding fiscal year. Palo Alto will allocate these funds to RWQCP Partners that have committed their Effluent to Valley Water by January 31 proportionally based on the RWQCP Partner's share of the total Effluent committed. The $1,000,000 annual amount referred to in this Section shall be in 2019 dollars, adjusted July 1 of each year by the annual average (previous 12 months) of the CPI-All Items for the San Francisco-Oakland-Hayward, California area published by the United States Department of Labor-Bureau of Labor Statistics (https://data.bls.gov/PDQWeb/cu). If the quantity of Effluent requested by Valley Water and delivered to Valley Water falls below the Minimum Flow Delivery in a year, the payment for that year shall be prorated accordingly.

b. Valley Water's payments for Effluent pursuant to this Article shall continue through the Term of this Agreement unless the Agreement is terminated earlier subject to Article 2. If the Agreement is terminated, Valley Water's payment for Effluent in the year it is terminated shall be prorated based on the termination date and the proportion of days lapsed in the fiscal year.

c. If implementation of the Regional Program is deferred pursuant to Article 14 (b) and, during that period of deferral, Palo Alto incurs incremental wastewater treatment costs to meet new NPDES requirements, Valley Water shall pay Palo Alto a proportion of the annual operation and maintenance costs, not capital costs, for such incremental wastewater treatment based on the percentage of Minimum Flow Delivery relative to the total volume of wastewater effluent produced over that period. However, Valley Water's obligation to pay for annual operation and maintenance costs under this Sub-Article shall not begin until the five-year anniversary of Startup and shall cover the period after that date. Palo Alto shall invoice Valley Water, detailing the basis of the costs for the preceding year, after the end of the sixth year after Startup and each year thereafter until Valley Water begins to take delivery of Effluent or until the Agreement is terminated pursuant to Article 2. Valley Water's obligation to pay such costs shall be capped at $150,000 per year (in 2019 dollars, adjusted July 1 of each year by the annual average (previous 12 months) of the CPI-All Items for the San Francisco-Oakland-Hayward, California area published by the United States Department of Labor-Bureau of Labor Statistics (https://data.bls.gov/PDQWeb/cu)).

d. To the extent that the participating RWQCP Partners are able to deliver, upon Valley Water's request, Effluent in excess of the Minimum Flow Delivery, consistent with Appendix 1, Valley Water's payment to Palo Alto shall increase by a prorated amount.

e. If the amount of Effluent Valley Water requests, up to the Minimum Flow Delivery, is not met, the Parties shall meet and confer for the purpose of identifying and implementing feasible solutions to any supply shortfall, including the potential to extend the Term of the Agreement to make up for lost Effluent delivery.

20. Reverse Osmosis Concentrate Produced by a Regional Plant in Palo Alto
In the event that a Regional Plant is located in Palo Alto, Palo Alto shall evaluate operating strategies and make best efforts to accomplish any necessary changes in its NPDES permit to accommodate reverse osmosis concentrate discharge from the Regional Plant to receiving waters under the jurisdiction of federal and state regulators. Palo Alto staff shall include Valley Water staff in its planning and negotiations with the regulators. To the extent that discharge of the reverse osmosis concentrate to receiving waters via Palo Alto's wastewater outfall is not feasible and acceptable to the regulators, Valley Water shall evaluate and implement alternative reverse osmosis concentrate management measures acceptable to Palo Alto, if within the city's jurisdiction, and the regulators. Valley Water shall pay the costs of treating the reverse osmosis concentrate to meet requirements of Palo Alto's NPDES permit and any alternative reverse osmosis concentrate management measures. The Parties acknowledge that a separate agreement will be negotiated to address management of reverse osmosis concentrate.

21. Water Supply Option for Palo Alto and Mountain View

a. Beginning one year from execution of this Agreement, Palo Alto or Mountain View or both shall each have an opportunity to provide Valley Water a notification of the need for additional water to meet demands in their respective service areas. The written notification shall include the amount of potable and/or non-potable water requested, up to the following maximum amounts: Palo Alto may request an annual average of up to 3.0 MGD and Mountain View may request an annual average of up to 1.3 MGD. The notification may also include an indication of a maximum cost for the water in the first year. Valley Water will make its best effort to develop a proposal that includes at least one supply within that maximum cost for the first year.

b. Within three (3) months of receiving the written notification from Palo Alto and/or Mountain View, Valley Water will provide an estimate of the incremental costs to Valley Water to prepare a proposal for the requested water. Palo Alto and/or Mountain View will respond to Valley Water's cost estimate within four (4) months. After receiving written approval from Palo Alto and/or Mountain View accepting the estimated cost for Valley Water to do so, Valley Water will have up to four (4) years from receipt of the original request to prepare a water supply proposal to Palo Alto and/or Mountain View. Parties will meet periodically as requested by any Party during this four (4) year period to discuss the request and the proposal being developed. Valley Water's proposal will include a description of the water supply, including the cost, payment schedule, and any conditions related to the supply to the requester (Palo Alto and/or Mountain View). Valley Water will submit quarterly cost invoices for its work in preparing the proposal and Palo Alto/Mountain View will reimburse Valley Water within 30 days.

c. Valley Water's cost estimate in its proposal shall be limited to Valley Water's costs, including all costs associated with the water supply, such as but not limited to: facility costs, commodity costs, and any wheeling fees. Valley Water shall not be required to subsidize the cost of the water in order to meet this maximum cost. The proposal shall include or allow for subsequent increases in cost after the first year based upon Valley Water's costs.

d. The requester (Palo Alto and/or Mountain View) will have up to twelve (12) months from receiving Valley Water's proposal to provide written notification that they accept or decline this proposal, unless a shorter time period is one of the conditions required by Valley Water. For example, a shorter time frame may be required if Valley Water's proposal involves a fleeting opportunity with third parties in which a commitment is needed in less than 12 months. In the event that Valley Water prepares a proposal with a time period for acceptance of less than 12 months, it shall also, with Palo Alto's and/or Mountain View's concurrence, proceed to develop a proposal for which the acceptance time period is up to twelve (12) months.

e. If Palo Alto and/or Mountain View does not accept Valley Water's proposal, Palo Alto and/or Mountain View may request a potable or non-potable water supply starting 5 (five) years from declining the previous opportunity. This sequence of proposals and potential denials, including the five (5) year period between the denial and the next request, can be repeated throughout the Term of the Agreement. Notwithstanding the minimum five-year interval between a proposal declined by Palo Alto and/or Mountain View and a subsequent opportunity to request a proposal, Valley Water shall not unreasonably deny a request by Palo Alto and/or Mountain View to develop a proposal for them after a period of less than five years since they declined a prior Valley Water proposal.

f. If Palo Alto and/or Mountain View accepts Valley Water's proposal, Valley Water will have up to ten (10) years from the acceptance date to begin delivery of the water to the requester (Palo Alto and/or Mountain View) at cost. All water provided by Valley Water may only be utilized by Palo Alto and/or Mountain View within their service areas and Valley Water's obligation to provide the water to Palo Alto and/or Mountain View expires at the end of the Term of this Agreement or an agreed upon date. The Parties shall develop detailed terms and conditions for Valley Water's water supply delivery to them in a separate agreement, and shall provide environmental documentation to support CEQA findings, for approval by Parties' governing bodies prior to commencement of delivery of water to them under this Article. Such separate agreement may have a term that extends beyond the Term of this Agreement.

g. If Valley Water determines Startup of the Regional Program will not occur within thirteen (13) years of execution of this Agreement and Parties have not agreed to further extend this timeline, Palo Alto and Mountain View shall no longer have the ability to request a potable and/or non-potable water supply from Valley Water.

h. If Valley Water was delivering Article 21 water to Palo Alto and/or Mountain View when Valley Water determines Startup of the Regional Program will not occur within thirteen (13) years of execution of this Agreement and Parties have not agreed to further extend this timeline , Valley Water may notify Palo Alto and/or Mountain View that within five years it will no longer be supplying Article 21 water.

22. Mutual Benefits of this Agreement

Through execution of this Agreement, Parties agree to commit funding and resources to advance a locally controlled, drought resilient supply that improves water supply reliability and assists in maintaining local groundwater basins, to the benefit of all Parties. Additionally, the Parties seek to develop reliable water supply sources to minimize supplies of water that would otherwise have to be imported via the Sacramento-San Joaquin River Delta and its tributaries, including the Tuolumne River and other mountain streams.

23. Notifications

Palo Alto and Valley Water shall notify all RWQCP Partners of the existence of this Agreement within 30 days of its execution.

SECTION D – SALE OF RWQCP DURING TERM

24. Sale of RWQCP During Term of Agreement

Palo Alto agrees that it shall not sell or attempt to sell the RWQCP to any third-party unless Valley Water is first offered the right to purchase the RWQCP at fair market value to be determined by an independent third-party consultant qualified in the wastewater and/or water industry. Valley Water shall have six months after a fair market value has been determined to consider this purchase, and Palo Alto may only pursue the sale to third parties following the expiration of this six-month period or receipt of Valley Water's written notice that it does not intend to purchase the RWQCP. Upon Valley Water's expression of intent to purchase the RWQCP, Palo Alto shall provide Valley Water with an additional twelve months to complete any financing necessary for the purchase.

25. Assumption of Agreement Obligations upon Third-Party Sale

The provisions of Section C herein (Effluent Delivery to Valley Water), shall survive any sale of the RWQCP to a third-party during the Term, and Palo Alto shall include as an express condition in the sale of the RWQCP to a third-party the requirement that the third party assume the obligations of this Agreement for the remainder of the Term. Valley Water shall constitute a third-party beneficiary to any agreement between Palo Alto and a third-party for the sale of the RWQCP.

26. Dispute Resolution Procedure

The process by which the Parties will attempt in good faith to resolve any dispute arising out of or relating to this Agreement, which will be undertaken promptly and initially by representatives of the Parties in the following manner:

a) If a dispute should arise, an authorized representative for each of the Parties will meet or teleconference within fourteen (14) calendar days of written notification of the dispute to resolve the dispute. Prior to such meeting or teleconference, the Party bringing the dispute will draft and submit to the other Parties a written description, including any factual support, of the disputed matter. After receiving this written description, the other Parties will provide a written response to such written description within a reasonable period of time.

b) If no resolution of the dispute occurs at this meeting or teleconference, the issue will be elevated to an executive-level manager of each Party (i.e. executive level manager for Valley Water and Assistant City Manager or higher-level executive for Palo Alto and Mountain View). Each Party's executive-level manager will meet or teleconference as soon as practical, but, in no event, later than twenty one (21) calendar days after the matter has been referred to them, with the initial meeting to occur at a location to be selected by the Parties.

c) If the dispute remains unresolved after forty five (45) calendar days from their receipt of the matter for resolution, and any necessary Party is not willing to continue negotiations, the Parties agree to submit the dispute to nonbinding mediation.

d) If the Parties are not able to agree on a mediator, any necessary Party may request the American Arbitration Association or other acceptable mediation service to nominate a mediator. The Parties will share the cost of the mediator equally.

e) In the event mediation is unsuccessful, any Party may pursue other remedies available at law including filing an action in Santa Clara County Superior Court.

27. Audit.

Valley Water shall have the right to conduct audits of Palo Alto and Mountain View to ensure that the funds paid by Valley Water under this Agreement are being used in accordance with all restrictions set forth in this Agreement. Palo Alto and Mountain View shall cooperate with any such audit and shall provide records requested by Valley Water within a reasonable amount of time.

Valley Water

MEMORANDUM

FC 14 (02-08-19)

TO: Board of Directors

FROM: Nina Hawk

SUBJECT: Anderson Dam Seismic Retrofit Project Board of Consultants Report #10

DATE: September 12, 2019

As noted in the CEO Bulletin for the week of June 7 – June 13, 2019, on June 11, 2019, the Anderson Dam Seismic Retrofit Project (ADSRP) convened the tenth meeting of the Federal Energy Commission's (FERC) mandated independent Board of Consultants (BOC). The BOC is tasked with overseeing and assessing the adequacy of investigations, planning, design, and construction of the proposed ADSRP.

Valley Water received the BOC's summary report and findings, Attachment 1, on August 11, 2019. The report, as well as Valley Water's initial analysis and response to the findings, was transmitted to FERC on August 27, 2019 for review and comment. Valley Water is currently awaiting FERC's official response to the report and Valley Water's initial responses.

A technical memorandum outlining potential schedule impacts to the project as a result of the BOC recommendations was emailed to the Board on September 10, 2019.

Nina Hawk
Chief Operating Officer
Water Utility Enterprise

Attachment 1: BOC Report #10, dated August 11, 2019

BOARD OF CONSULTANTS
ANDERSON DAM SEISMIC RETROFIT PROJECT

August 11, 2019

Mr. Christopher Hakes
Deputy Operating Officer
Water Utility Enterprise
5750 Almaden Expressway
San Jose, CA 95118-3686

Re: Letter Report; Board of Consultants Mtg. No. 10, Anderson Dam Seismic Retrofit Project (ADSRP), Valley Water, Santa Clara, California

Dear Mr. Hakes,

This letter report presents our observations and recommendations following the tenth Board of Consultants (BOC) meeting of June 11th and 12th, 2019 and our review of the materials and correspondence provided by the project team and by SCVWD regarding the ongoing studies for the proposed seismic dam retrofit and spillway and outlet works modifications for Anderson Dam.

BOC Meeting No. 10 addressed a broad range of issues, and a number of documents were provided to the BOC in advance of the meeting. These read-ahead documents included the following:

1. Test Fill TM (URS; August 3, 2018) and QRF.
2. 60% Electrical Drawings (URS; August 3, 2018) and QRF.
3. 60% Electrical Specifications (URS; August 3, 2018) and QRF.
4. 60% Spillway Drawings (URS; October 19, 2018) and QRF.
5. Spillway Basis of Design (60% Design) TM (URS; October 19, 2018) and QRF.
6. Stochastic Analysis of Potential for Interim Dam Overtopping (Black & Veatch / Schaaf & Wheeler; January 22, 2019).
7. Initial Reservoir Dewatering (Black & Veatch / Schaaf & Wheeler; February 7, 2019).
8. Phase 6 Drilling Program Plan (URS; May 9, 2019).
9. Monte Carlo Analysis of Critical Path of Construction Schedule TM (URS; January 26, 2019) and QRF.
10. ADSRP April 2019 Risk Management Status Report (Black & Veatch; April 19, 2019) and QRF.
11. Cofferdam TM, Appendix E – Diversion Extension Pipe Sizing (URS; February 15, 2019) and QRF.

12. Coyote Creek Alternatives Analysis TM (URS; March 27, 2019) and QRF
13. Concept for the 30-inch Low Level Bypass Pipe (April 17, 2019).
14. Outlet Works Basis of Design TM (URS; August 31, 2018) and QRF.
15. Analytical Validation of 60% Design of LLOW QRF with Responses.
16. Full BOC Comment Tracking Log (May 21, 2019).
17. BOC No. 10 Agenda

Additional materials were presented and discussed at the BOC meeting; we will also address a number of these in the course of the letter report that follows.

This BOC letter report (Part 1) begins with several over-arching comments and recommendations, and then (Part 2) answers the specific questions posed to the BOC, (Part 3) addresses each of the submittals in the sequence above, with section numbers corresponding to the above listing, and (Part 4) concludes with some additional comments.

Part 1: Over-Arching Comments and Recommendations

This is an unusually complex project with various types of "current/existing" hydraulic and seismic risks that require mitigation interacting with "interim" risks during construction that include construction risks and construction scheduling risks, hydrologic and weather risks, permitting risks, contracting risks, etc. Both existing and interim risks affect public safety.

There are four key sets of risks that require suitable mitigation in order to successfully complete this project: (1) existing seismic stability and seismic performance risks (of the embankment, and of some of the outlet works), (2) existing potential fault rupture offset risks (of the embankment and of some of the outlet works), (3) outlet works capacity and/or (hydraulic) resiliency risks, and (4) interim construction risks as mitigation of the previous types of existing risk is being implemented.

A key challenge is the need to successfully balance (1) the necessity to mitigate the existing risks against (2) the risk exposure generated by the mitigation operations required to accomplish that. The complexity of the interactions between a number of these different risks presents unusual challenges. Engineering solutions to existing risk exposure will have to be carefully balanced against construction-related interim (temporary) new risk exposure during construction.

Balancing, and suitable mitigation, of both existing risks and interim construction risks must begin in engineering analysis and design; the project elements must be designed both to mitigate existing risks as well as to be feasible to construct while adequately minimizing interim construction risk. Constructability, and feasible timelines for overall construction, must be considered in design of project elements targeting mitigation of existing risk.

Solving this complicated and interactive puzzle will require innovation and cooperation between (1) the engineering teams, (2) Valley Water, and (3) the regulatory agencies (FERC and DSOD) and it will also require (4) very good contractor performance and (5) strong coordination between the groups numbered (1) through (3) at the beginning of this paragraph.

It has been too long since the last BOC meeting (Mtg. No. 9). To meet the current project schedule, the next BOC meeting should be held sooner, likely in January or so.

<u>BOC Comment I.1</u>: *There is a design engineering schedule urgency to complete a number of key project elements (at least to the 90% level) as rapidly as possible to facilitate design decisions and efforts that require these as a partial basis. These include:*

1. *The proposed/upcoming Construction Risk PFMA (which should be convened as soon as possible; in September or early October if possible).*
2. *Finalization (to 90% level at least) of the stochastic analysis of potential for interim dam overtopping; in order to establish an analytical basis for evaluation of potential additional interim risk reduction measures.*
3. *Decisions as to the near-final geometries and general interim stages/sequencing of dam embankment deconstruction and re-construction.*
4. *Completion of the new spillway design to the 90% level.*

The potential proposal to leave a larger portion of the existing embankment in place to minimize excavation and reconstruction/fill volumes is somewhat unattractive because it fails to locate the proposed new seismically robust filters and drains on the downstream side at a location adjacent to the final core: an important element for eliminating existing risk associated with potential fault or shear zone offset beneath the embankment. We are also cognizant, however, of the challenges regarding (1) ability to excavate fully to the toe of the existing core (with regard to interim core stability near the toe) and (2) the need to balance mitigation of risk exposure due to potential basal fault offset vs. interim construction risk exposure to the downstream region. It may be feasible to engineer a suitably safe basal fault offset mitigation without pressing the new filter and drain systems fully up against the core. There are a number of BOC comments on this issue in this report.

Interim construction risk/schedule risk may not be solved by any one single idea or action. Instead it appears likely that a number of multiple, and coordinated, actions and design and planning details may be needed. Suitable resolution of interim construction risk may have to be addressed from multiple directions. This is discussed further in several sections of this BOC report.

Part 2: Questions to the BOC

Six specific questions were posed to the BOC. These questions, and our responses, follow below. These are not numbered as formal BOC comments, and some of the answers are repeated, sometimes in expanded form, as numbered comments/recommendations within the numbered letter report sections that follow. All responses below should be considered as equivalent to BOC comments.

1. **In response to comments from DSOD in July 2018 related to the unlined spillway channel, Valley Water's Design Consultant (URS) has developed a phased approach to completing a geotechnical investigation program at the unlined chute, as described in the Phase 6 Drilling Program Plan. The proposed investigations are intended to provide data for geological characterization and detailed condition assessment of the existing channel, and to satisfy design needs for future improvements of the channel, if needed.**

   Does the Board of Consultants have any specific concerns or additional recommendations with the approach being used for field investigations of the unlined spillway chute?

Response to Question 1:

The proposed unlined spillway chute investigation plan has been developed to provide geologic and geotechnical data for use in evaluation of existing conditions and for potentially designing one or more of the five following channel improvements:

1. *Line left bank of channel*
2. *Deepen channel*
3. *Raise upstream end of left bank*
4. *Raise entire left bank*
5. *Line entire channel*

The Board was informed during the meeting that improvements to the unlined portion of the spillway channel are being considered, however neither the design need nor the design criteria had been established prior to the meeting. The design objectives would likely include considerations for flow containment, hydraulic flow regimes and erodibility but again, those types of details have not yet been articulated.

Given the above understanding, the Board concurs that the proposed scope of investigation is satisfactory to gather geologic and geotechnical information that will be useful in evaluating existing conditions as well as considering combinations of the described measures 1 through 5, listed above. We will have a few additional comments and suggestions in Section 8.0.

2. **The laboratory strength testing program associated with the Test Fill Program is ongoing. Results of static shear strength and cyclic testing of test fill materials to date, and the characterization of behavior of the shell materials that will be used for redesign of Stage 2 interim dam and Stage 3 final dam sections, will be presented at the BOC 10 meeting.**

   Does the Board of Consultants have any specific comments related to the presented results of the shear strength and cyclic testing of samples of test fill materials or the

proposed approach for characterizing the behavior of the shell materials for redesign of the Stage 2 interim and Stage 3 final dam sections?

Response to Question 2:

The BOC agrees with the approach being taken to characterize static shear strengths of these materials.

The interpretations of cyclic strengths have not yet been fully developed, but we note that the cyclic behaviors of these materials, well compacted, should be expected to be suitable for the proposed redesigned embankment sections. We would like to see the fully developed cyclic strength modeling interpretations, and the associated seismic deformation analyses, as soon as possible.

3. **As discussed in BOC Meeting No. 9, Valley Water has elected to expand the ADSRP spillway design to a nearly full replacement of the spillway. The 60% Spillway Design Drawings and the Spillway Basis of Design TM incorporate the design for the replacement of the spillway.**

   Does the Board of Consultants concur with the performance criteria being used for the spillway structure?

Response to Question 3:

The designers have proposed the following "Performance Criteria" in Subsection 3.1.4 of the "Anderson Dam Seismic Retrofit Project, Spillway Basis of Design Technical Memorandum (60% Design)":

The performance requirements of the new spillway under: A. Normal, B. PMF, and C. Seismic (the MCE event scenarios) are as follows (assuming no landslide on the right side):

A. Normal Case: The spillway would remain fully functional for spills up to PMF, 95,800 cfs.

B. PMF Case: Same as Normal Case

C. Seismic Cases:

1. Calaveras fault event (Peak Ground Acceleration [PGA] = 0.85g, plus 10 percent topographic effect, shaking only, approximate 800-year return period event), or Coyote Fault event with no offset passing below the spillway structure (shaking only, PGA = 1.14g plus 10 percent topographic effect, approximate 2,000-year return period event): there would be no toppling or collapse of walls; but some damage, that is yielding and/or cracking, may occur during the event. The spillway would remain functional for spills similar to historic spills of record (7,200 cfs spill flow, estimated 5.25 feet of flow over crest and in chute). Additional spills that would normally pass over the spillway of up to about 9,300 cfs (for a total flow of 16,500 cfs) could be released through Low

Level Outlet Works (LLOW) (1,400cfs) and High Level Outlet Works (HLOW) (7,900 cfs). The spillway will require repairs to be fully functional (passing spills up to PMF, 95,800 cfs).

2. *Coyote Fault event with up to 4 feet of reverse thrust or 2 feet of strike-slip offset of faults passing below spillway structure (PGA = 1.25g, plus 10 percent topographic effect, approximate 2,000-year return period event): Severe damage would potentially occur during the event in the vicinity of the fault offset, including wall toppling, collapse, and structure dislocation. Design to prevent severe damage (i.e., yielding, cracking, and/or structure sliding) is likely to occur in other portions of the spillway structure. Damage in the areas of fault offset is likely not repairable for temporary operation of spillway. Spills that would normally pass over the spillway of up to about 9,300 cfs would have to be released through the LLOW (1,400 cfs) and the HLOW (7,900 cfs). The spillway will require major repairs to be functional (passing spills up to PMF, 95,800 cfs).*

The Board concurs with the proposed high-level objectives of the performance criteria for the normal and PMF loading cases. The Board suggests however that additional detail be provided in Section 3 "Design Basis and Criteria", Subsection 3.1.4 "Performance Criteria" which would describe the future performance of the replacement spillway under extended normal operational use as compared to the originally designed and constructed spillway in light of lessons learned from the 2017 dam safety incident at Oroville Dam. This section need not be long or all-inclusive, but would cover the rationale for deciding to construct a nearly full replacement spillway and the improvements that will be provided. The existing Anderson Dam spillway has a number of similarities to the original Oroville Dam Flood Control Outlet (FCO) Spillway including a weathered rock foundation, numerous structural design details and a lack of substantial anchorage.

The 60% design plans detail some of the design measures that are responsive to the Oroville incident and many of those details in their current level of development are discussed in Section 5 of the TM. It is the Board's view that the description suggested for Subsection 3.1.4 will be beneficial in establishing, up-front, the designers' intent with respect to how design features such as: required foundation quality, foundation preparation, foundation anchorage, spillway drainage objectives and the variety of defensive structural design measures will preclude the type of incident that occurred at Oroville.

The Board also concurs with the performance criteria for the seismic loading case, and has the following comments:

1. *The selected PGA's for structural seismic loading appear appropriately conservative. If it is the designer's intent to further factor the PGA's for stability and structural member design calculations, then the selected factors and references supporting those selections should be documented in the final spillway design TM or computation package.*

2. *The seismic performance criteria acknowledge that the spillway structure could experience offsets or other structural damage due to shaking or fault displacements and that no provisions will be included in the design to prevent damage that could include yielding,*

cracking or sliding. The Board concurs with the discussion for making temporary releases through the outlet works if the spillway is damaged by a major earthquake and recommends that the design includes conceptual contingency plans to quickly restore the structure if damaged in an earthquake. The plans should include short-term and long-term restoration concepts. These plans are important for the purpose to maintain awareness in the future that the spillway structure could be compromised by seismic loading and/or fault offset and that emergency-type contingency planning during design may be required.

3. *The Board is uncertain whether the spillway can be designed to pass flows up to historic maximums if damaged by an earthquake on the Calaveras Fault. The BOC concurs, however, with the plan to make interim releases through the outlet works while spillway repairs are pursued as described above.*

4. **Following the submittal of the 60% Construction Sequencing Plan and Materials Development and Handling TM as part of the BOC Meeting No. 9 package, Valley Water elected to have the Design Consultant perform a Monte Carlo Risk Analysis of the construction schedule. The results of the analysis are described in the Monte Carlo Risk Analysis of Critical Path of Construction Schedule TM.**

   Does the Board of Consultants have any specific concerns with the approach used to estimate the certainty of achieving the Year 1/2, Year 3, Year 4, and Year 5 milestones?

   Does the Board of Consultants concur with the proposed mitigation option (redesign of the dam section to leave more material in place) moving forward in design?

Responses to Questions 4(a) and 4(b):

We will answer Questions 4(a) and 4(b) in reverse order.

(b) We do not fully agree with the full current plan to leave more material in place at the downstream side. Initially planned mitigation of potential fault (or fault shear zone) offset would require that a wide and competent zoned filter and drain be placed adjacent to the downstream toe of the final core zone, and this would require excavation to the edge of the base of the core on the downstream side.

There is a need, however, to balance interim construction risk exposure to downstream populations and assets against the reliability of protection provided by the final embankment, and the final overall dam, reservoir and outlet works system. In addition, it may be infeasible to safely excavate fully to the downstream toe of the existing core with regard to (1) potential for instability near the downstream toe due to rapid excavation without time for pore pressure dissipation, and (2) schedule risk and resulting downstream "interim" risk exposure. There may be some flexibilities here. This is discussed further in Section 9.0.

(a) The prominent mitigation measure presented and discussed during BOC Meeting #10 is Alternate 1, which increases the size of the remnant in order to minimize earthmoving activities and thus reduces the number of shifts required in the Phase 2A Excavation and Phase 2B Embankment Reconstruction. From a constructability standpoint, this approach

provides increased reliability of achieving the established milestones, particularly in the crucial Phase 2 (Year 4) of construction. The Monte Carlo analysis presented indicates that, while there are remaining risks of not achieving the associated milestones, those risks have been decreased to a 1:2000 level. The Monte Carlo analysis included rationale and input for the Expected-Case, Best-Case, and Worst-Case schedule inputs for productions and durations. The earthwork productions were verified by a third party well experienced in earthwork means, methods, and productions. The third-party work supports the design team's analysis. The BOC agrees with the earthwork approach and productions, as well as considerations for production losses associated with weather, congestion, access, and breakdowns. Conducting the third-party review/check estimate was a worthwhile exercise and adds validity to the views on construction risks, staging, sequencing, and productions.

The project development team and the third-party team have concluded that the complexity of the schedule results in the need for a competent, experienced, and properly resourced contractor to be employed on this project. Contractor capability is one of the most important variables with regard to interim construction risk; and this interim construction risk has ramifications for downstream public safety. As a significant risk reduction measure, the procurement plan should include, at a minimum, a prequalification or Best Value procurement process that requires interested contractors to demonstrate their experience in dam construction, adequate personnel and equipment resources, and demonstrate their understanding of the project. The BOC recommends that a procurement plan be outlined and scheduled soon, and incorporated in the project schedule. There may be administrative actions that need to take place soon to facilitate this, such as actions by the Valley Water Board of Directors. The preparation of prequalification documents, and allowance for the prequalification process, takes time and would need to be accommodated in the program schedule. Prequalification and Best Value processes are regularly used on dam projects of this magnitude, including the recent Calaveras Dam in California, and the ongoing Gross Dam Raise and Chimney Hollow Dam projects in Colorado. The CalTrans CMGC process is well established and would suit the Anderson Dam SRP project well. Prequalification and Best Value procurement processes generally require the bidding contractors to demonstrate their abilities and resource commitments, and to demonstrate their understanding of the project by means of preliminary work plans and schedules.

While Valley Water does not currently have authorization to award projects on a best value basis, this has been discussed as a potential mitigation strategy. Given the project magnitude and risk associated with contractor performance, as part of the procurement planning and risk reduction, pursuit of authorization by governing bodies would be in the best interest of the project.

The BOC suggests that the project development team further consider award of the Diversion Works as a separate, early construction contract. This might help to isolate risks associated with an active diversion from those of dam embankment excavation and reconstruction.

The test fill (Test Fill TM (URS; August 3, 2018) and QRF) program has proven helpful. The BOC observed the results and were able to visit the site, post construction. While the test fill program was informative, it was not of the scale of demonstration that will be available during actual construction. Placement productions of the shell materials will be critical to the schedule and highly dependent on contractor approach and performance. The Test Fill *seemed to validate that an 18-inch lift thickness and a 15-inch maximum material size could be working parameters. The project should anticipate and allow for or require the contractor to conduct one or more demonstration fills in order to validate his ability to achieve design parameters, potentially using increased lift thickness and/or material size. The existing embankment and BHBA source materials include material larger than 15 inches that will need to be either incorporated in the embankment or scalped and discarded. The need for scalping would adversely impact the construction schedule.*

The BOC recommends the further development of specific risk reduction measures or contingency plans for each phase/construction year, and each element within that year, such that alternative action plans are in place if seasonal milestones are threatened by construction delays. Some interim measures have already been identified, including alternative earthmoving milestones in the event of delays or losses in production. Given the schedule dependency on previous years' milestone completion, it is paramount that alternative action plans or risk reduction measures be analyzed and planned for each construction season and for major project elements. Such risk reduction measures could be a product, at least in part, of a continued construction PFMA process involving the engineering teams as well as key planners and stakeholders.

5. **Since BOC Meeting No. 9 additional progress has been made on the Outlet Works design, as described in the Outlet Works Basis of Design TM. Additionally, in early 2019 Valley Water requested the Design Consultant to consider options for increasing the size of the 12-inch low flow bypass pipe included in the 60% design to allow for flows of up to 75 cfs for fisheries. The Concept for the 30-Inch Low Level Bypass Pipe Memorandum describes the Design Consultant's recommendations for increasing the size of the pipe to accommodate the requested flows.**

   Does the BOC have any specific concerns related to:

   a. **The results of seismic deformation analyses performed for the sloping intake structure?**
   b. **The approach being proposed for the 30-inch bypass pipe in the Low Level Outlet Tunnel?**

Response to Question 5(a):

The sloping intake structure is a critical project element, and it must remain serviceable in the immediate aftermath of a major seismic event. We are generally satisfied with the stability and seismic deformation analyses performed for the sloping intake structure, but have two additional questions with regard to analysis details and acceptable seismic displacements (see Section 14.0).

Response to Question 5(b):

The BOC have no specific concerns at this juncture.

6. **In response to BOC No. 9 Comment 16.1, Valley Water has enclosed the updated BOC Recommendations Status Report, dated May 21, 2019. The status of items considered "closed" since the last log was submitted on April 20, 2016 are noted in bold. Valley Water requests that the BOC communicates concurrence of the closed items, or states if further discussion or consideration is required by letter or email.**

Response to Question 6:

We have reviewed the new closures of comments (see Section 16.0 of this report).

Part 3: BOC Document Submittals - Comments and Observations

1.0 Test Fill TM and QRF (URS; August 3, 2018)

Comment 1.1: The test fill TM is now suitable for its principal intended purposes. It usefully studies handling and compactability of the shell materials tested, and provides a basis for (1) development of parameters for final embankment analysis and design (including both (a) static shear strengths and also (b) projections of expected seismic performance and behaviors), (2) development of compaction procedural recommendations and compaction specifications, and (3) estimates of handling and placement/compaction issues affecting projections of achievable production rates..

Comment 1.2: Proposed follow-on laboratory testing will provide additional useful data; those data would be of lesser value without the field compaction test program results.

Comment 1.3: The proposed compaction procedure involving placement of 18-inch lifts, compacted with 8 passes (each) by a large vibratory roller and a large tamping foot roller, is appropriate based on the field compaction results currently available, and has merits with regard to likely placement rates, and handling efficiencies (including dealing with oversize particles).

Comment 1.4: There may be further efficiencies and advantages that may be achieved by developing two or more different sets of placement and compaction procedures (and specifications) for different zones of the proposed new shell fills. These will be discussed further in Part 4 of this BOC report.

2.0 60% Electrical Drawings (URS; August 3, 2018) and QRF

Comment 2.1: We are grateful to receive these sets of drawings, and would like to continue to receive them with each new ADSRP project cycle. We are not, however, well-qualified nor efficiently well able to execute detailed reviews of these. As the project reaches the 90% design stage, we recommend that an independent expert review be executed here.

3.0 60% Electrical Specifications (URS; August 3, 2018) and QRF

Comment 3.1: We are also grateful to receive these sets of drawings, and would like to continue to receive them with each new ADSRP project cycle. We are not, however, well-qualified nor efficiently well able to execute detailed reviews of these. As the project reaches the 90% design stage, we recommend that an independent expert review be executed here.

4.0 60% Spillway Drawings (URS; October 19, 2018) and QRF, and

5.0 Spillway Basis of Design (60% Design) TM (URS; October 19, 2018) and QRF

The Board appreciates the opportunity to have reviewed the 60% spillway design. As mentioned in the Board's response to Question 3, the 60% drawings include many of the details and concepts being used in modern spillway design, however many of these details are still under development and this is an area of design that must be fully completed to assess the adequacy with respect to how the integrated design details will resist the potential forces that may develop over long-term operations. The Board's comments from Report No. 9 are repeated below as they continue to pertain to the final design which remains under development.

The Board understands that the spillway design is not as far along as the design for other facility components due to the need for revisiting the spillway design requirements in response to the Oroville spillway incident of 2017. Based on that incident, the Board recommends additional elements, including the following, be considered in establishing the overall design criteria:

- *Extra attention should be given to the spillway slab joint design details including: drainage, waterstops, continuous reinforcing and/or dowels, joint offsets and shear keys*
- *The need for use of epoxy coated reinforcing steel*
- *Concrete mixes and placement procedures that provide high strength and low potential for cracking*
- *Spillway slab anchor design criteria and confirmation testing plans*
- *Potential for uplift forces developing at spillway cracks or non-watertight joints*

The Board recommends the design team gain concurrence on these design criteria and details during the 60% design review before advancing the spillway to the 90% design level. Accomplishing this might entail an interim BOC "Technical Exchange" meeting, or similar. A TM for the spillway analyses and design should be developed and submitted prior to the 90% overall design submittal.

In addition to the points above made in Report No. 9, the following comments are provided following review of the 60% design documents:

Comment 4.1:

- *A clear foundation objective needs to be developed.*

- *The origin and magnitude of hydrostatic, including potential stagnation, uplift pressures is needed for design of the subdrain system and the spillway anchors.*
- *Spillway subdrain cleanouts that will be easily accessed and enable inspection and cleaning of the subdrain system should be included.*

Comment 4.2: *On sheets S-133, S-134, S-135, and S-136 please show the profile of the CFD calculated water surface elevations for the PMF event so that locations where cross wave heights occur can be visualized.*

Comment 4.3: *We agree with QRF reviewer Boone that the need for some improvements to the cut-off wall at the downstream end of the concrete-lined spillway chute should be reconsidered after the erosion potential of the unlined channel at this location is evaluated.*

Comment 4.4: *A final overarching comment on the spillway design is that the Board strongly concurs with the decision of nearly complete replacement of the existing spillway, and because this is such a critical structure with evolving design details that are receiving statewide and national attention, we recommend that an expert be hired to perform a detailed independent review of the spillway design, as was done with Dr. Greg Korbin for the tunneling elements of this project.*

As before the Board looks forward to reviewing the evolving spillway design in future revisions to the current preliminary (60%) design.

6.0 Stochastic Analysis of Potential for Interim Dam Overtopping (Black & Veatch /Schaaf & Wheeler; January 22, 2019)

The following summarizes our current comments and recommendations with regard to the Stochastic Analysis Report. Once the stochastic study results are finalized, all report Sections, Tables and Figures should be cross-checked for consistency. Whenever possible, study results should be compared with outside independent data available in the literature and the comparisons presented in the report to provide the reader or reviewer with an understanding of reasonableness of the study findings.

Comment 6.1: *Figure 4-9, page 18: The simulated annual precipitation versus frequency is not consistent with a probability distribution. Figure 4-9 shows that approximately 11% of the years (~11,000 of the simulated years) have an annual precipitation of less than 10 inches, whereas the 37 years of measured data have no years with precipitation equal to or less than 10 inches. There appears to be something potentially wrong with the stochastic model; this is most apparent at the low annual precipitation values.*

Comment 6.2: *Once the model is corrected it would be informative to add to Figure 4-9 the Henry Coe Park rainfall gage data. This would give reviewers a visual comparison of simulated and measured means, modes, and standard deviations of the data. Similar comparisons of 1-hour, 2-hour, 6-hour, and 24-hour precipitation durations would also be of value.*

<u>Comment 6.3</u>: Figure 4-10, page 19: The cumulative distribution function (CDF) of the measured data at Henry Coe Park gage does not look right. There are 37 years of measured annual precipitation data. These data should be ranked from 1 to 37 with the highest annual precipitation year ranked 1 and the lowest ranked 37. The non-exceedance probability for each year should then be calculated as {1-[rank/(n+1)]} where n = 37. Thus, the highest non-exceedance probability is 0.9737 and the lowest is 0.0263. Note that the plotted data will not be as high as 1.0000 nor as low as 0.0000. It would be informative if the simulated non-exceedance probability points are plotted on Figure 4-10 rather than or in addition to a smooth curve. This plotting will give the reviewer an indication of how well the simulated data conform to a classical CDF. If a smooth curve is fitted through the Henry Coe Park data, then the extrapolated portions of the curve should be distinct, such as a dashed line. It would also be informative to plot the actually measured data on Figure 4-9 for comparison with the simulated data.

<u>Comment 6.4</u>: Figure 4-14, page 23: The curves presented in Figure 4-14 do not display an S-curve shape that should be expected. The curves should be asymptotic to a low value at the low end and, theoretically, to the PMP at the high end of the curves. The precipitation amounts are not consistent with independently estimated values such as the Probable Maximum Precipitation (PMP) values presented in HDR's March 2013 Probable Maximum Flood (PMF) report. HDR's estimated PMP values, which include the area reduction factor, are presented on Figure 1, page 7 of their report and are approximately 6.7 inches, 15.5 inches, and 27.9 inches for 6-hour, 24-hour, and 72-hour durations, respectively. Theoretically the stochastic precipitation values for the 100,000-year return frequency events should be close to and asymptotically approaching the PMP values. Even if the Figure 4-14 curves are extrapolated to extreme return frequencies, on the order of 100 million years, they still do not approach HDR's PMP values. Similar comparisons should be included in Figure 4-14 for intermediate precipitation values, such as the 10-, 100- and 1,000-year estimates, obtained from other data sources and Weather Service publications.

<u>Comment 6.5</u>: Precipitation amounts presented in Tables 5-3 and 4-2 and Figure 5-7 should be modified to be consistent and clearly state whether or not the precipitation amounts include the area reduction factor. It should be pointed out in the text how the precipitation values for the Henry Coe Gage that are shown in Figure 4-14 are determined, i.e., how is the 10,000-year "6-Hour <u>Annual</u> Maximum" value determined with only 37 years of data.

<u>Comment 6.6</u>: Table 5-4, page 37: This table should be expanded to include Probable Maximum Flood (PMF) peak inflow and outflow rates, runoff volumes, and maximum reservoir water surface elevations. The calculations should be made using the rainfall-runoff model developed for the stochastic analyses but using the precipitation values developed by HDR. The same initial reservoir water surface elevations and assumptions regarding the extended dam crest and spillway side walls should be used in the calculations. The table should include peak inflow and outflow rates, runoff volumes, and reservoir water surface elevations for the Coyote Dam watershed, Anderson Dam watershed, and the routed and combined total inflow into Anderson Dam Reservoir. These values should be compared with the estimates obtained by HDR and presented in their 2013 report. HDR's estimated peak PMF inflow into Anderson Reservoir was 107,000 cfs and their peak outflow estimate is 95,800 cfs. ADSRP risks of overtopping are based on Anderson Reservoir maximum water surface elevations which are not only dependent upon magnitude of inflow, but also upon the volume and the timing of inflows. Thus, these comparisons will provide the reviewer an indication of the consistency of the stochastic analyses rainfall-runoff model with HDR's independently developed and previously accepted PMF model.

Comment 6.7: Section 8.2: In the 3rd and 5th paragraphs (and perhaps elsewhere) "12,000 realizations" are referenced. Is this something left over from the previous (BOC #8) report?

Comment 6.8: Appendix E: The relationships shown in Appendix E for probability versus duration and probability versus storm depth should be recalculated once the apparent anomalies discussed above are resolved. It appears that the relationships currently shown may improve.

Comment 6.9: Depending upon the results of the revised analyses, it may be prudent to have an independent 3rd party review of the stochastic analyses. Our evaluations have so far been based primarily on examination of the results of the analyses, rather than being also based on detailed reviews of calculations and methodology/calculation techniques.

7.0 Initial Reservoir Dewatering (Black & Veatch / Schaaf & Wheeler; February 7, 2019)

The general approach to the Initial Reservoir Dewatering analysis seems reasonable. However, there appear to be some differences in assumptions and project goals that are used in this document vs. those used in other concurrent analyses. The following comments highlight some of these differences and present some general comments on the report.

Comment 7.1: The report is, to some degree, written as a stand-alone document and includes assumptions and conclusions that are not wholly consistent with other concurrent analyses. In Section 1.1 it is stated that a project goal is to have the reservoir dewatered to the dead pool elevation by May 15 whereas in Section 1.1 of the Monte Carlo Critical Path Analysis the stated goal is to have the reservoir empty by April 15, a full month earlier. The May 15 date assumes the reservoir will be managed to the DSOD restriction level to maximize beneficial use of water (Table 5-4). If the reservoir is managed to minimize reservoir storage (Table 5-2) the earliest start date for cofferdam construction is April 16. This should be made clear at the beginning of the report and also shown on Figures 2-3 and 5-3 to avoid confusion. Also, Tables 5-2, 5-3, and 5-4 should include assumed storage volumes in Coyote Reservoir at the beginning and end of the dewatering period.

Comment 7.2: Section 2.2.2 and Figure 2-3 indicate that construction of the cofferdam and pumping bypass system will be completed in 1 week and that bypass pumping will begin on May 22. This seems a bit optimistic, keeping in mind that the cofferdam includes a concrete encased section of the gravity bypass system. Time must be included in the construction schedule for construction of this section, as well as sufficient curing of the concrete. Will the cofferdam need to be capable of supporting heavy construction equipment immediately after cofferdam construction is complete?

Comment 7.3: The BOC concurs with the basic conclusions presented in the report with the exceptions of Conclusion 7, which states that "A six-foot diameter diversion pipe should be sufficient to safely extend the construction season in all but the most extreme fall runoff scenarios." This conclusion differs somewhat from the conclusions presented in Cofferdam Basis of Design, Appendix E (Version 3), Table E-5 (February 15, 2019). In Table E-5 of Appendix E a six-foot diameter pipe extension would only eliminate one of five potential overtoppings during the period September through November. A 10-foot diameter pipe extension is recommended in Appendix E *and would eliminate 3 of the five potential overtoppings between September and November and several additional potential overtoppings in December.*

<u>*Comment 7.4*</u>*: The Monte Carlo Analysis of Critical Path of Construction Schedule TM (Section 5.1) indicates that there is only a 75% chance that lowering of the reservoir could begin in April (not necessarily April 1) and this is not considered in evaluation of the various scenarios. This should be mentioned and emphasized in the dewatering report.*

<u>*Comment 7.5*</u>*: Section 4 briefly describes the spreadsheet methodology used in the analyses. It would be helpful to have at least some of the spreadsheet calculations in an appendix so that water balances and assumptions can be easily followed and understood. Additionally, the spreadsheets would provide an indication of the magnitude and duration of average daily rates of water releases to the downstream Coyote Creek.*

<u>*Comment 7.6*</u>*: Does dewatering over a 2-week period exceed the downstream discharge capacity?*

<u>*Comment 7.7*</u>*: Table and Figure numbering beginning with Section 5 are not consistent with numbering in other report Sections.*

<u>*Comment 7.8*</u>*: The Initial Reservoir Dewatering report does not seem to address the likelihood of fine grade sediments and turbidity entering the diversion as a potential on-going problem during cofferdam construction or bypass pumping. Lakebed sediments seem likely to become mobilized during rapid dewatering and precipitation events. This potential should be addressed as a potential risk related to permitting expectations. It seems somewhat likely that interruptions in reservoir dewatering could be encountered due to permit violations. This is listed as a "High" risk in the Risk Register, but no mitigation measures are identified in the Initial Reservoir Dewatering report. A mitigation strategy is discussed in the Risk Management Status Report, including settling basins at Stockpile Area A. It is our understanding that analysis is being conducted in order to understand the required sizing of settling basins, based on characterization of actual lakebed sediments and expected flow rates during reservoir drawdown.*

8.0 Phase 6 Drilling Program Plan (URS; May 9, 2019)

<u>*Comment 8.1*</u>*: The purpose of the Phase 6 Drilling Plan investigations is to evaluate erosion potential of the unlined spillway channel. One method of evaluating erosion potential is the procedures published by the U.S. Bureau of Reclamation and Army Corps of Engineers entitled IV-1 Erosion of Rock and Soil (last modified 06/18/2018). This publication is available on-line. The geotechnical data needed for using this erosion potential procedure should be collected and documented in the format presented in the publication.*

<u>*Comment 8.2*</u>*: A profile of the unlined channel bed and banks along with a labeling of key features such as the water falls would be helpful.*

<u>*Comment 8.3*</u>*: Figures 1-1, 2-1, and 3-1 through 3-6 are missing.*

9.0 Monte Carlo Analysis of Critical Path of Construction Schedule TM (URS; January 26, 2019) and QRF

Comment 9.1: *This report presents a very good analysis of the project critical path schedule. The study results clearly show the need for a significant change in project planning. A 3rd party technical review of the Monte Carlo Analysis methodology and assumptions may be appropriate once the stochastic analyses are complete and safe interim dam crest levels are better understood. The Monte Carlo Analysis concentrated mostly on two critical schedule components; the initial operation date of the diversion such that the reservoir could be emptied by April 15 of Year 3; and meeting the required excavation and embankment milestones, particularly the Phase 2A Excavation and Phase 2B Embankment Reconstruction to Elevation 570 in Year 4.*

Comment 9.2: *The Monte Carlo TM further discusses potential mitigation measures that may be implemented in the interest of improving schedule reliability. Mitigation measures for both the diversion startup and the excavation and embankment activities are explored and incorporated in the analysis. Furthermore, the project team utilized a third-party well experienced in earthwork means, methods, and productions to independently evaluate potential earthwork strategies and production rates. The BOC agrees with this approach to schedule risk analysis.*

Comment 9.3: *Sections 2.2, 2.3, and 2.4 discuss production rates, work week, and weather. The language in Section 2.2 could be clearer regarding any double shifting expected in the activities of tunneling, MTBM drive, and steel lining. The production tables in the appendix could also be clearer in defining this. Consider adding a "Number of Shifts" column to the various production tables in Appendix B. This facet is important for the reader to understand because any potential to work an additional shift on the critical path is considered a mitigation measure. Conversely, if all shifts are already factored into the schedule, then that influences schedule risk.*

Comment 9.4: *The haul truck capacities listed in the TM are generally overstated and should be revisited. An adjustment in truck capacity would not necessarily alter the productions used in the Monte Carlo analysis, it would simply be a matter of adjusting the number of trucks needed to keep the excavator productions as stated.*

Comment 9.5: *Sections 2.2, 2.3, and 2.4 assert that productions were based on "other projects and engineering judgement". The TM would benefit form a deeper discussion of this and reference of at least some relevant project productions for both tunneling and earthworks. These might include local works such as New Irvington Tunnel, Caldecott Fourth Bore Tunnel, Calaveras Dam, or others familiar to the authors.*

Comment 9.6: *The earthwork production rates are realistic, and appropriately adjusted for expected project conditions. Haul patterns and excavator positions are realistically approached, and the number of crews or headings seems well thought out.*

Comment 9.7: *A third-party opinion regarding earthwork analysis was solicited and has added value to the risk analysis. Given the critical nature of the tunneling activities, it seems that this may also be a place for third-party input from a tunnel construction expert.*

Comment 9.8: *The following comment is made in Section 2.1: "The risk factors for this scope of work were limited to weather and controllable technical engineering-related categories such as* *production rates, traffic congestion, and equipment breakdown. Other potential risk categories, including, but not limited to, categories such as client/regulator organizations, project management, regulatory approvals/permits, external factors (such as earthquake, civil unrest, etc.), financial/contractual, and logistics were not considered in the simulation model described in this TM. These other potential risk categories could be considered in future studies, if deemed appropriate and necessary." While this approach is likely necessary to isolate the physical elements of the diversion and the earthwork, the factors above need to be considered in the development of mitigation measures. Such mitigation measures explored might include "what if" scenarios or alternate approaches with permitting agencies, project management, or regulators. The TM could address these risks further and offer a path forward for contingency planning and specific mitigation measures.*

Comment 9.9: How are lost production days due to weather calculated in the model for a critical path work item that begins in one season, say April 1, and extends into the next season, say to May 30? From Figure A2, the average lost production days for April is 4 days and the average for the May through October season has only 1 lost day per month (6 for the season).

Comment 9.10: The last sentence of Section 2.4.1 on page 7 indicates that "... if the construction works are completed ahead of planned schedule, the crews would stop working for the year, and would not begin the next year's work". Is there some way the model could be modified to give the probability of an early completion and the number of days of early completion?

Comment 9.11: Moisture conditioning (drying) of core materials is of concern. Mitigation measures could include active disking and drying activities of excavated core materials as they are deposited in stockpile areas. Additionally, consideration should be given to stockpiling and drying core materials in the Packwood Gravel borrow area. Rather than excavate these materials as needed in Year 4 or 5, these materials could be excavated, dried or conditioned, and stockpiled during year 3 or the first part of Year 4. While this adds cost of re-handling materials, it may significantly reduce risk. At a minimum, once the reservoir is dewatered in Year 3, the Contractor should be required to provide access to the Packwood Gravel site and conduct a materials reconnaissance program to verify design assumptions regarding available quantity and quality of these materials. This would be required as part of the Contractor's Site Material Use Plan.

Comment 9.12: Site material handling and stockpiling will have an impact on earthwork productions. The previous borrow area defined as the Quartz Hill Borrow Area could be made available to the Contractor as a potential staging and stockpiling area, subject to approval. While there may be logistic issues concerning the use of this site, it is an excellent downstream position for stockpiling downstream embankment excavation. If downstream noise is of any consideration, this site could be limited to daytime use.

Comment 9.13: The Monte Carlo Analysis of Critical Path of Construction Schedule TM, Section 5 lists conclusions and recommendations, including mitigation measures. This section should include some of the mitigation measures detailed in the April 2019 Risk Management Status Report to the extent that they affect the critical path.

Comment 9.14: The Monte Carlo Analysis of Critical Path of Construction was well targeted and well performed. It did not, however, address all potential construction risk factors. Additional factors that will exist for the actual field works will also include things like haul road *instability/maintenance, potential cofferdam overtopping, instability of the lower clayey core during excavation, unpredictability of extent of excavation needed beneath the shell zones, abutment conditions revealed by deconstruction, etc. The omission of these was appropriate for this critical path Monte Carlo exercise, but the engineering design team will have to remember and address these (and other potential construction risks) as comprehensively as possible prior to inception of contracting for the actual field works.*

Comment 9.15: In Alternative 2 for the embankment excavation/fill operation (Section 4.2.3) the interim dam would have a crest elevation of 525' with a 10-foot-high sheetpile wall for freeboard. This interim dam crest elevation will require providing less flood protection to downstream improvements. It is essential to excavate down to elevation 525' during Stage 1 excavation to increase the likelihood of completing the Stage 2 excavation/fill in year 4 and to maintain overtopping protection of the interim dam. However, there is some probability that Stage 2b fill can go above elevation 525' if time allows. Any amount of extra increase in the interim dam crest elevation that can be achieved during the Stage 2b fill will allow for an increase in the amount of flood protection that can be provided to the downstream improvements. We feel that a Monte Carlo analysis of a beginning Stage 2 interim dam crest elevation of ~525' (plus 10-foot freeboard wall) would be worthwhile to estimate the probabilities of equaling or exceeding a crest elevation of ~525' at the end of Stage 2b if Alternative 2 continues to be considered. This analysis should also evaluate the likelihood of success of achieving elevation ~525' in the Stage 1 excavation. We are not suggesting specifically this combination of crest height targets. Targeted interim crest elevations here should be re-assessed based on the next revised stochastic overtopping analysis tools, and considerations of potential alternate design details and potential changes in construction production rates, etc.

Embankment Construction Mitigation Alternative 2, or some modification of it, might be investigated further. A principal downside of Alternative 2 is that it provides a lower than ideal level of interim overtopping risk mitigation, which is a significant deficit.

Mitigation Alternative 1, on the other hand provides (1) higher interim stage crest levels, and (2) lower apparent risk with regard to meeting targeted interim crest levels. This is achieved, however, at the cost of significant lateral separation between the downstream toe of the final central clay core and the enhanced new filter and drain system being constructed to help to address long-term risk associated with potential basal fault or shear zone offset beneath the reconstructed dam.

Initial project design criteria have included providing a seismically robust filter and drain system (capable of functioning after maximum likely basal foundation seismic offset displacements) at the downstream toe of the new dam embankment, with a rising chimney section up the downstream face of the core, and a horizontal section exiting beneath the downstream shell. Design basal offset potentials (both magnitudes and directions) were suitably conservatively established. The design intent here is to safely capture, and filter, and potential flows/leakage caused by basal offset until further mitigation can be accomplished.

Basal fault rupture offset hazard is a challenging project risk element. The likelihood of offset is very low, but it is non-zero. And agreement as to what constitutes suitable mitigation is not well established at present. The proposed embankment design mitigation (a competent chimney and blanket drain capable of surviving the maximum likely offsets and still capturing and filtering potentially increased flows) has two reasonably good precedents at Cedar Springs Dam and at Lake Isabella Dam.

The unusual level of interim potential risk of overtopping during construction, and downstream risk exposure, for the ADSRP adds a new set of conflicting risks and constraints. It may simply not be feasible to excavate safely to the base of the downstream toe of the existing dam core zone due to (1) challenges with regard to low stability of un-buttressed core materials/slopes during rapid unloading of total stresses due to excavation but likely minimal dissipation of pore pressures due to excavation pace, and (2) the inability either to "wait", or to engineer the final basal excavation of the downstream shell near the toe of the core in a more conservative manner (e.g. with slotted lateral toe excavations, or similar in order to provide some buttressing support), as schedule risk would render those approaches infeasible.

It is necessary to balance and jointly engineer all of these competing risk elements.

Mitigation Alternative 1 is unattractive largely due to the lateral separation of the enhanced new downstream filters and drains from the toe of the final central clay core. That may reduce the reliability of the mitigation achieved with regard to basal offset hazard exposure. But the degree of risk reduction reliability cannot be directly assessed, and is a matter of engineering judgment.

The principal objective of the targeted mitigation of basal offset risk is to prevent any possibility of dam breach and reservoir release.

There are three elements to mitigation of basal fault offset risk. The first of these is the creation of a seismically robust downstream filter and drain system. The second of these is an initial post-seismic response capability. And the third is a longer-term response and eventual repair capability.

Even with some lateral separation between the downstream toe of the final core and the new filter and drain system, the likelihood of potential progressive erosion development and eventual dam breaching will be significantly reduced, and the time available for response will be significantly enhanced.

The second element of basal fault offset risk mitigation is thus important.

In the aftermath of a near-field seismic event, the District and their engineers (and the oversight agencies) will want several sets of information/data to inform their potential response. These will include:

1. Was there any basal offset across the mouth of the canyon at or between the dam abutments? (Displacements across the spillway or other outlet works can more easily be directly evaluated and are a separate issue.)
2. What was the approximated location, and magnitude, and direction of basal offset?
3. Was there a resulting increase in downstream flows, and does it appear to be increasing over time?

With availability of this information/data, response capability is projected to be good; the new dam system will have multiple outlet capabilities, and the ability to relatively quickly draw down the reservoir. Taking an embankment design approach that separates (to some degree) the new downstream filter and drain systems from the toe of the core might be justified if it was accompanied (1) by an instrumentation system capable of rapidly providing data needed to inform initial response actions, and (2) by response plans and capabilities able to usefully employ those data.

In a previous ADSRP project cycle, instrumentation was discussed. There is an opportunity here to perhaps enhance instrumentation capabilities with regard to basal fault offset risk exposure.

Rapidly answering Questions 1 and 2 above might be accomplished with an integrated array of survey/positional stations located on both abutments and across the mouth of the canyon (likely across the downstream face of the dam). One or more additional stations should be located further from the mouth of the canyon to provide a remote baseline. With continuous positional recordings (e.g. weekly positional data storage, and then multi-day recent positional storage in shorter time increments) these instruments could rapidly discern whether there have been any positional changes of the stations across the canyon mouth. If these stations were co-located with inclinometer casings, read perhaps twice a year or so, then the locations (and potential displacements) at and near the bases of the inclinometer casings could be relatively quickly (likely less than a day) be determined (especially if Valley water staff are the ones who perform the twice yearly inclinometer readings); and those basal displacements are the information of principal interest here.

Similarly, if outflows downstream if the dam can be continuously monitored, ideally with telemetric (and tele-video) transmission, then rapid evaluation of potential increases of outflow could also be accomplished.

Initial response plans for a significant near-field event would likely include rapid inception of reservoir lowering; this might be started before more detailed assessments are made, and might then be adjusted as additional data become available.

This is just a conceptual outline; the project and engineering teams would need to develop a suitable scheme here.

In the event of fault offset beneath the dam embankment, there would likely then also be a need for longer-term repair. With the reservoir safely lowered, there would be time for that. Valley Water (District) risk exposure would then entail also (a) potential loss of reservoir use for at least one water season, and (b) costs of repair. Given the very low likelihood (but non-zero) of basal fault offset, that might likely be an acceptable risk to the District.

With the mitigation of risk of uncontrolled reservoir release addressed, the remaining (low likelihood) residual risk to the District of potential temporary loss of reservoir use and repair/mitigation costs would likely not be a major oversight agency issue. The agencies should be consulted here.

<u>Comment 9.16</u>: *We feel that it would be feasible to undertake a multi-element approach to fault rupture displacement mitigation that would suitably address fault rupture displacement hazard, while allowing an approach similar to Alternative 1 in which the new and seismically robust filter*

and drain systems would not be located fully adjacent to the downstream toe of the final core. This might produce a suitable balance between the reliability of mitigation of potential fault offset hazard exposure, and adequate reduction of interim/construction risk exposure to the downstream communities during embankment deconstruction and reconstruction for overall seismic mitigation. The oversight agencies should be consulted here.

Comment 9.17: This would likely require a multi-element approach to fault rupture hazard mitigation, including (1) a seismically robust filter and drain system located as close to the downstream toe of the core as feasible (with considerations for core stability during excavation, and construction time-lines and associated interim downstream hazard exposure), (2) well-engineered instrumentation to inform post-earthquake evaluations and response, and (3) plans for immediate and short-term emergency response to further mitigate risk of potential reservoir release. The BOC feels that these types of measures, in conjunction, could be engineered to provide suitable mitigation of basal fault displacement offset hazard for the Anderson Dam and reservoir system.

Comment 9.18: The static and seismic stability and seismic deformation analyses presented were well executed, and are a useful basis for refining both interim and final dam embankment design geometries and details. We have some questions and suggestions regarding these (See Attachment A).

Comment 9.19: The dam will continue to be monitored, and periodically re-evaluated, over the decades ahead. Ongoing developments in the analytical tools, models and relationships employed in seismic stability and seismic deformation analyses can be expected to continue. It is important that the dam be designed to continue to pass muster as analytical tools and possibly also seismic evaluation criteria continue to evolve. The discussion in Attachment A addresses this with regard to mitigated embankment performance, and is likely pertinent to analyses that will be performed to refine the interim and final stage designs.

Comment 9.20: An approach similar to Alternative 1 may be feasible. Would it be possible to laterally shift the "remaining" (unexcavated) dam section somewhat towards the upstream? This would reduce (partially) the separation between the toe of the final core and the new downstream filter and drain system, and it would offer an additional benefit as the seismic deformation analyses of the current Alternative 1 final geometry show the principal seismic displacements occurring toward the downstream side. Upstream side stability may be higher, and there may be room for a bit less excavation (and thus for a bit more embankment to be left in place) on the upstream side?

10.0 ADSRP April 2019 Risk Management Status Report (Black & Veatch; April 19, 2019) and QRF

The risk management program, and the Risk Register, continue to be well-managed. We have a few comments as follow. Some of these are only requests for clarification.

Comment 10.1: Some of the risk scores (risk minus mitigation plan status) are dependent upon the results of the stochastic overtopping analysis which is currently being revised.

Comment 10.2: Table 6 includes risks that have been revised downward. Note that Risk's No's. 48 and 102 were revised downward, but the coloring of the Risk Score remains red in color. Revise to yellow.

Comment 10.3: Risks Nos. 129 and 130 are listed as Closed in Table 4, with the stated reason being that these have been included into design. These might be justifiably down-weighted as design proceeds, but they should remain Open until final designs, and overall construction plans and schedules, are advanced further. Ditto for these two risks Table 6.

Comment 10.4: Risk No. 22 is listed as Closed in Table 6, but not in Table 4. What is the basis for closure? If valid, then Table 4 (and Section 4.2) should explain. Does Risk No. 83 replace Risk No. 22?

11.0 Cofferdam TM, Appendix E – Diversion Extension Pipe Sizing (URS; February 15, 2019) and QRF

Comment 11.1: On page E-1 it is stated that the overtopping evaluation was a simplified water balance spreadsheet analysis. We would be interested is seeing the spreadsheet calculations. Review of the spreadsheet methodology and data may answer some of the following questions/comments.

Comment 11.2: The critical period in cofferdam construction is after completion of the cofferdam embankment but before completion of the bypass pipe extension. During this period only a 5 cfs flow is being released from Coyote Reservoir. Assuming 400 acre-feet of storage is available in the cofferdam forebay, then the facilities would be capable of bypassing 30 cfs of inflow (equivalent to 60 acre-feet per day) and storing 200 cfs (equivalent to 400 acre-feet per day) for the first day of a runoff event. However, on the second day inflows over 30 cfs will overtop the cofferdam. Discussions at the BOC #10 meeting indicated that it will take some time to construct the pipe extension.

Comment 11.3: The 2017 spill out of Anderson Reservoir was the result of a series of relatively small runoff events. It would be worthwhile to route all available 15-minute flow data through the cofferdam forebay and 30 cfs pumping system for the period of cofferdam and bypass pipe construction (April and May?), not just flow equal to or greater than 220 cfs. Although there are only 15 years of data available, the limited routings will give some indication of potential overtopping problems during the critical period when the extension pipe is not completed.

Comment 11.4: We would be interested in seeing calculations supporting the elevation-discharge curves presented in Figure E-4.

Comment 11.5: What is the rational for positioning the bypass pipe crown at the upstream end two feet below the cofferdam crest? A lower elevation would allow more complete draining of the forebay.

Comment 11.6: Section E3.1 indicates that a simplified two-dimensional HEC-RAS model was set-up to simulate hydraulic routing through Coyote and Anderson reservoirs. We are not sure why *a two-dimensional model was used. Given the other simplifying assumptions in the analysis, routings through the two reservoirs could have been done using the spreadsheet model, including differences in lag times.*

Comment 11.7: On page E-10 the number of events that would pass the through the diversion extension pipes but not pass the 30 cfs pumping system are measured events at USGS gage 11169800 between 110 cfs and 220 cfs. Please give the rational for this estimate.

12.0 Coyote Creek Alternatives Analysis TM (URS; March 27, 2019) and QRF

Comment 12.1: The handout for the BOC #10 meeting indicates that the maximum release during reservoir lowering may be as high as 2,000 cfs. Depending upon weather conditions, reservoir levels at the start of dewatering, and scheduling needs for excavation and fill of the embankment, releases may have to be greater than 2,000 cfs. In any event, future spillway releases will be greater than 2,000 cfs. Therefore, we agree that reopening the original channel is the best alternative and should be carried forward.

Comment 12.2: In Table 5 it is mentioned that the work associated with the recommended Alternative 3 is near the diversion system construction. Will this result in "overcrowding" of construction activities, and should this be mentioned in the text?

Comment 12.3: It would be helpful if the spreadsheet calculation for weir sizing discussed in Appendix D were included. Can you provide it to us?

13.0 Concept for the 30-inch Low Level Bypass Pipe, April 17, 2019

It is our understanding that to satisfy the 75 cfs fishery flows and the ability to simultaneously make releases to the treatment plant, an increase in the bypass pipeline from a 12-inch diameter to a 30-inch diameter pipe is necessary along with addition of a downstream 24-inch sleeve valve (SV) in the bypass line to regulate flows. The 30-inch pipe size is based on limiting maximum flow velocity through the pipe to 15 feet per second.

Comment 13.1: It would be helpful to include calculations and stage-discharge relationships for the 30-inch bypass pipe and 24-inch SV.

To accommodate the larger bypass pipeline and new SV in the downstream outlet structure the bifurcation in the 78-inch outlet pipe and the 42-inch SV in the bifurcated branch of the outlet pipe that were proposed in the 60% submittal will be eliminated. To compensate for this loss in outlet capacity, the 54-inch flow control valve (FCV) in the outlet pipe will have to be replaced with a 60-inch FCV to provide the full range of outlet capacity.

Comment 13.2: The BOC would appreciate the opportunity to review stage-discharge relationships for the modified outlet pipe and calculations of reservoir drawdown capability for the new configuration.

Comment 13.3: The BOC believes that the proposed changes in the bypass and outlet facilities are reasonable and necessary and will result in a simpler operation system. Elimination of the 12-inch bypass will also eliminate the potential need for erosion control at one point along Coyote Creek.

Comment 13.4: It is noted that when the reservoir is at elevation 627.9 feet the FCV is only 5% open to pass the 75 cfs flow needed to support fishery flows downstream of the dam. Under these conditions a lot of energy is dissipated at the valve. Should cavitation and/or erosion problems at the valve and outlet structure be anticipated if this flow condition persists for extended periods?

14.0 Outlet Works Basis of Design TM (URS; August 31, 2018) and QRF

This TM presents documentation and analyses for the proposed outlet works, with emphasis on the HLOW and the LLOW.

Comment 14.1: Section 2.4 presents a 12-inch diameter low-flow LLOW bypass pipe. This should be updated to reflect the now planned 30-inch diameter LLOW bypass pipe for the 90% design.

Many of the analyses presented have been through more than one iteration, and we are familiar with them and the approaches taken. Appendix A presents analytical studies/validation of the LLOW pipeline design, with emphasis on seismic performance. We have reviewed earlier iterations.

Comment 14.2: These analyses (Appendix A) are well done, and the engineering interpretations, and the resulting conclusions/recommendations appear suitable. There is likely a bit of conservatism in the seismic input motions, as they take no advantage of what might be expected to be some minor topographic "de-amplification". This is appropriate, given the critical nature of the LLOW, and the challenges of these analyses.

Appendix H presents stability analyses (Spencer's Method) and seismic displacement analyses (based on the simplified Newmark method) for the five tunnel portals during construction.

Section H2 presents stability analyses and pseudostatic analyses of the three upstream portals for (1) the intake structure access adit tunnel portal, (2) the HLOW tunnel upstream portal, and (3) the diversion intake portal.

Comment 14.3: Material strengths for the slopes were developed based on geologic interpretation, and then implementation of the modified Hoek-Brown criterion (employing conservatively enveloped estimates of m_i, σ_{ci}, etc. based on the observed geological conditions/materials). Static Factors of Safety, and pseudostatic Factors of Safety (with $k_h = 0.14g$) were judged suitable for "construction". Localized measures to control localized instabilities are anticipated but no larger-scale slope reinforcement or stabilization is proposed. This appears to be a suitable engineering conclusion for Cases 1 and 2 (the first two portals), but it is not clear to us why the third case (the Diversion Intake Portal) might not have a lower Factor of Safety, given its similar slope height and steeper geometry. Case 3 should be checked; it may prove to be a correct calculation.

The HLOW tunnel downstream portal analyses are presented in Section H3. The geologic materials are generally complex (alternating layers of shale, serpentinite, graywacke and greenstone of the Franciscan formation). In the region of principal interest for the portal, they are also highly weathered.

Development of shear strength parameterization is not fully explained. Modified Hoek-Brown criteria are again employed, and a value of intact uniaxial compressive strength of 288 ksf, and corollary values of GSI, disturbance factor, intact modulus, and modulus ratio are cited in the figure presenting the strength envelope, but largely without explanation.

Comment 14.4: We would like to have further explanation of the basis for the strength envelope modeled here for the weathered "rocky" materials.

Comment 14.5: Shear strength of the residual soil that appears to control the lowest stability cases is modeled with $\phi' = 32°$, and no cohesion, with the comment that this was based on no geotechnical data being available. This is not necessarily conservative.

Pseudostatic stability analyses (with $K_h = 0.14g$) did not meet screening level criteria of FS ≥ 1.1, so soil nailing was then designed (mainly to hold the residual soils in place at the top of the slope and cut), and this was designed to produce pseudostatic Factors of Safety of FS ≥ 1.2.

Comment 14.6: This is a generally suitable approach, but it would have been good to have some geotechnical data on the upper layer of residual soil (though variability of the material may be significant). There may potentially be some remaining/residual risk of localized instabilities in the event of seismic shaking. This is a relatively small area to stabilize, but the slope excavation and the portal are both necessary, and some degree of additional over-design (stabilization) may be warranted here.

Because the finished slope after backfilling (which will be a "permanent" slope) does not satisfy the pseudostatic screening criteria, Newmark-type seismic displacement analyses were next performed (1) using QUAD4M to calculate HEA time histories within the slope, and then (2) by performing direct integration (by Hudson et al., 1994) of the exceedances of driving shear forces vs. resisting forces (based on Spencer's method) to calculate incrementally accumulating seismic slope displacements. Input motions were well-selected and well handled.

Comment 14.7: That is an excellent analysis for this situation. Resulting seismic slope displacements calculated were between 0.66 to 1.59 feet. These displacements are only "approximate", but they appear to represent likely acceptable performance for the finished slope.

Similar approaches were taken for the stability and seismic deformation analyses of the Outlet Works downstream portal. It was again found that soil nailing (and shotcrete to avoid sloughing) would be needed during construction, and that the post-construction slope (after backfilling) would have ample stability.

Comment 14.8: These appear to be suitable analyses, and suitable conclusions. But we note that the proposed five levels of soil nailing must support a tall slope, and that slope shear strength parameters are not well defined. Targeting a slightly larger static FS, and a slightly larger *pseudostatic FS, perhaps at the cost of closer spacing and an additional row of soil nailing, might be advisable here. Seismic failure here might largely represent an unlikely act of God, but a static failure could produce an unfortunate (and avoidable) construction delay.*

Section H5 presents stability analyses for the Diversion Tunnel portal. There is some geotechnical data available here, and soil nailing is again proposed. The soil nailing (with 4-inch thick fiber-reinforced shotcrete to lag between the nails) develops acceptable static FS values, but it does not develop acceptable pseudostatic (with $k_h = 0.14g$) FS values. As a result, the analysis is again extended to a full Newmark-type seismic displacement analysis using QUAD4M to calculate lateral inertial time histories, and direct time-step integration (Hudson et al., 1994) to developed seismic displacement values. With relatively extensive soil nailing plans, maximum calculated Newmark-type displacements (for the two slopes analyzed) were on the order of 1.4 feet.

Comment 14.9: *The "Newmark-type" displacements are at best only an estimate here, and actual displacements could be significantly larger. With that understood, the design motion levels are high, and are thus associated with low likelihood of occurrence, and the analytical results would appear to indicate that worker safety would be successfully protected during construction.*

Comment 14.10: *These appear to also be "permanent" slopes. The analyses indicate a level of seismic performance that would likely protect the diversion outlet and the associated pipes and valves, but a level of performance that might require some slope repair operations in the wake of an MCE level event. With safety protected, and good access for repairs as necessary, that might likely also represent suitable design performance.*

Appendix I presents Newmark-type analyses of seismic displacement potential for the sloping intake structure. These are performed with the same types of procedures as discussed above, and these approaches are suitable here as well. The sloping intake structure is a critical feature, and it must remain operable in the immediate aftermath of a major near-field seismic event. Assumed shear strength characterization of the projected engineered fill (well-compacted Zone 5 material) appears appropriate.

Maximum calculated "Newmark-type" seismic displacements of the sloping intake (with keys and rock anchors assumed to prevent sliding at the concrete/rock interface beneath the inclined intake structure, forcing shear displacements to occur deeper in the foundation) were on the order of approximately 0.2 feet for the Maximum Pool water level, and 0.4 feet for the Half Pool water level. These appear to be referred to as global stability and global deformations.

Newmark-type maximum seismic displacements were slightly less for more localized slippage beneath the reinforced/keyed foundation zone (at the base of the rock anchors), with corresponding maximum displacements of approximately 0.16 feet and 0.13 feet at the same two reservoir levels.

The text states (1) that the deeper-seated displacements (extending up to the top of slope) would damage the access gallery causing significant leakage, and (2) that the shallower displacements will need to be accommodated (a) in bending of the outlet pipe where it bends around to the outlet tunnel at the base of the intake, and (b) in extension of the access adit at the top of the slope.

Comment 14.11: *Newmark-type seismic displacement analyses provide approximate results, and calculated displacements are generally considered accurate to within factors of approximately +/- 3 to 4. They are also often conservatively performed (or somewhat conservatively biased) in understanding of this uncertainty. Would the seismic displacements be acceptable if the actual displacements were ~3 times larger? Is the overall analysis somewhat conservative, so that the conservatism would largely offset the uncertainty here?*

Comment 14.12: *This is a critical structure/system for post-earthquake response and reservoir management. Should structural analyses next be performed to evaluate how these types displacements will be tolerated by the inclined outlet and its connections? How brittle is the inclined outlet structure (and its connections) relative to these ranges of displacements? If relatively simplified structural analyses/evaluations indicate that approximately two to three times the calculated Newmark displacements can safely be tolerated, or if there is demonstrable conservatism in these calculations, then these questions might be quickly closed.*

The comments that follow generally address hydraulics issues:

Comment 14.13: *It is difficult to follow the derivation of the equations in Appendix D. The symbols used for the variables are not consistent throughout the Appendix but change from one equation to another. A complete list of all symbols should be provided along with their definition and location. A sketch that shows the system and indicates the locations of the variables would be helpful. We were not able to derive some of the equations. Please check the derivation and of all equations in the Appendix.*

Comment 14.14: *The first sentence in Appendix D, Section D4 is a little confusing. Is equation (2) the equation for calculating the head loss coefficient for the bifurcation or the head loss coefficient for the fixed cone valves? The first term in the equation is K_{fcv} which implies the equation is intended to calculate the head loss coefficient for the valves. If so, the "A" term in the equation should be the area through the valve, which varies with valve opening. In this case the discharge is Q_{fc}, not two times Q_{fc}. If the equation is intended to calculate the head loss through the bifurcation then it should include the areas both upstream and downstream from the bifurcation. I don't think you should ignore the loss through the bifurcation. There appears to be an equal sign (=) missing in equation (2).*

Comment 14.15: *Appendix D: When you refer to "head" at a location does this head include the velocity head?*

Comment 14.16: *Appendix D: Please describe in words the three terms following the equal sign in equation (4). There seems to be something wrong with this equation.*

Comment 14.17: *Appendix D: Where did the 75.3 value come from that is used in equation (14)?*

15.0 Analytical Validation of 60% Design of LLOW QRF with Responses

No BOC comments here.

16.0 Full BOC Comment Tracking Log, May 21, 2019

Comment 16.1: Additional revisions are being made to the Stochastic Analysis of Potential for Interim Dam Overtopping, January 22, 2019. These revisions may require changing responses to some of the BOC #9 comments.

We have reviewed the new "closures" in this last round, and have comments on a few of these as follow:

Comment 16.2: BOC Comment #164 appears to still be "Open".

Comment 16.3: Comment 201 should also remain Open, until the details of downstream mitigated embankment design are further advanced.

Comment 16.4: With the work still ongoing, Comment 212 should also remain Open.

Comment 16.5: With work still in progress, Comment 261 appears to still be Open.

Comment 16.6: We understand the basis for closure of Comments 284, 285 and 286, but note that it may not be feasible to reduce risk of interim overtopping fully to zero. These issues may therefore arise again in discussions of interim overtopping mitigation alternatives.

Comment 16.7: The response to Comment 448 did not fully address the concern here; which is degradation of SPT and Mod-Cal penetration resistance measurements/blowcounts (not the potential for hydrofracture). This ship has likely now sailed.

Comment 16.8: Comment 272 has been closed. This involves our suggestion to have Dr. Gregg Korbin review the tunnel designs and assumptions. Since the last review that the BOC has seen, the Diversion, LLOW and HLOW have been changed significantly. Comment 532 indicates Dr. Korbin's continued involvement. We recommend an additional review by Dr. Korbin of both tunneling and lake tap designs and operations as these appear to approach 90% design levels. In addition, if tunneling operations continue to represent critical path issues with regard to construction risk, then a third-party tunneling constructor's review would be warranted with regard to feasibility (and risk) of projected rates of progress for the tunneling works and lake tap.

Comment 16.9: Comments 536 and 538 centered on the idea of some form of contractor prequalification or best value award, with the idea of contracting with a competent dam contractor with proper project understanding and commitment. These comments were closed with an acknowledgment of that prequalification was envisioned for this project, including evaluation criteria. The BOC is pleased with this response. The concept of contractor prequalification has been highlighted in various reports and meetings as a mitigation measure and is surely paramount to the success of this project. The BOC would appreciate the opportunity to review a Procurement Plan.

Comment 16.10: A number of Comments received good initial responses, but due to work still ongoing they should remain open until more fully resolved. These include Comments 461, 572, 573, 580 and 626.

Comment 16.11: The initial response to Comments 628 through 636 (the Monte Carlo analysis) was a good one, and very useful. But this is a more complex set of issues, as discussed in this current BOC letter, and the Monte Carlo analysis did not yet fully resolve these issues. These comments should remain Open.

Comment 16.12: In view of likely design changes, Comments 200 and 201 should be re-opened. These may be resolved by other approaches, but they should be open until that is accomplished.

Part 4: Additional General Comments

The ADSRP project is unusually challenging due to the need to both balance and cross-coordinate (1) the "existing" (long-term) risks to be mitigated vs. (2) the "interim" risks that occur during implementation of long-term mitigation. These two sets of risk exposure are closely inter-related, posing a complex problem. A large number of very good engineers have been working on this problem, and good progress has been made. But challenges still remain.

The BOC cannot become too directly involved in helping to "solve" this puzzle, as we must retain objectivity with regard to evaluating the appropriateness and feasibility of solutions developed by the engineering team.

BOC Comment IV.1: The partial (one-day) Construction PFMA at the end of the last BOC meeting was an interesting and useful exercise. We recommend that it be continued, and completed, as soon as possible; ideally in the next few months.

We would suggest considering having a first day with (a) presentations and discussions of selected (and already well-identified) construction risks and potential and/or recommended mitigation measures, and (b) broader ranging discussion of construction risk (and interim risk) concerns without necessarily using the fully formally facilitated PFMA structure/context. A more formal PFMA exercise could begin when the initial presentations and discussions wind down. It would also be good to have a presentation of the updated stochastic analysis of potential for interim dam overtopping if that can be accomplished, as that would help to inform the Construction PFMA. That could be followed by either one or two additional days to continue to perform a more formal/conventional PFMA exercise to address Construction Risk issues. Given the complexity and difficulty here, the first day's early sessions might represent a useful opportunity to get a number of experts together in the same room and have earnest discussions and good idea sharing; and with more rapid turn-around times with regard to the usual cycle of agency and BOC input/comments. Targeted products of this overall PFMA would then likely include (1) initial (partial) development of lists of potential "interim" (during construction) risks, and (2) initial/partial development of specific mitigation measures for anticipated and potentially anticipated conditions, or "Plan B" operations. Further development, formalization, and formal review, could follow.

Given the scope and complexity of the challenges involved in jointly coordinating both interim and long-term risk mitigation, we would like to offer some comments and suggestions. Most of these are not "numbered" BOC comments. Instead they are a set of observations that may help to provide ideas, or may contribute to generating some additional degrees of freedom, with regard to resolving the complex overall problem of both designing and implementing the ADSRP. Numbered BOC Comments occur in italics. Non-italicized statements are also sometimes numbered for easy reference, but these are not formal BOC Comments that warrant formal specific responses.

IV-1. Project design is necessarily interactive with implementation. Design should constantly consider feasibility of construction, and associated construction scheduling risk and corollary downstream flood risk exposure.

IV-2. Providing downstream flood protection during project construction is imposing some restrictions on construction of some project elements, and has impacts on project risks. The magnitude and frequency of reservoir releases and their associated downstream damage potential are not well defined but seem to be limited to a relatively narrow range of downstream discharges. Some of the downstream damaging flows originate from below Anderson Dam and cannot be regulated by reservoir releases, further limiting the amount of flood control that can be provided by reservoir operation rules. Operating the reservoirs for minimum storage, i.e., maintaining a fully open outlet valve, may or may not result in damaging flows during the relatively short interim period when the dam crest is at its lowest elevation, and the outflows would represent partially metered releases (rather than un-metered natural storm outflows.

<u>BOC Comment IV.2</u>: Improving downstream channel capacity may be a better method of improving downstream flood control than reservoir operation rules, and it would also provide long-term lasting protection after the project is completed.

There may be some degrees of additional freedom that can be garnered with regard to fill handling, placement, and compaction that might reduce construction risk either (1) by increasing production rates, or (2) reducing risk of delays.

IV-3. The proposed placement and compaction plans for shell materials are suitably supported by the test fill program, and in conjunction with the ongoing laboratory testing should also provide a suitable basis for development of resulting properties/parameters for final design analyses (including static and seismic stability, and seismic deformations). But there may be two additional potential degrees of freedom here:

(1) Most of the downstream shell will never become saturated, and so does not need to be compacted to suitably resist potential seismically-induced soil liquefaction (and associated deformations). The new dam will have a wide and competent clayey core, and good downstream filters. Above the lower-most portion (first 10 to 20 feet above the horizontal blanket filter/drain) the downstream side cohesionless shell materials need only to provide suitable frictional strength and to suitably resist both limited shear deformations and limited volumetric deformations (cyclic densification or shake-down). This can likely be accomplished with a lesser degree of compaction. Compaction (with the same vibratory rollers) to a slightly lesser degree of compaction should suffice to generate friction angles greater than about 37 to 39 degrees, and suitably limited (unsaturated) shear and volumetric strain potentials. A slightly relaxed compaction specification for most of the downstream shell should enhance placement rates, and could reduce construction schedule risk; especially as the dam "comes back up" from the base in Phase 2b.

(2) It appears likely that a larger-scale field placement/compaction test fill might generate some additional flexibility with regard to placement and compaction of cohesionless shell materials in

other zones (e.g. the upstream side, and at the base of the downstream shell zone). The 18-inch lifts currently proposed may suffice, but it might be possible to justify 24-inch lifts (with lesser problems with oversize particles), especially on the downstream side, if even larger static and vibratory rollers can be brought to bear. If the downstream side relaxation of compaction specifications suffices, then this may not be needed. But if not, then the option of requiring an additional (and larger scale) test fill might be considered. Such an exercise <u>might</u> also result in potential use of slightly larger lifts on the upstream side (and at the base of the downstream side) as well.

IV-4. Choke points for production during embankment reconstruction appear to occur at the excavators/loaders. Clever contractors will likely be able to at least partially resolve this with good site management and with possible use of more excavators/loaders (possibly somewhat smaller loaders, and not necessarily fully dedicated to just filling trucks). There is some room for innovative thinking here; which would require a skilled and experienced contractor with suitable resources.

IV-5. There are several sets of construction/schedule risk issues associated with the cohesive core materials. Some of our comments/observations here include:

(1) There may be significant challenges excavating to the base of the existing core on the downstream side, as relief of total stresses will not quickly be accompanied by similar pore pressure relief. "Drawdown-type" slope stability issues may likely result. It is likely infeasible to usefully relieve these pore pressures over a sufficient extent of the lower core due to concerns with regard to potential for fracturing of the core, etc. Slope steepness, and "berming" (support) from the adjacent shell zones will likely be important here. If it is simply not possible to get right to the toe of the downstream side of the base of the core due to evolving instabilities as excavation work progresses, then a reasonable contingency might be to settle for getting the new downstream filter and drain zones as close to the base of the core as possible, and counting on the combined benefits of the existing filter/drain and the new (but non-adjacent) filter/drain to mitigate the low probability (but non-zero) risk associated with potential for fault or shear zone offset at the base of the dam. It would be best to get the new filter/drain to the base of the new/final core, but this contingency might represent a suitable "contingent" balancing of interim construction risk vs. long-term fault offset risk exposures; especially in conjunction with suitable instrumentation and response plans to address the potential seismic basal offset risk exposure. (These instrumentation and response contingencies are important anyway, even if the new filter/drain directly abuts the core.)

(2) There are a number of construction risks with regard to handling and placement of core materials; mainly due to the challenges of drying and processing these materials to a compactable consistency (water content range). Contractors' operations with regard to handling and processing (and "farming") of cohesive fill materials will be an important element of overall construction operations. The 60% Design Specifications regarding borrow materials and embankment anticipate that these core materials will be wet of optimum either from the existing core materials, or from the Packwood Gravel Borrow Area. The Design Specifications also require that materials be conditioned to between -2% and optimum. The timing and methods of the Contractor's moisture conditioning program will at times become critical. Drying and conditioning production is likely to be lower than material placing production, and the available area for conditioning is limited. Consider additional requirements in the Specification that the Contractor demonstrate his drying

program and techniques early in the project. This might include drying of core materials during Phase 1 excavation. Additionally, the contract could require the Contractor to access the Packwood Gravel Borrow Area during Years 1, 2, or 3 for the purposes of verifying quantity and quality of materials, but also to consider stockpiling and processing these materials well in advance of their scheduled need in the embankment. The Contractor's understanding of the expected conditions and his proposed means and methods should be well explained in a required submittal Material Handling and Use Plan. A preliminary copy of this submittal should be required with any Contractor Prequalification. We would like to see a discussion of these issues at the proposed Construction PFMA.

IV-6. We are pleased to hear that senior political forces will likely become involved in the permitting process. There are significant public safety issues involved here, and that involvement is appropriate.

IV-7. The probabilistic hydrological analyses of interim overtopping risk will be needed to inform both (1) evaluations of risk exposure, and (2) designs (and planning) to suitably manage these risks. It is important to prosecute these analyses to useful conclusion as rapidly as practicable. A rapid, and off-cycle, review of these (perhaps with a small BOC meeting for presentation and discussion) might be appropriate here. We previously had two "over-the-shoulder" BOC meetings/discussions with the engineering team (jointly with the oversight agencies) to interactively discuss (and then subsequently more formally review ensuing work products) the challenging project elements associated with (1) numerical modeling of spillway flows, and (2) three-dimensional dynamic (seismic) analyses of the outlet works pipes and pipe support systems. These did not compromise the BOC's objectivity, but time was likely saved in review iteration cycles.

IV-8. The two principal windows of interim downstream risk exposure are (1) at the end of embankment deconstruction Phase 1 (partially degraded dam embankment with reduced crest height) and (2) at the end of embankment deconstruction/reconstruction Phase 2b (reduced crest height new embankment on the way back up). The year ending in Phase 2b (on the way back up) appears to pose the most challenging risks. Contingency plans to handle/manage interim risks at the end of each year should be developed and reviewed. We have a few comments and observations to offer.

(1) If the targeted dam embankment crest heights are not achieved during initial deconstruction (at the end of Year 1), then it may be possible to continue to excavate (as weather permits), possibly with reduced crews, and only as haul roads and weather conditions allow. This would likely require contingency planning for availability of excavated fill storage areas not likely to become inundated or otherwise unusable; at least not during the early to mid-Fall season.

(2) If the targeted dam embankment crest heights are not achieved during initial reconstruction (at the end of Phase 2b; on the way back up), then a number of contingent remedies might be considered. The following are not intended to be a comprehensive list, or recommendations, and the engineering and project teams will likely have additional and/or alternate ideas.

(a) One contingency might be to continue to construct. This might entail continuing fill placement as originally planned, but continuing after the initially projected seasonal end date, as weather windows permit. An alternative might entail continuing fill placement, but with an altered geometry (to enhance useful crest height with lesser embankment width/mass, and thus optimize any available windows of useful construction weather). This type of approach might also be taken prior to the projected end of seasonal construction if it becomes clear that the targeted construction schedule (and final seasonal crest height) is unlikely to be achieved. Interim crest geometries to consider here might include (a) a narrower crest section atop the wider overall "top of current crest" fill, (b) similar, but enhanced with a sheetpile curtain/crest for additional height, (c) etc. Any of these types of approaches might then be subsequently augmented (again as weather permits) by placement of buttressing fills.

(b) A second set of contingencies would consist of planning for mapping of likely worst-case downstream flood risk, and programs for notification of properties at risk. Weather can be forecast, and weather risk does not develop instantly (as with earthquakes). Reservoir stages, and forecasting, are useful here. There is no reason for interim downstream risk exposure to include any significant risk of loss of life.

(c) We are looking forward to seeing the results of the updated/augmented dam breach analyses, and would like to take a bit of time at our next BOC meeting (ideally the interim/construction risk PFMA meeting) for a discussion of (a) erodibility, and (b) potential interim dam crest details.

(d) The two interim dam crests lack interim spillways. Are there potential interim solutions for this? We would encourage the engineering team to consider the potential (highly unlikely, but non-zero probability) scenario wherein one of the two interim dam crests/stages appears likely to face overtopping risk as a series of storms have largely filled the interim reservoir and further rainfall is forecast. As the waters rise towards the crest; (1) what additional "interim" measures (at the crest, or elsewhere) would we all wish that we had previously implemented (as advance preparation), and (2) what additional emergency measures might be implemented now (as emergency response measures)? Might these have benefitted by alternate crest detailing earlier in the process?

(e) While the specifications require Winter Protection for embanked materials, the overall aspect of winter protection should be addressed as a section of the contract. This section would be comprehensive in nature and include protections of stream flows through the project site and diversion system, shaping and sealing borrow areas (primarily core materials), permit conditions, winter site observations and weather response planning, storm condition access, stockpiling of emergency materials, etc.

IV-9. While Valley Water does not currently have authorization to award projects on a best value basis, this has been discussed as a potential mitigation strategy. Given the project magnitude and risk associated with contractor performance, as part of the procurement planning and risk reduction, pursuit of authorization by governing bodies would be in the best interest of the project.

There are a number of additional "interim" and/or construction risks, and the currently proposed PFMA-type of exercise, with some emphasis on initial development of mitigation alternatives, would likely be of significant value at this juncture. Most of the information and data needed to optimize this exercise is largely in hand, and this appears to be a propitious time with regard to project status and schedule to mobilize this PFMA.

Closure

The materials provided prior to the 10th BOC meeting, and the presentations and discussions presented at the meeting, were well focused and provided important information suitable to our current task and the overall ADSRP objectives. This is a complex and challenging project; there continue to be a lot of studies, investigations, analyses and planning efforts ongoing, and the pace of work in progress (and its scope and diversity) continue to present significant challenges for the ADSRP.

The project is now approaching the 90% design stage, and it is important to continue to cross-coordinate the significant inter-related analysis, design and planning efforts, and optimize and verify the evolving designs and plans.

We hope this letter report provides the information that you need as you continue to advance this project.

If you have any questions, please let us know.

Yours sincerely,

Stephen W. Verigin

Dan Hertel

Tom MacDonald

Raymond B. Seed

cc: Hemang Desai, Valley Water
Megan Puncke, Black and Veatch

ADSRP BOC Letter Report No. 10

Attachment A

The static and seismic stability analyses performed in support of the Monte Carlo Analysis of Critical Path of Construction Schedule TM were well targeted, and well performed. They provided useful insights.

The Oakland office of AECOM (with several previous incarnations of company names) has a long and strong history with regard to performing these types of analyses.

The text describing analytical details in this TM was sparse, likely representing the timing and pace of the current project. The BOC would benefit from a bit more information regarding analysis details in helping us to interpret the results.

In addition, it is clear that similar types of analyses will be performed in support of further project design refinements, as well as in support and documentation of final remediated dam suitability. A number of these same types of details will come into play there as well.

A.1 Details Regarding Analyses Performed for the Monte Carlo Analysis of Critical Path of Construction Schedule TM

We would like to be certain that we understand the details of some elements of the analyses performed. This does not indicate any sense that we perceive short-comings; instead it helps us to interpret the analysis results. The following are queries; they are not numbered BOC Comments.

1. Which analytical model was employed (in FLAC) for the elements comprised of potentially liquefiable soil types?
2. Which liquefaction triggering relationship was employed as a basis for model parameterization with regard to cyclic pore pressure generation in the FLAC analyses?
3. What criteria were used to judge when potentially liquefiable soil elements would transition to post-liquefaction strength (S_r)?
4. How was this transition implemented (e.g. a stoppage and re-start at or near the end of shaking? Or other?)
5. There is a stability berm shown at the downstream toe of the embankment section analyzed. What are the projected berm embankment materials, and what types of properties were employed?
6. Is Figure D3-4 representative of the phreatic conditions modeled for the other analyses?
7. Was strain softening of the central clay core modeled or otherwise accounted for in any of these analyses, and if so please explain the approaches, and the shear strength properties

employed in each of the analyses, and the timing of implementation of strain-softened strengths in the seismic deformation analyses if applicable.

8. For the pseudo-static analyses, was potential tensile cracking of the clay core modeled?

9. In the pseudo-static analyses, was S_r used in "liquefied" elements, or was $r_{u,seis}$ employed? Or $r_{u,seis,max}$?

10. Ditto the above for the post-seismic stability analysis?

11. For the Remnant Dam analyses, please explain (a) pore pressures modeled (especially in the core) and their basis.

12. Was a rapid drawdown-type of analysis employed? If so, by which method? Was Spencer's method used for the stability calculation?

A.2 Forward Analyses

Similar types of static and seismic stability and seismic deformation analyses will be performed to inform ongoing design revisions, and then eventually to verify the final design sections. There are changes ongoing within the profession with regard to a number of analysis details involved here. It would be ideal if the final analyses performed for the ADSRP will then stand up well over the decades ahead, to reduce risk of additional required mitigation at a later date.

To that end, we recommend that the final embankment be designed to provide (1) acceptable behavior with regard to expected seismic deformations under the worst case seismic loading (the Coyote Creek input motion employed is suitable), and (2) "residual stable" conditions on both the upstream and downstream sides with a suitable factor of safety (e.g. FS $\geq$ 1.2 or similar).

Any number of analytical models will provide suitable seismic pore pressure and seismic deformation results if they are suitably calibrated. Chowdhury (2018) found good results for back-analyses of the Upper and Lower San Fernando Dam 1971 seismic performance case histories with each of the following models; the Roth model, UBCSAND, PM4Sand and Wang2D so long as they were calibrated with suitable triggering relationships. Some of the generally publicly available versions of these models are calibrated with only one of the available triggering relationships, but the Oakland AECOM office likely have access to additional versions with alternate calibrations as Ethan Dawson was a contributor to Dr. Chowdhury's investigations.

Triggering relationships are usually a potentially important choice to be made. The analyses performed in the Monte Carlo TM, however, show high cyclic pore pressure ratios in all critical zones (Fig. D3-11) so this may be a bit less of a critical an issue here. Of the three likely candidate triggering relationships; the recently revised Cetin et al. (2018) relationship is the most conservative, the Boulanger and Idriss (2014) relationship is the least conservative, and the Youd et al. (2001) relationship would produce almost exactly intermediate results at the K_σ levels of apparent principal interest for this case. Selection of the triggering relationship employed is an engineering decision.

The S_r relationship of Weber et al. (2015) is the only current relationship that specifically captures the dependence of S_r on both initial effective vertical effective stress and $N_{1,60,CS}$. The relationship of Kramer and Wang (2015) is a second relationship that predicts S_r based on both initial effective vertical effective stress and $N_{1,60,CS}$, but Weber et al. (2015) found three sets of errors in Kramer and Wang's initial work which together produce strongly conservatively biased S_r estimates, and Prof. Kramer is currently revising that relationship to corect these. That relationship will likely be of roughly co-equal merit when it is available. Dr. Chowdhury found that S_r relationships that did not specifically account for the effects of both initial effective vertical effective stress and $N_{1,60,CS}$ were unreliable and could produce poor results.

The criteria employed by Dr. Chowdury in his back-analyses for transition to S_r were those long-employed by the Sacramento District of the USACE. They performed well for the two challenging and well-documented case histories, one with a nearly catastrophic liquefaction-induced upstream flow failure and the other (similarly constructed) dam with only limited to moderate deformations and displacements. They should probably be considered for use here.

Dr. Chowdhury found that the two simpler analytical models (Roth and UBCSAND) tended to slightly over-predict crest settlements, and that this roughly compensates for omission of additional settlements due to post-earthquake volumetric reconsolidation for analyses performed with them. For the two more complex models (PM4Sand and Wang2D) adding volumetric reconsolidation is appropriate and recommended.

The central clay core of the final dam embankment sections will be wide, and potential for strain-softening (and/or partial strain-softening depending on shear strains and shear displacement offsets) of the core should be incorporated in both deformation analyses as well as in pseudo-static analyses and post-earthquake stability analyses. Potential for tensile cracking of the clay should also be accounted for in the static and pseudo-static analyses.

The "residual stable" condition would be evaluated with a static analysis (e.g. Spencer's method), but with S_r in "liquefied" (or likely liquefied) soils, strain-softening addressed in the core materials (and any cohesive foundation units), and suitable treatment of potential tensile cracking of cohesive soils near the crest.

There are a significant number of model selections, and modeling judgments to be made in these suites of analyses, and the BOC is not intending to specify or dictate these. But the project timelines are shortened now as the 90% design level is approaching, and it seems prudent to mention some of the specific details that we will examine and/or use to make adjustments to our interpretations of analytical results eventually likely to be presented in order to try to reduce potential iterations. In the end, selection of models and relationships, and modeling details, are engineering judgements.

The regulatory agencies will likely have similar issues and will likely examine similar types of details. One cannot simultaneously please everyone; performing these analyses in a manner that all parties will judge to have been (a) generally suitable and (b) adequately conservative as to successfully and reliably "verify" designs is probably the best that can be targeted.

INCOMING BOARD CORRESPONDENCE

Report Name: Correspondence (open)

Correspond No	Rec'd By District	Rec'd By COB	Letter To	Letter From	Description	Disposition	BAO/ Chief	Staff	Draft Response Due Date	Draft Response Submitted	Writer Ack. Sent	Final Response Due Date
C-19-0226	09/11/19	09/11/19	All	LISA GILLMORE CITY OF SANTA CLARA	Letter from City of Santa Clara Mayor, Lisa Gillmor requesting the preservation of the Freedom Bridge.	Refer to Staff	Callender	Gibson	09/19/19		n/a	09/25/19
C-19-0227	09/11/19	09/11/19	All	SUZANNE SOLMONSON	Letter from Suzanne Solmonson requesting that the Board allow her to file a late claim for a damaged fence.	Refer to Staff	Yamamoto	Cahen	09/19/19		n/a	09/25/19