GEOSCIENCE

November 12, 2018 **DRAFT**

Mr. Mark Norton, PE, LEED AP, ENV SP
Water Resources & Planning Manager
Santa Ana Watershed Project Authority
11615 Sterling Ave.
Riverside, CA 92503

**Re: Third Request for Budget Amendment for Consulting Services for Santa Ana River Waste Load Allocation Model Update**

Dear Mark:

GEOSCIENCE Support Services, Inc. (GEOSCIENCE) submitted a first budget amendment on February 8, 2018 (draft dated January 5, 2018) to address out of scope work requested in comments received on the Santa Ana River Waste Load Allocation Model (WLAM) draft Technical Memorandums (TMs) No. 1 and 2. This first budget amendment also included a budget reduction arising from the Basin Management Program (BMP) Task Force's decision to forego Task 4 (Develop WLAM for Managed Recharge in Percolation Basins). The budget for Task 9 was also affected by this decision since it included a Draft TM No. 4 summarizing the results of Task 4.

GEOSCIENCE submitted a draft second budget amendment on July 26, 2018 in response to a request from the Regional Water Quality Control Board (Regional Board) to include an evaluation of the impacts of surface spreading at Corona Ponds and Redlands Basin on receiving groundwater and surface water. This work was originally covered under Tasks 4 and 9, but was cancelled during the October Task Force meeting. The remaining funds for this work were then used to cover a portion of the out of scope work proposed in the February budget amendment. The draft second budget amendment proposed reinstating a portion of Task 4 and the draft TM No. 4 under Task 9. However, in response to concerns raised by the City of Corona during the August 14, 2018 meeting, the Task Force requested that an amendment to reinstate work related to the Corona Ponds and Redlands Basin be postponed until Corona and the Regional Board reached a consensus on how to proceed. Per the Regional Board, additional modeling conducted by the City of Corona provided sufficient information regarding the impact of waste water spreading. Therefore, the finalized second budget amendment only included additional expenses for extra meetings as a result of unforeseen project delay.

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Per your request at the October 30, 2018 BMP Task Force meeting, GEOSCIENCE submits this third budget amendment to account for requested additional modeling work. A breakdown of the requested additional modeling and scope of work is presented in attached Table 1 and described below.

## 1.0 PROPOSED ADDITIONAL SCOPE OF WORK

**Task 3 – Evaluate Waste Load Allocation Scenarios for Major Stream Segments**

During the discussion held at the October 30, 2018 BMP Task Force meeting, several suggested revisions to the 2017 WLAM HSPF scenario runs were recommended by the Task Force. In addition, further recommendations were submitted by Risk Sciences on November 8, 2018 (see attached). Based on these recommendations and suggestions, three additional subtasks are required under Task 3. An overview of each subtask is provided in the following sections.

Rather than issue another draft of TM No. 3: WLAM Predictive Scenario Runs, we recommend including the results from the additional scenarios and analyses described below in the draft Study Report. This report will also include a compilation of all the previous draft reports and address all comments received from the Task Force to-date. Therefore, no additional work for Task 9 will be necessary.

***Task 3d – Revise Assumptions for the Six WLAM Scenarios and Rerun***

Currently, the 2017 WLAM HSPF has been used to evaluate water quality in major stream segments over the base hydrologic period from Water Year 1950 through Water Year 2016 for the following six scenarios:

- Scenario A: Maximum Expected Discharge under 2020 Conditions
- Scenario B: Average Expected Discharge under 2020 Conditions
- Scenario C: Minimum Expected Discharge under 2020 Conditions
- Scenario D: Maximum Expected Discharge under 2040 Conditions
- Scenario E: Average Expected Discharge under 2040 Conditions
- Scenario F: Minimum Expected Discharge under 2040 Conditions.

Based on comments from the Task Force at the October 30, 2018 BMP Task Force meeting, some of the underlying assumptions for these six scenarios will be altered and the scenarios will be rerun. The following changes will be incorporated in the new set of model runs:

- Lake Elsinore Spill: Since lake modifications in the 1990s, there have been no recorded spills from Lake Elsinore. Based on this, the current assumption in the model runs is that there will be

no spills in the future, even though lake levels are assumed to be high enough at certain times to preclude discharge from the Elsinore Valley Municipal Water District (EVMWD) Regional Wastewater Reclamation Facility (WWRF) into the lake. However, while spills from Lake Elsinore into Temescal Creek may not happen as frequently as those observed historically, EVMWD and the Task Force advise including some spill assumptions under future conditions. Therefore, we will work with CDM Smith and Dr. Anderson from University of California, Riverside (UCR) to develop flow and water quality assumptions for spill from Lake Elsinore for the hydrologic period from Water Year 1950 through 2016, based on their modeling work in support of the Lake Elsinore & Canyon Lake (LECL) Total Maximum Daily Load (TMDL) revision.

- Corona Discharge TDS Concentrations: The current 2017 WLAM HSPF model scenario runs assume permitted concentrations for all discharges from Publicly Owned Treatment Works (POTWs). However, TDS concentrations for discharge from Corona Wastewater Treatment Plant (WWTP) No. 1 were modeled seasonally in the 2008 WLAM. The purpose of this seasonal fluctuation was to simulate typical variability in TDS concentration in the Plant 1 effluent to more accurately evaluate compliance with the August-only Reach 3 TDS objective. At the suggestion of the Task Force, this same approach for Corona discharge will be used in the 2017 WLAM HSPF scenarios. Summer discharge will be simulated with a TDS concentration of 725 mg/L while winter discharge will be simulated with a TDS concentration of 665 mg/L, such that the average TDS concentration of Corona effluent will be equal to the permitted limit of 700 mg/L, as shown in the following table.

**Corona Discharge TDS Concentration Assumptions for Revised Scenario Runs**

| Month | Corona WWTP No. 1 Effluent TDS Concentration (mg/L) |
|---|---|
| January | 665 |
| February | 665 |
| March | 665 |
| April | 665 |
| May | 725 |
| June | 725 |
| July | 725 |
| August | 725 |
| September | 725 |
| October | 725 |
| November | 725 |
| December | 665 |
| **Average** | **700** |

- Stormwater Capture: Currently, stormwater capture is modeled in the 2017 WLAM HSPF scenarios based on observed historical capture. However, due to basin modifications and

increased stormwater capture, future stormwater capture is likely higher than that which occurred during historical conditions. Therefore, stormwater capture assumptions will be updated for the revised model runs. Future projections for stormwater capture in Chino Basin have already been received from Chino Basin Watermaster (CBWM) and will be used in the revised runs.

- Arlington Desalter Discharge: A comment was received from Orange County Water District (OCWD) questioning whether it was necessary to include Arlington Desalter discharge in the model scenarios, given that the desalter is no longer discharging to surface water. However, as explained at the October 30, 2018 meeting, discharge from the Arlington Desalter cannot resume in the future if it is not accounted for in the WLAM scenarios. As such, Western Municipal Water District (Western) has requested that discharges continue to be included in the scenario assumptions. The exact discharge values for the revised runs will be verified with Western.

- Dry Weather Runoff to Off-Channel Percolation Basins: Per the request of the Task Force and Risk Sciences, the revised 2017 WLAM HSPF scenario runs will attempt to more accurately account for diversions of dry weather runoff to off-channel percolation basins by the San Bernardino County Flood Control District (SBCFCD) in the eastern side of the watershed. We will work closely with the Task Force and SBCFCD to develop these additional assumptions.

- Streambed Percolation in Orange County Groundwater Management Zone: Currently, the 2017 WLAM HSPF scenarios do not account for streambed percolation in the Orange County Groundwater Management Zone (GMZ) except for the stretch from the outflow of OCWD's Recharge Facilities Model (RFM) to the Santa Ana River at Santa Ana streamflow gage. While no streamflow percolation is thought to occur between Prado Dam and the Santa Ana River at Imperial Highway streamflow gage, OCWD has confirmed that percolation does occur along the Santa Ana River past the Imperial Highway gage. As such, percolation along this stretch of the Santa Ana River will be accounted for in the revised scenario runs to help ensure that the model results reflect observed water quality at the Imperial Highway gage and are not biased by the high quality stormwater that influences streamflow below the RFM outflow location.

***Task 3e – Conduct Additional Analyses on the Results from the Six WLAM Scenarios***

Based on the results from the revised model scenarios described above, the following additional analyses will be completed at the request of Risk Sciences:

- Any differences in water quality results for Santa Ana River Reach 3 at Prado Basin, Reach 3 below Prado Dam, and Reach 2 overlying Orange County GMZ will be systematically investigated. A thorough explanation for any inconsistencies will be provided.

- Cumulative Frequency Distribution graphs of TDS and TIN will be prepared for each GMZ. These graphs will provide the cumulative probability on the X-axis and the concentration on the Y-axis. 1-year, 5-year, 10-year, and 20-year data output will be shown on the same graph and represented by different colored lines. The graphs will also include horizontal lines representing the water quality objective(s), current ambient water quality, and 67-year average. These graphs will provide a comprehensive picture of the model results to facilitate the interpretation of reported maximum concentrations during the model simulation.

***Task 3f – Conduct Sensitivity Runs or Mass Balance Analyses to Understand Key Issues***

Per the request of Risk Sciences, additional sensitivity runs and/or mass balance analyses will be conducted to understand the following key issues for the waste load allocation:

- How much degradation, if any, is caused by relocating a portion of the City of Riverside discharge to Santa Ana River Reaches 3 and 4 (above Riverside-A GMZ)?
- Why is the August-only TDS objective of 700 mg/L being exceeded when the vast majority of POTW discharge is below 650 mg/L. What is the source for the TDS that is causing a problem?
- What is driving the slight degradation to San Timoteo Reach 1 above Bunker Hill-B GMZ in Scenario A?

**Task 10 – Monthly Project Meetings**

In the previous budget amendment request (dated August 15, 2018), additional scope of work and budget was included for monthly project meetings through December, 2018, due to unforeseen project delay. Given the additional out of scope of work detailed above, it is anticipated that preparation for, and attendance at, an additional two (2) meetings will be needed (i.e., January and February Task Force Meetings).

## 2.0 PROPOSED BUDGET AMENDMENT

The estimated cost of the additional work associated with Task 3 and the extra meetings in response to an extended project schedule is detailed in Table 1 and summarized below.

## Proposed Budget for Additional Scope of Work

| TASK | | Total Additional Hours | Total Additional Cost |
|---|---|---|---|
| 3d | Revise Assumptions for the Six WLAM Scenarios and Rerun | 56 | $7,780 |
| 3e | Conduct Additional Analyses on the Results from the Six WLAM Scenarios | 38 | $5,060 |
| 3f | Conduct Sensitivity Runs or Mass Balance Analyses to Understand Key Issues | 74 | $11,130 |
| 10.0 | Prepare For and Participate in up-to 2 Half-Day Monthly Meetings Where GSSI will Describe Project Status and/or Present Draft and Final Results to the BMPTF and/or Regional or State Water Boards | 30 | $5,740 |
| | **TOTAL** | **198** | **$29,710** |

## Budget Amendment Summary

| TASK | | Original Approved Budget (6-Jan-17) | Amended Budget (8-Feb-18) | | Amended Budget (15-Aug-18) | | 3rd Budget Amendment Request (12-Nov-18) | Total Project Budget |
|---|---|---|---|---|---|---|---|---|
| | | | Amendment | Approved Budget | Amendment | Approved Budget | | |
| 1.0 | Update the Data Used in the Waste Load Allocation Model (WLAM) | $25,665 | $4,600 | $30,265 | - | $30,265 | - | $30,265 |
| 2.0 | Update and Recalibrate the WLAM | $59,255 | $30,255 | $89,510 | - | $89,510 | - | $89,510 |
| 3.0 | Evaluate Waste Load Allocation Scenarios for Major Stream Segments | $33,150 | - | $33,150 | - | $33,150 | $23,970 | $57,120 |
| 4.0 | Develop WLAM for Managed Recharge in Percolation Basins | $16,070 | $(12,374) | $3,696 | - | $3,696 | - | $3,696 |
| 5.0 | Estimate Off-Channel Recharge From Natural Precipitation | $6,385 | - | $6,385 | - | $6,385 | - | $6,385 |
| 6.0 | Run the WLAM in Retrospective Mode, Using Historical Discharge Data, to Estimate the Quantity and Quality of Recharge that Actually Occurred | $8,290 | - | $8,290 | - | $8,290 | - | $8,290 |
| 7.0 | Compile the WLAM into a Run-Time Software Simulation Package | $17,340 | - | $17,340 | - | $17,340 | - | $17,340 |
| 9.0 | Draft Task Reports, Draft and Final Report | $45,005 | TM 2: $7,245 TM 4: $(5,760) Total:$1,485 | $46,490 | - | $46,490 | - | $46,490 |
| 10.0 | Monthly Project Meetings | $35,640 | - | $35,640 | $11,480 | $47,120 | $5,740 | $52,860 |
| 11.0 | Pilot Evaluation of the Doppler Data Compared to Precipitation Gauge Data | $3,000 | - | $3,000 | - | $3,000 | - | $3,000 |
| | **TOTAL** | **$249,800** | **$23,966** | **$273,766** | **$11,480** | **$285,246** | **$29,710** | **$314,956** |

Our existing contract amount, which includes the August 15, 2018 budget amendment, is $285,246. The requested cost for this contract amendment is **$29,710**, which would increase the total contract amount to **$314,956**. This includes the cost of the additional work for evaluating waste load allocation scenarios for major stream segments ($23,970), and two additional meetings under Task 10 ($5,740) as a result of project delay. The remaining tasks are still in place and do not require additional budget or changes in budget.

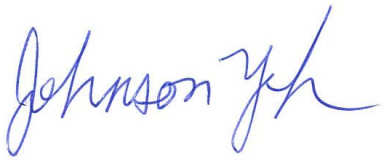
## 3.0 REVISED PROJECT SCHEDULE

A revised project schedule in response to delay associated with the requested additional model runs and analyses is presented on Table 2. As shown, we anticipate finishing the Draft Study Report mid-January, 2019, and the Final Study Report mid-February, 2019.

We appreciate the opportunity to provide our services on this important project. If you have any questions, please call us at (909) 451-6650.

Sincerely,

Dennis E. Williams, Ph.D., PG, CHG
President



Johnson Yeh, Ph.D., PG, CHG
Principal/Groundwater Modeler

encl.

**TABLES**

GEOSCIENCE

Santa Ana Watershed Project Authority
Third Request for Budget Amendment for Consulting Services for Santa Ana River Waste Load Allocation Model Update

**DRAFT**
**Table 1**

## ADDITIONAL COST ESTIMATE FOR CONSULTING SERVICES

### Santa Ana River Waste Load Allocation Model Update

| Task | | Description | ADDITIONAL COST - THIRD BUDGET AMENDMENT | | | | | | | | | | Original Budget (6-Jan-17) | First Amended Budget (8-Feb-18) | Second Amended Budget (15-Aug-18) | Third Amended Budget (12-Nov-18) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Principal Hydrologist | Senior Geohydrologist | Project Geohydrologist | Staff Geohydrologist | Graphics | Clerical | Total Hours | Labor Cost | Reimbursable Expenses [1] | Additional Cost | | | | |
| | | *Hourly Rate:* | $285 | $200 | $165 | $125 | $110 | $95 | | | | | | | | |
| **1.0** | **Update the Data Used in the Waste Load Allocation Model (WLAM)** | | | | | | | | | | | | | | | |
| | 1a | Update Relevant Land Use Maps for the Region | | | | | | | 0 | $ - | | $ - | $ 4,520 | $ 4,520 | $ 4,520 | $ 4,520 |
| | 1b | Update the Stormwater Management Facility Maps | | | | | | | 0 | $ - | | $ - | $ 4,520 | $ 4,520 | $ 4,520 | $ 4,520 |
| | 1c | Update the Historical Precipitation Data for the Region | | | | | | | 0 | $ - | | $ - | $ 2,530 | $ 2,530 | $ 2,530 | $ 2,530 |
| | 1d | Review and Confirm the Operating Assumptions for Seven Oaks Dam and Prado Dam | | | | | | | 0 | $ - | | $ - | $ 2,020 | $ 2,020 | $ 2,020 | $ 2,020 |
| | 1e | Update and Consolidate the Flow Data Used in the WLAM | | | | | | | 0 | $ - | | $ - | $ 3,530 | $ 3,530 | $ 3,530 | $ 3,530 |
| | 1f | Update and Consolidate the Water Quality Data Used in the WLAM | | | | | | | 0 | $ - | | $ - | $ 3,530 | $ 3,530 | $ 3,530 | $ 3,530 |
| | 1g | Perform a Systematic QA/QC Review of All Data | | | | | | | 0 | $ - | | $ - | $ 5,015 | $ 5,015 | $ 5,015 | $ 5,015 |
| | 1h | Update and Consilidate Flow Data from Additional Discharge Sources Identified in the WLAM | | | | | | | 0 | $ - | | $ - | $ - | $ 2,400 | $ 2,400 | $ 2,400 |
| | 1i | Create Plots and Database Files of Model Input Data (to be included as appendices) | | | | | | | 0 | $ - | | $ - | $ - | $ 2,200 | $ 2,200 | $ 2,200 |
| | | ***Task 1.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 25,665** | **$ 30,265** | **$ 30,265** | **$ 30,265** |
| **2.0** | **Update and Recalibrate the WLAM** | | | | | | | | | | | | | | | |
| | 2a | Update the Estimate of Surface Water Runoff to Major Stream Segments | | | | | | | 0 | $ - | | $ - | $ 24,800 | $ 24,800 | $ 24,800 | $ 24,800 |
| | 2b | Update the Estimate of Stream Flow in Major Stream Segments | | | | | | | 0 | $ - | | $ - | $ 10,685 | $ 10,685 | $ 10,685 | $ 10,685 |
| | 2c | Update the Estimated Concentration of TDS in Major Stream Segments | | | | | | | 0 | $ - | | $ - | $ 10,685 | $ 10,685 | $ 10,685 | $ 10,685 |
| | 2d | Update the Estimated Concentration of TIN in Major Stream Segments | | | | | | | 0 | $ - | | $ - | $ 5,885 | $ 5,885 | $ 5,885 | $ 5,885 |
| | 2e | Estimate the Volume of Stream Flow Recharging from Each Major Stream Segment to the Underlying Groundwater Management Zone | | | | | | | 0 | $ - | | $ - | $ 2,400 | $ 2,400 | $ 2,400 | $ 2,400 |
| | 2f | Estimate the Average Daily Concentration and Mass of TDS Recharging from Each Major Stream Segment to the Underlying Groundwater Management Zone | | | | | | | 0 | $ - | | $ - | $ 2,400 | $ 2,400 | $ 2,400 | $ 2,400 |
| | 2g | Estimate the Average Daily Concentration and Mass of TIN Recharging from Each Major Stream Segment to the Underlying Groundwater Management Zone | | | | | | | 0 | $ - | | $ - | $ 2,400 | $ 2,400 | $ 2,400 | $ 2,400 |
| | 2h | Create an Impoundment for the Prado Wetlands to Account for Evapotranspiration and Changes in Water Quality | | | | | | | 0 | $ - | | $ - | $ - | $ 6,485 | $ 6,485 | $ 6,485 |
| | 2i | Re-Estimate Stream Flow in Major Stream Segments after Incorporating Additional Discharge Data | | | | | | | 0 | $ - | | $ - | $ - | $ 3,400 | $ 3,400 | $ 3,400 |
| | 2j | Re-Estimate Concentration of TDS in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands | | | | | | | 0 | $ - | | $ - | $ - | $ 3,400 | $ 3,400 | $ 3,400 |
| | 2k | Re-Estimate Concentration of TIN in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands | | | | | | | 0 | $ - | | $ - | $ - | $ 3,400 | $ 3,400 | $ 3,400 |
| | 2l | Tabulate the Differences between WLAM Versions | | | | | | | 0 | $ - | | $ - | $ - | $ 7,370 | $ 7,370 | $ 7,370 |
| | 2m | Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment | | | | | | | 0 | $ - | | $ - | $ - | $ 3,800 | $ 3,800 | $ 3,800 |
| | 2n | Conduct Formal Outlier Analyses for Areas of High Model Over/Underestimation (i.e., greater than two orders of magnitude) | | | | | | | 0 | $ - | | $ - | $ - | $ 2,400 | $ 2,400 | $ 2,400 |
| | | ***Task 2.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 59,255** | **$ 89,510** | **$ 89,510** | **$ 89,510** |
| **3.0** | **Evaluate Waste Load Allocation Scenarios for Major Stream Segments** | | | | | | | | | | | | | | | |
| | 3a | Specify the Range of Probable Discharge Conditions | | | | | | | 0 | $ - | | $ - | $ 6,720 | $ 6,720 | $ 6,720 | $ 6,720 |
| | 3b | Use WLAM to Analyze Six Scenarios | | | | | | | 0 | $ - | | $ - | $ 15,040 | $ 15,040 | $ 15,040 | $ 15,040 |
| | 3c | Report Results of the WLAM Scenario Analyses | | | | | | | 0 | $ - | | $ - | $ 11,390 | $ 11,390 | $ 11,390 | $ 11,390 |
| | 3d | Revise Assumptions for the Six WLAM Scenarios and Rerun | | 4 | 12 | 40 | | | 56 | $ 7,780 | | $ 7,780 | $ - | $ - | $ - | $ 7,780 |
| | 3e | Conduct Additional Analyses on the Results from the Six WLAM Scenarios | | 2 | 4 | 32 | | | 38 | $ 5,060 | | $ 5,060 | $ - | $ - | $ - | $ 5,060 |
| | 3f | Conduct Sensitivity Runs or Mass Balance Analyses to Understand Key Issues | | 24 | 2 | 48 | | | 74 | $ 11,130 | | $ 11,130 | $ - | $ - | $ - | $ 11,130 |
| | | ***Task 3.0 Subtotal Hours and Costs*** | **0** | **30** | **18** | **120** | **0** | **0** | **168** | **$ 23,970** | **$ -** | **$ 23,970** | **$ 33,150** | **$ 33,150** | **$ 33,150** | **$ 57,120** |
| **4.0** | **Develop WLAM for Managed Recharge in Percolation Basins** | | | | | | | | | | | | | | | |
| | 4a | Identify the Percolation Ponds and Recharge Basins to be Evaluated | | | | | | | 0 | $ - | | $ - | $ 3,720 | $ 3,720 | $ 3,720 | $ 3,720 |
| | 4b | Characterize the Volume and Quality of Water Recharged to Groundwater | | | | | | | 0 | $ - | | $ - | $ 6,720 | $ 6,720 | $ 6,720 | $ 6,720 |
| | 4c | Summarize the Results of Task 4b by Groundwater Management Zone | | | | | | | 0 | $ - | | $ - | $ 2,815 | $ 2,815 | $ 2,815 | $ 2,815 |
| | 4d | Integrate Results from Task 4c with the Results from Task 3c | | | | | | | 0 | $ - | | $ - | $ 2,815 | $ 2,815 | $ 2,815 | $ 2,815 |
| | | Remove Costs for Task 4 (minus $3,696.25 for work already completed) | | | | | | | - | $ - | | $ - | $ - | $ (12,374) | $ (12,374) | $ (12,374) |
| | | ***Task 4.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 16,070** | **$ 3,696** | **$ 3,696** | **$ 3,696** |

Santa Ana Watershed Project Authority
Third Request for Budget Amendment for Consulting Services for Santa Ana River Waste Load Allocation Model Update

**DRAFT**
**Table 1**

**ADDITIONAL COST ESTIMATE FOR CONSULTING SERVICES**

**Santa Ana River Waste Load Allocation Model Update**

| Task | Description | ADDITIONAL COST - THIRD BUDGET AMENDMENT | | | | | | | | | | Original Budget (6-Jan-17) | First Amended Budget (8-Feb-18) | Second Amended Budget (15-Aug-18) | Third Amended Budget (12-Nov-18) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Principal Hydrologist | Senior Geohydrologist | Project Geohydrologist | Staff Geohydrologist | Graphics | Clerical | Total Hours | Labor Cost | Reimbursable Expenses [1] | Additional Cost | | | | |
| | *Hourly Rate:* | $285 | $200 | $165 | $125 | $110 | $95 | | | | | | | | |
| **5.0** | **Estimate Off-Channel Recharge from Natural Precipitation** | | | | | | | | | | | | | | |
| | Estimate the Volume and Quality of Natural Rainfall that Percolates to The Underlying Groundwater Basin | | | | | | | 0 | $ - | | $ - | $ 6,385 | $ 6,385 | $ 6,385 | $ 6,385 |
| | ***Task 5.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 6,385** | **$ 6,385** | **$ 6,385** | **$ 6,385** |
| **6.0** | **Run the WLAM in Retrospective Mode, Using Historical Discharge Data, to Estimate the Quantity and Quality of Recharge that Actually Occurred** | | | | | | | | | | | | | | |
| | Run the Most Current Version of the WLAM Produced in the RFP Task 2 After It Has Been Finalized (Calibrated and Validated) to Estimate the Actual Volume and Quality of Water Recharged to the Six GMZ's Named in Task 5 for the 12-Year Period Commencing in January of 2005 and Ending in December of 2016. | | | | | | | 0 | $ - | | $ - | $ 6,385 | $ 6,385 | $ 6,385 | $ 6,385 |
| | Prepare a Summary Comparing the Estimated Actual Values to the WLAM Projects for the Same GMZs. | | | | | | | 0 | $ - | | $ - | $ 1,905 | $ 1,905 | $ 1,905 | $ 1,905 |
| | ***Task 6.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 8,290** | **$ 8,290** | **$ 8,290** | **$ 8,290** |
| **7.0** | **Compile the WLAM into a Run-Time Software Simulation Package** | | | | | | | | | | | | | | |
| | Develop a Simple Windows-Based Graphical User Interface for the WLAM | The proposed WinHSPF computer code is a Windows-Based Graphic User Interface | | | | | | 0 | $ - | | $ - | $ - | $ - | $ - | $ - |
| | Prepare a Standardized Input File Specifying the Key Input Variables for Each Wastewater Discharge | | | | | | | 0 | $ - | | $ - | $ 6,600 | $ 6,600 | $ 6,600 | $ 6,600 |
| | Prepare a User Manual* and Training for up to 15 Staff Members on How to Analyze Scenarios, Run and Retrieve Results From the WLAM. | | | | | | | 0 | $ - | | $ - | $ 6,480 | $ 6,480 | $ 6,480 | $ 6,480 |
| | Prepare and Submit Model Documentation Suitable for Peer Review | | | | | | | 0 | $ - | | $ - | $ 4,260 | $ 4,260 | $ 4,260 | $ 4,260 |
| | ***Task 7.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 17,340** | **$ 17,340** | **$ 17,340** | **$ 17,340** |
| **9.0** | **Draft Task Reports, Draft and Final Report** | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 1 Documenting the Results of Task 1 | | | | | | | 0 | $ - | | $ - | $ 4,380 | $ 4,380 | $ 4,380 | $ 4,380 |
| | Prepare Draft Task Report for Task 2 Documenting the Results of Task 2 | | | | | | | 0 | $ - | | $ - | $ 9,680 | $ 9,680 | $ 9,680 | $ 9,680 |
| | Prepare Second Draft Task Report for Task 2 Documenting the Results of Task 2 | | | | | | | 0 | $ - | | $ - | $ - | $ 7,245 | $ 7,245 | $ 7,245 |
| | Prepare Draft Task Report for Task 3 Documenting the Results of Task 3 | | | | | | | 0 | $ - | | $ - | $ 5,760 | $ 5,760 | $ 5,760 | $ 5,760 |
| | Prepare Draft Task Report for Task 4 Documenting the Results of Task 4 | | | | | | | 0 | $ - | | $ - | $ 5,760 | $ 5,760 | $ 5,760 | $ 5,760 |
| | Remove Costs for Draft Task Report for Task 4 Documenting the Results of Task 4 | | | | | | | - | $ - | | $ - | $ - | $ (5,760) | $ (5,760) | $ (5,760) |
| | Prepare Draft Task Report for Task 5 Documenting the Results of Task 5 | | | | | | | 0 | $ - | | $ - | $ 3,440 | $ 3,440 | $ 3,440 | $ 3,440 |
| | Prepare Draft Task Report for Task 6 Documenting the Results of Task 6 | | | | | | | 0 | $ - | | $ - | $ 3,440 | $ 3,440 | $ 3,440 | $ 3,440 |
| | Prepare a Draft Study Report, Reflecting a Compilation of the Draft Reports and Addressing All Comments Received from SAWPA and Members of the Task Force on the Previous Drafts | | | | | | | 0 | $ - | | $ - | $ 8,720 | $ 8,720 | $ 8,720 | $ 8,720 |
| | Prepare a Final Study Report in Electronic Format for Distribution to SAWPA | | | | | | | 0 | $ - | | $ - | $ 3,825 | $ 3,825 | $ 3,825 | $ 3,825 |
| | ***Task 9.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 45,005** | **$ 46,490** | **$ 46,490** | **$ 46,490** |
| **10.0** | **Monthly Project Meetings** | | | | | | | | | | | | | | |
| | Prepare For and Participate in up-to-18 Half-Day Monthly Meetings Where GSSI will Describe Project Status and/or Present Draft and Final Results to the BMPTF and/or Regional or State Water Boards | | | | | | | 0 | $ - | | $ - | $ 35,640 | $ 35,640 | $ 35,640 | $ 35,640 |
| | Prepare For and Participate in up-to-4 Half-Day Monthly Meetings Where GSSI will Describe Project Status and/or Present Draft and Final Results to the BMPTF and/or Regional or State Water Boards | | | | | | | 0 | $ - | | $ - | $ - | $ - | $ 11,480 | $ 11,480 |
| | Prepare For and Participate in up-to-2 Half-Day Monthly Meetings Where GSSI will Describe Project Status and/or Present Draft and Final Results to the BMPTF and/or Regional or State Water Boards | 4 | 12 | 12 | | 2 | | 30 | $ 5,740 | | $ 5,740 | $ - | $ - | $ - | $ 5,740 |
| | ***Task 10.0 Subtotal Hours and Costs*** | **4** | **12** | **12** | **0** | **2** | **0** | **30** | **$ 5,740** | **$ -** | **$ 5,740** | **$ 35,640** | **$ 35,640** | **$ 47,120** | **$ 52,860** |
| **11.0** | **Pilot Evaluation of the Doppler Data Compared to Precipitation Gauge Data** | | | | | | | | | | | | | | |
| | Pilot Evaluation of the Doppler Data Compared to Precipitation Gauge Data | | | | | | | 0 | $ - | | $ - | $ 3,000 | $ 3,000 | $ 3,000 | $ 3,000 |
| | ***Task 11.0 Subtotal Hours and Costs*** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **$ -** | **$ -** | **$ -** | **$ 3,000** | **$ 3,000** | **$ 3,000** | **$ 3,000** |
| | **TOTAL HOURS AND COST:** | **4** | **42** | **30** | **120** | **2** | **0** | **198** | **$ 29,710** | **$ -** | **$ 29,710** | **$ 249,800** | **$ 273,766** | **$ 285,246** | **$ 314,956** |

**Note**

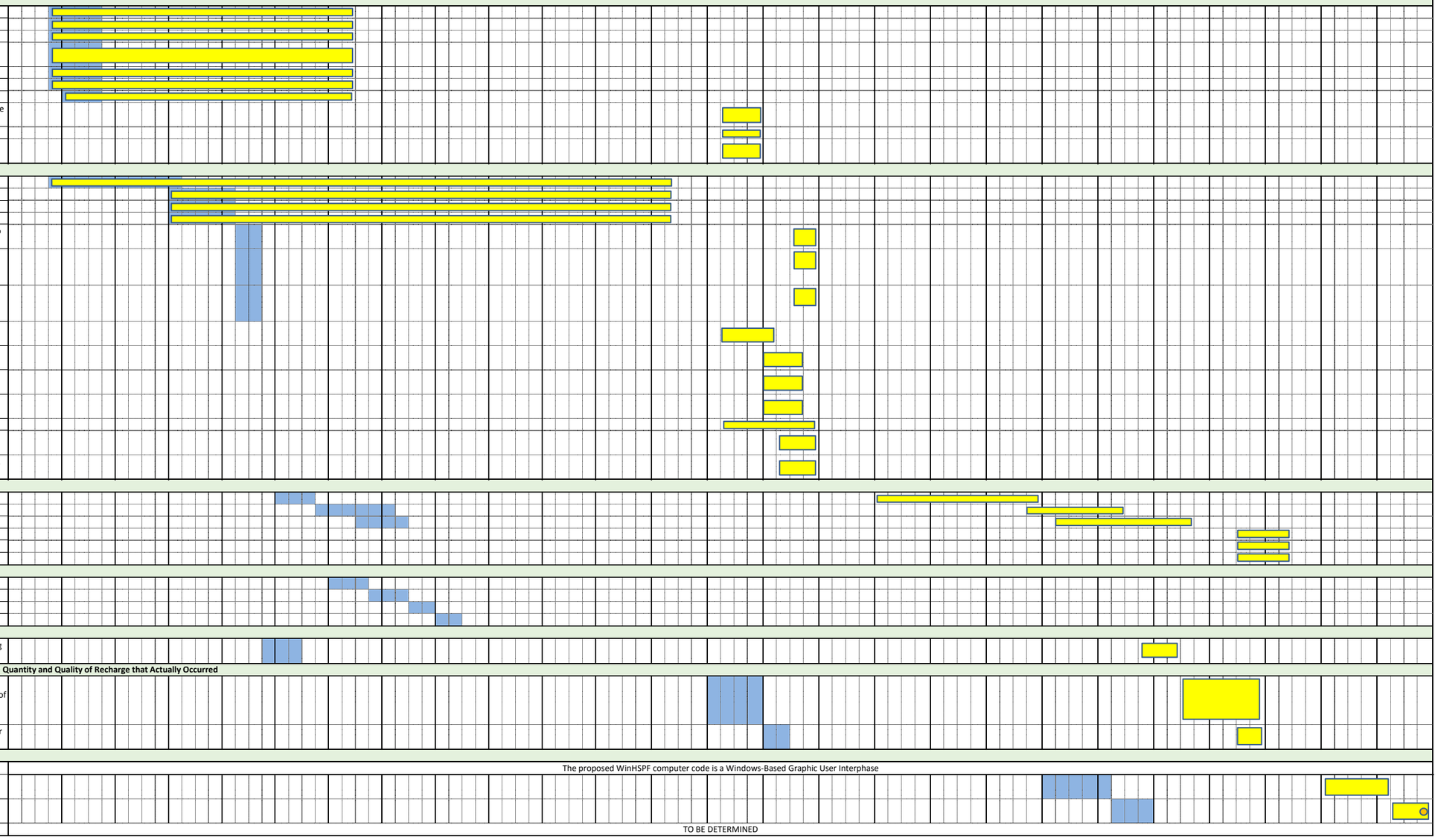
[1] Reimbursable expenses include report reproduction.

**Santa Ana Watershed Project Authority**
**Third Request for Budget Amendment for Consulting Services for Santa Ana River Waste Load Allocation Model Update**

**DRAFT**
**Table 2**

## REVISED PROJECT SCHEDULE

| Task | | Description |
|---|---|---|
| **1** | | **Update the Data Used in the Waste Load Allocation Model (WLAM)** |
| | 1a | Update Relevant Land Use Maps for the Region |
| | 1b | Update the Stormwater Management Facility Maps |
| | 1c | Update the Historical Precipitation Data for the Region |
| | 1d | Review and Confirm the Operating Assumptions for Seven Oaks Dam and Prado Dam |
| | 1e | Update and Consolidate the Flow Data Used in the WLAM |
| | 1f | Update and Consolidate the Water Quality Data Used in the WLAM |
| | 1g | Perform a Systematic QA/QC Review of All Data |
| | 1h | Update and Consolidate Flow Data from Additional Discharge Sources Identified in the WLAM |
| | 1i | Augment TIN Water Quality Data |
| | 1j | Create Plots and Database Files of Model Input Data (to be included as appendices) |
| **2** | | **Update and Recalibrate the WLAM** |
| | 2a | Update the Estimate of Surface Water Runoff to Major Stream Segments |
| | 2b | Update the Estimate of Stream Flow in Major Stream Segments |
| | 2c | Update the Estimated Concentration of TDS in Major Stream Segments |
| | 2d | Update the Estimated Concentration of TIN in Major Stream Segments |
| | 2e | Estimate the Volume of Stream Flow Recharging from Each Major Stream Segment to the Underlying Groundwater Management Zone |
| | 2f | Estimate the Average Daily Concentration and Mass of TDS Recharging from Each Major Stream Segment to the Underlying Groundwater Management Zone |
| | 2g | Estimate the Average Daily Concentration and Mass of TIN Recharging from Each Major Stream Segment to the Underlying Groundwater Management Zone |
| | 2h | Create an Impoundment for the Prado Wetlands to Account for Evapotranspiration and Changes in Water Quality |
| | 2i | Re-Estimate Stream Flow in Major Stream Segments after Incorporating Additional Discharge Data |
| | 2j | Re-Estimate Concentration of TDS in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands |
| | 2k | Re-Estimate Concentration of TIN in Major Stream Segments after Incorporating Additional Discharge Data and Effects of the Prado Wetlands |
| | 2l | Tabulate the Differences between WLAM Versions |
| | 2m | Tabulate the Average Mass Balance (by Source) for Flow, TDS, and TIN in Each Major Stream Segment |
| | 2n | Conduct Formal Outlier Analyses for Areas of High Model Over/Underestimation (i.e., greater than two orders of magnitude) |
| **3** | | **Evaluate Waste Load Allocation Scenarios for Major Stream Segments** |
| | 3a | Specify the Range of Probable Discharge Conditions |
| | 3b | Use WLAM to Analyze Six Scenarios |
| | 3c | Report Results of the WLAM Scenario Analyses |
| | 3d | Revise Assumptions for the Six WLAM Scenarios and Rerun |
| | 3e | Conduct Additional Analyses on the Results from the Six WLAM Scenarios |
| | 3f | Conduct Sensitivity Runs or Mass Balance Analyses to Understand Key Issues |
| **4** | | **Develop WLAM for Managed Recharge in Percolation Basins** |
| | 4a | Identify the Percolation Ponds and Recharge Basins to be Evaluated |
| | 4b | Characterize the Volume and Quality of Water Recharged to Groundwater |
| | 4c | Summarize the Results of Task 4b by Groundwater Management Zone |
| | 4d | Integrate Results from Task 4c with the Results from Task 3c |
| **5** | | **Estimate Off-Channel Recharge from Natural Precipitation** |
| | | Estimate the Volume and Quality of Natural Rainfall that Percolates to The Underlying Groundwater Basin |
| **6** | | **Run the WLAM in Retrospective Mode, Using Historical Discharge Data, to Estimate the Quantity and Quality of Recharge that Actually Occurred** |
| | | Run the Most Current Version of the WLAM Produced in the RFP Task 2 After It Has Been Finalized (Calibrated and Validated) to Estimate the Actual Volume and Quality of Water Recharged to the Six GMZ's Named in Task 5 for the 12-Year Period Commencing in January of 2005 and Ending in December of 2016. |
| | | Prepare a Summary Comparing the Estimated Actual Values to the WLAM Projects for the Same GMZs. |
| **7** | | **Compile the WLAM into a Run-Time Software Simulation Package** |
| | | Develop a Simple Windows-Based Graphical User Interface for the WLAM |
| | | Prepare a Standardized Input File Specifying the Key Input Variables for Each Wastewater Discharge |
| | | Prepare a User Manual and Training for up to 15 Staff Members on How to Analyze Scenarios, Run and Retrieve Results From the WLAM. |
| | | Prepare and Submit Model Documentation Suitable for Peer Review |



**Santa Ana Watershed Project Authority**
**Third Request for Budget Amendment for Consulting Services for Santa Ana River Waste Load Allocation Model Update**

**DRAFT**
**Table 2**

## REVISED PROJECT SCHEDULE

| Task | Description | Jan-17 | Feb-17 | Mar-17 | Apr-17 | May-17 | Jun-17 | Jul-17 | Aug-17 | Sep-17 | Oct-17 | Nov-17 | Dec-17 | Jan-18 | Feb-18 | Mar-18 | Apr-18 | May-18 | Jun-18 | Jul-18 | Aug-18 | Sep-18 | Oct-18 | Nov-18 | Dec-18 | Jan-19 | Feb-19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | **Draft Task Reports, Draft and Final Report** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 1 Documenting the Results of Task 1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 2 Documenting the Results of Task 2 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 3 Documenting the Results of Task 3 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 4 Documenting the Results of Task 4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 5 Documenting the Results of Task 5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare Draft Task Report for Task 6 Documenting the Results of Task 6 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare a Draft Study Report, Reflecting a Compilation of the Draft Reports and Addressing All Comments Received from SAWPA and Members of the Task Force on | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare a Final Study Report in Electronic Format for Distribution to SAWPA | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **10** | **Monthly Project Meetings** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prepare For and Participate in Half-Day Monthly Meetings Where GSSI will Describe Project Status and/or Present Draft and Final Results to the BMPTF and/or Regional or | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **11** | **Pilot evaluation of the Doppler Data Compared to Precipitation Gauge Data** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Pilot evaluation of the Doppler Data Compared to Precipitation Gauge Data | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Original GEOSCIENCE Working Period**
**Revised GEOSCIENCE Working Period**
**Deliverable Date**
**Meeting / Workshop**
**Note**
* The dates of the Regional and State Water Board hearings have not yet been determined

**ATTACHMENT A**

**Suggestions from Risk Sciences for Additional Modeling and Analyses**

GEOSCIENCE

**Suggestions from Risk Sciences for Additional Modeling and Analyses**
**Sent via email November 8, 2018**

Here are my suggestions:

1) The scenario I am most interested in adding is one where we evaluate Santa Ana River Reaches 3 and 4 (above Riverside-A) without the proposed new discharges by the City of Riverside to this zone. I am trying to figure out how much of the projected degradation shown in your previous model run is due to this new source of N & TDS in this particular reach.

2) Since the vast majority of POTW discharges to Reach 3 and 4 have TDS limits <650 mg/L, and everybody is meeting these limits, it is hard to understand why we are busting the 700 mg/L water quality objective in August. Is there some scenario we can run that will help us figure out what the unknown source of TDS is that is causing the problem?

3) We need to make sure that the results shown for SAR-Reach 3 at the Prado Basin, and for SAR-Reach 3 below Prado Dam, and for SAR-Reach 2 overlying OCGMZ are relatively consistent with each other or that we explain why they appear to differ so significantly from one another. This one is hugely important because we appear to be busting the August-Only objective for TDS at the dam.

4) We need to understand what is driving the slight degradation to San Timoteo-Reach 1 above the Bunker Hill-B GMZ in Scenario A. To my knowledge the only existing permitted discharge in this area is the geothermal discharge. Is this somehow related to Sterling's proposed discharge? The degradation is relatively minor. But, as a legal technicality, the Board may need to authorize a small allocation of assimilative capacity.

5) Cumulative Frequency Distribution graphs would be a huge help in interpreting the results. I think we need two graphs for each of the six scenarios - one for TDS and one for TIN. Each graph would show cumulative probability on the X-axis and concentration on the Y-axis. The 1-year, 5-year, 10-year and 20-year data output would be shown by different lines on the same graph. Might also be a good idea to had horizontal lines to indicate the applicable water quality objective, current ambient quality and the 67-year average to each graph as well.

6) Need to make sure we have accurately account for diversions of dry weather runoff to off-channel percolation basins by the San Bernardino County Flood Control District in the eastern side of the watershed (outside of IEUA's service area).

Tim