Request for Proposals
for the Development of a
Numerical Groundwater Flow Model of the
Tri-Valley Portion of Owens Valley and Fish Slough Subbasins
and Isotope Study in Mono County, California

FINAL

June 27, 2024

Proposals will be received until 5:00 p.m., August 16, 2024
via e-mail to the Project Manager: Tim Moore, PG, CHG
tmoore@inyocounty.us

Request for Proposals for the Development of a Numerical Groundwater Flow Model of the Tri-Valley Portion of Owens Valley and Fish Slough Subbasins and Isotope Study in Mono County, California

Mono County, in collaboration with the Tri-Valley Groundwater Management District (TVGMD), is seeking proposals from qualified firms with experience and expertise in developing and applying computer models of groundwater flow to multi-aquifer hydrogeologic systems having structural controls on groundwater flow to develop a numerical groundwater flow model of the Tri-Valley portion of Owens Valley and Fish Slough subbasins (the Basins) in Mono County. Locally, the northern arm of the Owens Valley subbasin that includes Chalfant, Hammil, and Benton Valleys is referred to as the "Tri-Valley" (see Figure 1 for a project location map). Additionally, this project includes an isotope study to help determine key characteristics of the groundwater in the region, such as source and age.

The groundwater model will be used to predict groundwater level fluctuations, flow, and spring discharge. Inyo County Water Department (ICWD) is working collaboratively with TVGMD and is under contract with Mono County for project management services. **The selected modeling firm (Consultant) will be required to work closely with Mono County, TVGMD, and ICWD.**

This Request for Proposals (RFP) describes the required scope of services, consultant selection process, and the minimum information that must be included in the proposal. Failure to submit information in accordance with these requirements and procedures may be cause for disqualification.

Project Overview and Structure

This project shall develop a numerical MODFLOW groundwater model covering the Tri-Valley area and the Fish Slough subbasin, which is designated as an Area of Critical Environmental Concern (ACEC), for the purpose of better understanding and quantifying the amount and the flow of groundwater in these areas. The groundwater model will be calibrated to existing historical data and is intended to provide confidence in the state-of-science of the Tri-Valley/Fish Slough groundwater system. It will serve as a predictive tool to analyze simulated future groundwater conditions and to provide a framework for analyzing future groundwater management options. This project will also include an isotope study to help determine key characteristics of the groundwater in the region that will be used in updating the existing hydrogeologic conceptual model.

Mono County and the Tri-Valley Groundwater Management District (TVGMD) will both make use of the model and isotope study. TVGMD has been approved to be a Groundwater Sustainability Agency (GSA) within its statutory boundaries, and Mono County has been approved to be the GSA for the other parts of the Mono County portions of the Basins that are not included within TVGMD's boundary. Thus, both policymaker entities will use the MODFLOW model to inform their decisions as GSAs which will become even more important if the region is recategorized in the future to medium or high priority by DWR. This model will help inform both agencies on how,

where, and when new wells should be constructed. This model will also help both agencies make decisions about whether water usage should be curtailed in the future. The model will be insightful as to the "health" of the groundwater basins and will be instrumental in making conservation decisions should they need to be made. This model may also be used to inform permitting decisions for new wells or other projects that may impact the overall sustainability of the groundwater resources of the Basins.

The primary work of the project will be to develop a numerical MODFLOW groundwater model and to update the existing hydrogeologic conceptual model (HCM), as needed. Once created, the model will be calibrated to existing data, and a sensitivity analysis will be conducted. Aspects of numerical simulation such as the mass-balance components, boundary conditions, and aquifer layers and properties will be compared to the HCM, and areas of discrepancy will receive additional evaluation. This project shall require that the modeling team conduct a field visit to become acquainted with the area (unless they are already familiar with the area) and to hear from key agency personnel. Field work will also be required to perform the water sampling for the isotope study.

The modeling team will review existing hydrogeologic studies and build upon recent advances in knowledge such as the December 2023 DWR-sponsored Airborne Electromagnetic (AEM) survey if the processed data availability align with the project schedule. Once the numerical groundwater flow model has been created and calibrated to historical data, the modeling team will collaboratively develop and then analyze three predictive simulations to inform current and future groundwater management options.

The Consultant will be required to work closely with Mono County, TVGMD, and ICWD and receive public input throughout the span of the project. There may be a peer review component of the overall modeling project. An independent third-party peer reviewer may be hired outside of the scope of this RFP to provide review services at significant project milestones. The Consultant will be required to work professionally and respond promptly to any requests received from a peer reviewer that pertain directly to their project review role. Any project scope or task changes will only be authorized by Mono County with input from the Project Manager.

Background

This numerical model development project was included as Project and Management Action #4 in the Owens Valley Groundwater Authority (OVGA) Groundwater Sustainability Plan (GSP). The OVGA GSP was submitted to the California Department of Water Resources (DWR) in voluntary compliance with the Sustainable Groundwater Management Act of 2014 (SGMA). Owens Valley Subbasin (DWR Basin ID: 6-012.01) is categorized by DWR as Low Priority, and Fish Slough Subbasin (6-012.02) is categorized as Very Low Priority. The three management areas included in the GSP from north to south are:

- Tri-Valley Management Area including the Fish Slough subbasin;
- Owens Valley Management Area; and

- Owens Lake Management Area.

Significantly more data collection, modeling, and verification of inflow/outflow components have occurred in the Owens Valley and Owens Lake management areas compared to the Tri-Valley area due to the development and implementation of the County of Inyo and the City of Los Angeles Inyo/LA Long Term Water Agreement (LTWA). The Owens Valley and Owens Lake management areas are intensively monitored by LADWP, and recharge and discharge components of the water balance are better understood than the Tri-Valley portion of Owens Valley and Fish Slough subbasins. Insufficient information exists in the Tri-Valley area to design an effective program to manage pumping to ensure the GSP Sustainable Management Criteria (SMC) for water levels in the valleys and spring flow are achieved.

Funding

In June 2022, a model development and isotope study project proposal was approved by the Inyo-Mono Integrated Regional Water Management Program (IRWMP) to be put forward for Proposition 1 grant funding administered by DWR. The project was accepted and awarded a grant through Proposition 1 IRWM Implementation funding.

Hydrogeology

Available records in the Tri-Valley area indicate that water levels have been steadily declining approximately 0.5-2 ft/year for 20-30 years (depending on location and data record). The existing monitoring well network may not be representative of the Tri-Valley area as a whole since existing monitoring wells tend to be located near production wells. Spring discharge into Fish Slough likewise has steadily decreased over the past 30 years. Available geologic and hydraulic evidence suggests there is hydrologic connection between the Tri-Valley and Fish Slough areas, and that the declining water levels in Tri-Valley are associated with reduced spring discharge in Fish Slough. If these trends continue, spring discharge may cease completely or intermittently at some locations as was recorded in 2022, which could severely degrade or eliminate a significant portion of remaining habitat for the endangered Owens pupfish and threatened Fish Slough milk-vetch which are dependent on spring flow and water management.

Fish Slough spring discharge water source is inferred indirectly from geologic and hydrologic data. Based on general geochemistry, stable isotopes, and tritium, Zdon et al. (2019) concluded Fish Slough springs were sourced by a combination of water from Tri-Valley to the east (Northeast Spring had the strongest reported signature for Tri-Valley area waters) and the shared recharge areas for Adobe Valley and the Volcanic Tablelands to the north and northwest. The geochemistry of source water analyzed by Zdon et al. varied spatially within Fish Slough, suggesting it is located at a convergence of regional groundwater flow paths.

Most small creeks from the White Mountains are ungauged, but the few data available suggest the contribution is small and almost entirely used for irrigation on the valley floor. No direct surface-water connection exists between the Tri-Valley area and the Owens River except for an ephemeral wash that occasionally flows from Chalfant into the Laws area during extreme precipitation events. Surface water that enters the Tri-Valley area as runoff from the surrounding

mountains, less any water lost to evapotranspiration or vadose zone storage, is believed to recharge groundwater.

Structural boundaries of the Tri-Valley area aquifer system are generally delineated by the contact between alluvium and the bedrock of the adjacent mountain blocks. The boundary west of Chalfant and Hammil valleys is formed by the contact between valley fill alluvium and the Bishop Tuff. At this boundary, the Bishop Tuff likely overlies valley fill that was present when the tuff was deposited. Faults are roughly parallel to the axis of the valley and form barriers to groundwater flow across their strike (orientation) due to offset of high permeability layers and formation of low permeability material in the fault zone. Faults can also serve as conduits to groundwater flow in the Subbasin along their strike and create discharge zones where faults intersect.

The Tri-Valley area aquifer system can be generalized into a shallow unconfined zone and a deeper confined or semi-confined zone separated by confining unit(s) that are laterally discontinuous. In Fish Slough, relatively thin locally derived alluvium overlies Bishop Tuff. Most of the valley fill in the Basin is clastic material shed from the surrounding mountains, the majority of which is sand and gravel. Alluvial fan sediments are coarse, heterogeneous, and poorly sorted at the head of the fans and finest at the toe, beyond which fans transition to fluvial plain sediments.

Previous Models

The most geographically extensive model development for Owens Valley was performed by Danskin (1998) of the United States Geological Survey (U.S. Geological Survey or USGS). His conceptual model relied heavily on previous USGS investigations (e.g., Hollett, e. al., 1998 and 1991) in which he was also an author. A three-layer conceptual model was used in the USGS numerical groundwater flow model for Owens Valley. The model domain only captures the southerly portions of the Tri-Valley and Fish Slough management area. Ensuing modeling efforts generally relied on the USGS model as their starting point (e.g., Bishop/Laws Area Model developed by Harrigton, 2007).

TEAM Environmental (TEAM) developed a preliminary numerical groundwater flow model of the Tri-Valley area. The results of the model were presented in MHA (2001). The development of the preliminary numerical model was focused on modeling the occurrence and movement of groundwater in the Tri-Vally area. The model was developed in response to a proposed groundwater export project by the USFilter Corporation. Three export project alternatives were evaluated, none of which were implemented. The preliminary numerical model was a steady-state model. General hydrogeologic assumptions and inputs that were used in the model were based on previous work in the Tri-Valley area and research conducted by the USGS in the Owens Valley as described above (Hollett, e. al., 1991 and Danskin, 1998). TEAM later used the model to conduct a surface water and groundwater availability assessment for the Tri-Valley area (TEAM, 2006) for the County of Mono.

As part of the OVGA GSP development project, Daniel B. Stephens & Associates (DBS&A) developed a Distributed Parameter Watershed Model (DPWM) that they used to prepare an estimate of natural groundwater recharge that occurs via precipitation or surface water

percolation within the Basins. The DPWM is a spatially discretized "tipping bucket" type soil-water balance model, which evaluates precipitation, evapotranspiration, and resultant percolation through the soil column. The modeling approach includes methods previously applied in similar basin and range locations by the USGS (e.g., Flint et al., 2007).

Available Data and Information

The following is a summary of the information and data that will be available for project execution. Where available, links are provided to online sources. Many of the datasets required to develop the proposed numerical groundwater flow model have already been compiled and processed as part of the OVGA GSP preparation. Groundwater pumping data do not exist or are unavailable for the Basins, and the Consultant will need to propose an appropriate method for estimating pumping in the Tri-Valley area. Available groundwater data for the Tri-Valley area are sparce, largely consisting of records from landfill monitoring wells in Benton and Chalfant, a private well in Hammil, and Los Angeles Department of Water and Power (LADWP) monitoring wells in the vicinity of Chalfant Valley. Available Fish Slough area data include groundwater levels from six monitoring wells and flow records from permanent surface water gauges.

Hydrogeologic Conceptual Model

Harrington (2016) completed a recent available evaluation of water budget components for the Basins. He reviewed previous studies (e.g., Danskin, 1998; MHA, 2001 and TEAM, 2006) to estimate the water budget for the entire Owens Valley groundwater basin and also for the Tri-Valley, Owens Valley, and Owens Lake areas to assess regional differences in the Owens Valley Basin. Harrington also prepared original estimates for some water balance components that were poorly or not quantified by previous studies. In each of the subareas, the greatest uncertainty in the water balance were inflows from recharge and runoff. The groundwater extraction outflow (pumping) component for the Tri-Valley management area was uncertain due to lack of monitoring data, as mentioned above. Pumping was estimated based on irrigated acreage totals obtained from remote sensing/GIS analysis and approximate water duty for alfalfa. The pumping total in Tri- Valley also included the estimated domestic pumping use based on the approximate water duty and number of households.

The OVGA GSP includes a hydrologic conceptual model for Owens Valley groundwater basin that relied on Harrington (2016) and other sources. It also includes a water budget analysis (Appendix 10) that utilized the Basin Characterization Model (BCM) developed by the USGS (Flint, et al., 2013) to quantify water budgets, including those for the Fish Slough and Tri-Valley management area.

Other Information and Data

DWR sponsored an Airborne Electromagnetic (AEM) survey in which the Basins were flown in November 2023. The flight lines for all survey areas can be viewed online via DWR's AEM flown Flight Line Map. The flown flight lines shapefile for Owens Valley and Fish Slough (Survey Area 11) can be downloaded from the CNRA Open Data Portal. Raw AEM data are available, and processed data, texture interpretations, and final reports are expected to be available in late

2024. In addition, an LADWP-funded AEM survey was flown in April 2024 that targeted their areas of interest in more tightly spaced flight lines than the DWR AEM survey. These included the southern portion of Fish Slough subbasin and Laws. It is unknown if the LADWP AEM survey data will be available for this modeling project. To the extent feasible, the Consultant should use the available AEM data to refine the hydrogeologic conceptual model.

The California Department of Fish and Wildlife (CDFW), DWR, and United States Geologic Survey (USGS), in cooperation with the Bureau of Land Management (BLM) Bishop Field Office, propose to install two multi-completion groundwater monitoring facilities (i.e., nested monitoring wells) in southern Hammil Valley. A third multi-completion groundwater monitoring facility is planned to be installed on LADWP-owned land in the Fish Slough subbasin to a depth below the Bishop Tuff. The monitoring well construction is scheduled to begin in fall of 2024. The proposed project includes provision to equip the monitoring facilities with pressure transducers and dataloggers. Availability of data collected during and after this monitoring well installation project will not likely align with the schedule for use in this groundwater model development project.

However, in support of the monitoring well installation project, DWR has compiled the available well completion reports for the Tri-Valley and Fish Slough areas. They have assigned preliminary lithology picks from the driller log descriptions and plan to prepare a series of cross-sections as part of their Basin Characterization Program. This preliminary effort is planned to be available in July 2024, in draft form for use in this modeling project (i.e., hydrogeologic conceptual model update). In the future, DWR plans to refine this preliminary effort into a work product that will be made publicly available.

The Consultant will be provided with the following reports and data currently available for download online, or in TVGMD or ICWD files:

- Hydrogeologic Conceptual Model for the Owens Valley Groundwater Basin (6-12), Inyo and Mono Counties (Harrington, 2016) report.
- OVGA GSP and Appendices.
- OVGA WY 2022 Annual Report.
- Distributed Parameter Watershed Model (DPWM) Tri-Valley Area Watershed.
- USFilter Tri-Valley Groundwater Surplus Program (MHA, 2001) and Tri-Valley Area Surface Water and Groundwater Availability Assessment (TEAM, 2006) reports.
- USGS Model report (Danskin, 1998).
- USGS Groundwater Ambient Monitoring and Assessment (GAMA) Program in Owens Valley.
- Fish Slough source water chemistry study (Zdon et al., 2019).
- OVGA Data Management System (OVGA DMS) of well locations and groundwater level data. Records extend from the 1990s to fall 2023 with a few LADWP monitoring well records in Laws/Chalfant Valley that extend back to the 1970s.

- W385/W386 Operational Test Baseline Hydrologic Study - Quarterly Updates. These reports contain available groundwater level data from LADWP monitoring wells and flow data from permanent surface water gauges in Fish Slough subbasin since 2017.
- Water level pressure transducer and datalogger records from three wells in Fish Slough subbasin and one well in Tri-Valley area.
- LADWP gauged surface water flow data, where available.
- Weather data for the Paiute Ridge transect prepared by the University of California San Diego (UCSD) from 2007 to 2021. These data are from a transect of weather stations running from Fish Slough to the top of the White Mountains.
- USGS Fault Coverage (shapefile).
- USGS Quadrangle Geologic Maps (PDF format).

Anticipated Scope of Services

Groundwater flow model development is anticipated to include the scope of services described in the following sections.

The Consultant is expected to work closely with the Project Manager and Mono County throughout the project, sharing working drafts and meeting frequently as the work progresses (via a web meeting service or in-person, if appropriate).

Task 1: Project Kick-Off

Subtask 1a: Develop Working Knowledge of the Basins

The Consultant shall develop a working knowledge of the Tri-Valley portion of Owens Valley and Fish Slough subbasins (the Basins) and surrounding areas. This includes becoming familiar with available datasets, hydrostratigraphic units, aquifer flow system, and groundwater recharge/ discharge processes.

Subtask 1b: Project Kick-Off Meeting(s)

After the Consultant has developed a working knowledge of the Basins, a meeting will be held in-person in Mono County or via a web (virtual) meeting platform. The meeting will be between the Consultant and the Project Manager and will include a review of the existing hydrogeologic conceptual model, project goals, and project objectives, and a discussion of the project schedule and logistics. If needed, there may be a second web meeting that will be with Mono County, TVGMD representative, and the Project Manager to discuss the scope, approach, and assumptions for the remaining tasks.

Task 2: Isotope Study

The same modeling team or a separate teaming subconsultant will, contemporaneously with Task 3, complete an isotope study of the groundwater in the region. The purpose of the study is to better understand sources that contribute to surface water (e.g., flow from Fish Slough springs) and provide recharge to groundwater both spatially and temporally. Detection of dominant or preferential groundwater flow paths associated with source water mixing is an objective of the study. The Task is intended to build on the Zdon et al. (2019) study that examined water quality

and isotope chemistry samples to identify source water mixing in the Fish Slough spring complex described in the Hydrogeology subsection above.

The study results will inform Subtask 3a, item 4 (hydrogeologic conceptual model update). Proposals should include a schedule that corresponds to an outline of the proposed study design to answer the general study objectives identified herein. Water sampling and accredited laboratory analysis costs should be included in the proposed budget.

Subtask 2a: Isotope Study Design

One of two potential isotope studies (or combination of both types) will be completed by the Consultant: stable (e.g., ^{18}O and ^{2}H) or radioactive (e.g., ^{222}Rn, ^{14}C and ^{3}H). A stable isotope study is likely relatively cheaper and would help answer questions such as groundwater sources whereas a radioactive isotope study is likely relatively more expensive and would help determine age.

The Consultant will propose a detailed study design that includes objectives, methods, and anticipated limitations. Mono County and the Project Manager will determine which type of isotope study to use through recommendations and discussion with the Consultant. The study is intended to evaluate isotope chemistry data compiled from both previously published sources and collection of new samples from springs and wells. Water sampling shall be conducted in accordance with industry standards by experienced field personnel. During site visit sampling events, field water quality parameters of temperature, pH, and electrical conductivity shall be measured, at a minimum. An accredited water testing laboratory shall be identified by the Consultant and approved by the Project Manager before samples are submitted for laboratory analysis.

Subtask 2b: Isotope Data Evaluation

The interpretation and conclusions of the isotope study shall be included as a section in the Subtask 3e draft technical memorandum (tech memo) deliverable. The laboratory analytical results from the new samples collected as part of the study shall be included in tabular form and presented in graphical form (e.g., graphs and diagrams) in the draft tech memo.

Task 3: Pre-Modeling

The pre-modeling task consists of the following:

1. Review initial hydraulic property estimates, if available;
2. Develop a hydrogeologic conceptual model including the recharge and discharge processes in the model domain;
3. Establish an appropriate model domain which may extend south to include Laws and the Five Bridges area in Inyo County;
4. Propose steady-state and transient model calibration periods;
5. Develop initial water budgets for each calibration period to help guide and constrain numerical model calibration;

6. Prepare a description of the proposed numerical modeling approach, including the proposed model code(s) and associated packages, layering, gridding, and the overall proposed calibration approach (based on review of the existing conceptual hydrogeologic model and results of items 1-5 listed above).

These efforts are organized into the subtasks described below. The consultant shall not begin work on Task 4 until Task 3 is complete or is otherwise authorized to proceed by the Project Manager.

Subtask 3a: Data Review, HCM update and Preliminary Analysis

The Consultant shall complete the following:

1. Review available data and compile additional data, as needed.
2. Review the available hydraulic properties and property zones from Danskin (1998), TEAM's investigation (MWH, 2001), DBS&A's DPWM report (2021), and BCM modeling for the OVGA GSP, and propose changes and other sources, as needed.
3. Review available data and information relevant to developing groundwater budget estimates.
4. Update the existing hydrogeologic conceptual model, as needed. Develop a descriptive diagram of the aquifer flow system and recharge and discharge processes.
5. Complete a preliminary analysis to determine data gaps and key uncertainties for developing water budget estimates. Identify a recommended approach for estimating each water budget component.
6. **Deliverable:** Brief, draft written summary of findings. The results of the isotope study and interpretation should be included along with a summary of existing hydrogeologic conceptual models. Note: the write-up will ultimately be incorporated into the Subtask 3e technical memorandum (see below).

Subtask 3b: Progress Meeting and TVGMD Board Meeting

After Subtask 3a is completed, a progress meeting will be held virtually (or in-person in Mono County, if feasible) with the Project Manager to discuss the findings and recommendations and confirm the details of the scope for Subtasks 3c and 3d. The Consultant shall also assume that they will present the results in-person at a subsequent TVGMD Board meeting (**Public Meeting 1**). These two meetings may be scheduled so that the Consultant only needs to travel to Mono County one time for these meetings.

Subtask 3c: Estimate Water Budget Components

The purpose of this subtask is to develop pre-numerical model development water budget estimates to help guide and constrain numerical model calibration, where appropriate. The Consultant shall estimate the groundwater budget components identified in Subtask 3a from historical estimates and pre-modeling analysis. It is recognized that it will not be possible to estimate some of the water budget components with great accuracy and will include a high level of uncertainty. For groundwater pumping, the Consultant shall assign the hydrostratigraphic

unit(s) from which each well extracts groundwater or propose an appropriate method for estimating pumping from each of the hydrostratigraphic units.

Subtask 3d: Develop Numerical Modeling Approach

The purpose of this subtask is to work with the Project Manager to develop the overall numerical modeling approach. The numerical modeling approach will consist of a written description of:

1. Proposed MODFLOW code(s) and associated packages, layering, and initial grid spacing.
2. Approach for simulating each water budget component.
3. Recommended steady-state and transient model calibration periods and associated stress period durations and time step lengths.
4. Recommended approach for constraining uncertainty and increasing the model uniqueness during calibration, particularly as it relates to the water budget components having the greatest uncertainty.
5. Description of the proposed approach to model calibration and verification, including development of calibration goals, identification of calibration and verification targets, and description of the proposed sequence of calibration tasks, including any proposed use of automated calibration tools (e.g., PEST).

Subtask 3e: Pre-Modeling Draft Technical Memorandum

Deliverable: The Consultant shall prepare a draft technical memorandum that documents the work performed in Task 2 and Subtasks 3a – 3d. The purpose of the draft technical memorandum is twofold: (1) communicate Tasks 2 – 3 work results to the stakeholders and (2) serve as a reference tool for the modeling team to help guide and constrain model development and calibration. The Consultant shall assume that the draft memorandum will be reviewed and revised once, following comment by Mono County and the Project Manager. However, the technical memorandum will not be finalized; rather, relevant content will be incorporated into the model report (Task 6).

Subtask 3f: Progress Meeting

A progress meeting will be held among the Consultant, Mono County, TVGMD representative, and the Project Manager following completion of subtasks 3c -3e.

Task 4: Numerical Model Development

The numerical model development task consists of the following:

1. Initial model setup and evaluation of model runtime for various discretization (grid–spacing and layering) options.
2. Perform steady-state and transient model calibration runs. Revisit the conceptual model and water budget estimates during calibration and refine as needed.
3. Execute verification run(s) and perform additional calibration, as needed, based on the results.
4. Perform sensitivity analyses to inform model calibration and document parameter sensitivity of the calibrated model.

The consultant shall not begin work on Task 5 until Task 4 is complete or is otherwise authorized by the Project Manager.

Subtask 4a: Initial Numerical Model Setup

The Consultant shall set up the numerical model and assess runtimes for a range of grid-size and layering options during early transient calibration runs. Final grid-size and layer definition will be determined by the Consultant and Project Manager.

Subtask 4b: Numerical Model Calibration and Verification

The Consultant shall provide a list of their proposed criteria of a well-calibrated model (e.g., residual mean close to 0.0, absolute residual mean less than 10% of data range, etc.) to the Project Manager for approval before beginning the calibration process.

The Consultant shall perform steady-state and transient calibration model runs in accordance with the approved Pre-Modeling Draft Technical Memorandum developed in Task 3. The Consultant shall avoid allowing the model calibration to proceed with water budget component fluxes and/or hydraulic properties that lie well outside of the anticipated ranges developed in Task 3. If the calibration includes significant deviation from the anticipated ranges, an explanation shall be provided in the Model Report (Task 6). The Consultant shall perform sensitivity analyses throughout the model calibration process to help guide calibration decision-making. Model calibration shall proceed until calibration goals are met or the calibration process has reached a point of diminishing returns, as determined by the Consultant and Project Manager.

The Consultant is expected to critically reevaluate the Task 3 updated hydrogeologic conceptual model work on a continuous basis during the model calibration process. To this end, the Consultant shall not rely on automated calibration tools as a primary means of calibration and shall only use such tools in accordance with the approved Pre-Modeling Draft Technical Memorandum.

The model calibration efforts shall be documented in a detailed model run log. The log shall clearly document the calibration decision-making process and shall contain sufficient detail such that a peer reviewer (i.e., 3rd party modeler) could reconstruct and review the model calibration process. Model input files for each calibration run shall be saved and provided, if requested, as an attachment to the final report. The Consultant and the Project Manager (as appropriate) will review the calibration run results to determine if further calibration is needed.

A final sensitivity analysis shall be performed after the calibration and verification process has been completed.

Subtask 4c: Progress Meeting and TVGMD Board Meeting

A progress meeting will be held virtually among the Consultant, Mono County, TVGMD representative, and the Project Manager following model calibration and verification. The Consultant shall assume that they will attend a TVGMD Board meeting (**Public Meeting 2**) to discuss the proposed scenarios and receive public input. If logistically feasible, Consultant meeting attendance may be virtual via a web meeting platform.

Task 5: Calibrated Numerical Model Initial Simulations

Subtask 5a: Predictive Simulations

Using the calibrated numerical model, the Consultant shall propose, set up, execute, postprocess, and present the results of three modeling scenarios that will be cooperatively developed by the Consultant, Mono County, and the Project Manager with input from TVGMD. It is anticipated that the modeling scenarios will address a range of groundwater basin management alternatives. Predictive simulation efforts shall be documented in the same manner as the calibration efforts (described above).

Subtask 5b: TVGMD Board Meeting

The Consultant shall also assume that they will present the results and receive public comments at a subsequent TVGMD Board meeting (**Public Meeting 3**). If logistically feasible, Consultant meeting attendance may be virtual via a web meeting platform.

Task 6: Modeling Report and Files

Subtask 6a: Draft Modeling Report

Deliverable: The Consultant shall prepare a draft report documenting Tasks 2 – 5. The draft report will be reviewed and comments provided by Mono County and the Project Manager. At a minimum, the report shall include:

1. Brief summary of the project background, purpose, and scope of work;
2. Pre-Modeling Draft Technical Memorandum content (Task 2 and Subtasks 3a – 3d), including a description of the updated hydrologic conceptual model (e.g., hydrostratigraphic units, flow barriers, and aquifer flow system) and a description of the analysis to determine data gaps and key uncertainties in the development of the water budget estimates;
3. Description of the final model setup: domain, grid spacing, layers, stress periods, time steps, approach to simulating boundary conditions, and rationale for any significant changes relative to the Pre-Modeling Draft Technical Memorandum;
4. Detailed description of the calibration and verification process, including descriptions of insights gained during calibration and any significant deviations from the numerical modeling approach described in the Pre-Modeling Draft Technical Memorandum;
5. Description of the calibrated model parameters and boundary conditions;
6. Description of the final sensitivity analysis results;
7. Model run log (to be included as an appendix);
8. Evaluation of the model calibration, including discussion of the spatial and temporal distribution of model error and limitations on predictive capabilities;
9. Description of the three model scenario runs, including discussion and interpretation of the results.
10. Discussion of opportunities for model improvement and recommended data collection actions to reduce uncertainty in key areas or input parameters for future model updates;
11. Model input files for all model runs;

12. Model output files and post-processed results from the final calibrated model run and all scenario runs; and
13. Appendices containing electronic versions of all raw and processed data, calculations, spreadsheets, and GIS file summary index table.

Subtask 6b: Final Modeling Report

Deliverable: The Consultant shall prepare a final report that addresses the comments from Mono County and the Project Manager.

Subtask 6c: Model Files

Deliverable: All electronic model files including predictive scenario input and output files will be provided to Mono County and the Project Manager. All files shall be organized in a logical manner and a brief description of each file shall be included in a file index. The standard will be that an experienced modeler who did not work on the project could run the model and reproduce the model calibration and predictive scenario results.

General Requirements

The following are general project or proposal requirements.

CEQA

This is primarily a data compilation and groundwater modeling project, and the California Environmental Quality Act CEQA is not likely applicable. However, filing for a CEQA exemption may be required for the isotope study. If a CEQA categorical exemption is required, Mono County staff will file the exemption.

Professional Services Agreement

If selected, the Consultant will be required to sign an Agreement for Professional Services. If the Consultant has a standard Agreement that they would like to use, Mono County, at their discretion, may use the selected Consultant's Agreement. Otherwise, Mono County will provide an Agreement for Professional Services to the selected Consultant. Proof of professional liability (errors and omissions) insurance will be a requirement of the Agreement.

GIS Files

All GIS files shall be prepared in accordance with the industry standard format and metadata documentation. All GIS files shall be named and stored using a logical and consistent file structure. All geographic data used in each map shall be provided as an ESRI ArcGIS software-compatible shapefile (.shp) or geodatabase (.gbd) and shall be registered to the California State Plane NAD 83, Zone IV (EPSG 2228) coordinate system, units in feet.

Proposals

Content Requirements

1. Proposals shall be concise, organized, and presented in a neat and logical format. They shall be relevant to the services required and shall be accurate and comprehensive.

Proposals shall be no more than 30 single-sided pages (not including resumes). Excessive or irrelevant material will not be favorably reviewed.

2. Failure to provide all requested information may be sufficient grounds to disqualify respondents from further consideration.
3. Proposals shall include:
    a. Cover letter.
    b. Qualifications and relevant experience of Consultant, including listing of relevant previous projects with current contact information for the client.
    c. Organizational chart for the Consultant project team. List key personnel that will actually work on the project and provide resumes in an appendix. Resumes will not count against the page limit but shall be no longer than three pages per person. Note: Consultant shall not substitute key personnel during the project without prior written permission from the Project Manager.
    d. Proposed Scope of Work and Schedule. The requested timeframe for project completion is nine (9) to 12 months from the project award date. Proposals should include a detailed schedule that identifies the estimated time required to complete each task. Prospective consultants are encouraged to submit proposals with an alternative schedule timeframe if they do not believe they can complete all of the project deliverables within one year of project initiation.
    e. Proposed budget, including schedule of hourly billing rates and estimated labor hours and billing rates by subtask (summed by task) for each team member.
    f. The Proposal must be signed by company officers who can attest to the accuracy of the answers provided. Discovery of any fraudulent or substantially false answers or statements will be grounds for immediate disqualification from further consideration.

Submittal and Point of Contact

1. Respondent shall e-mail their Proposal in PDF format to the Project Manager, Tim Moore, at tmoore@inyocounty.us with a subject line reading: Tri-Valley GW Model Proposal – Company Name. Prospective consultants may **only** contact the Project Manager via email or at (760) 878-8834 with questions or requests for additional information. Any consultant who contacts Mono County staff or a TVGMD Board member may be **disqualified**.
2. Proposals will be received until **5:00 p.m., August 16, 2024**. Late responses will not be accepted and will be deleted. It is the respondent's responsibility to ensure proposal delivery by this closing date which includes potential electronic file transfer issues such as large file sizes. Evaluation of the proposals will occur following this closing date.

Selection Process

1. Selection of qualified consultant respondents will be based on the written material submitted. Mono County and the Project Manager reserve the right to verify all information submitted in the Proposal. As a part of the evaluation, the Project Manager may select any or all projects from each respondent's experience list and contact the

owner or other relevant parties to verify the information presented. Project information included that cannot be verified will not be considered in the evaluation process. The Project Manager may obtain assistance from outside entities in the evaluation of the Proposals.

2. The Proposals will be reviewed and evaluated by Mono County and the Project Manager with input from the TVGMD Board of Directors. Evaluation criteria shall be as follows:
    a. Project Approach (Modeling and Isotope Study Approach and Techniques): **35%**
    b. Consultant's Qualification & Experience (including project area expertise): **35%**
    c. Proposed Rates, Budget, and Schedule: **30%**
3. Within 60 calendar days of the due date for submittal of proposals, the Project Manager will provide written notification to all prospective consultants who have submitted proposals as to whether they have been selected. Do not contact the Project Manager, Mono County staff, or TVGMD Board members during this time.
4. Interviews may be held.

References

Daniel B. Stephens & Associates (2021). Distributed Parameter Watershed Model Tri-Valley Area Watershed. Submitted to the Owens Valley Groundwater Authority.

Danskin, W. R. (1988). Preliminary Evaluation of the Hydrogeologic System in Owens Valley, California. U.S. Geological Survey Water-Resources Investigations Report 88-4003.

Danskin, W. R. (1998). Evaluation of the Hydrologic System and Selected Water-Management Alternatives in the Owens Valley, California. U.S. Geological Survey Water-Supply Paper 2370-H. In Hydrology and Soil-Water-Plant Relations in Owens Valley, California.

Flint, A. L. and L. E. Flint. (2007). Application of the basin characterization model to estimate in-place recharge and runoff potential in the Basin and Range carbonate-rock aquifer system, White Pine County, Nevada, and adjacent areas in Nevada and Utah. U.S. Geological Survey Scientific Investigations Report 2007-5099.

Flint, L. E., A. L. Flint, and M.A. Stern. (2013). The basin characterization model – a regional water balance software package. U.S. Geological Survey Techniques and Methods 6-H1.

Harrington, R. (2007). Development of a Groundwater Flow Model for the Bishop/Laws Area: Final Report for Local Groundwater Assistance, Grant Agreement No. 4600004129.

Harrington, R. H. (2016). Hydrogeologic Conceptual Model for the Owners Valley Groundwater Basin (6-12), Inyo and Mono Counties. Prepared for submittal to the California Department of Water Resources. Prepared by Inyo County Water Department, Independence, California.

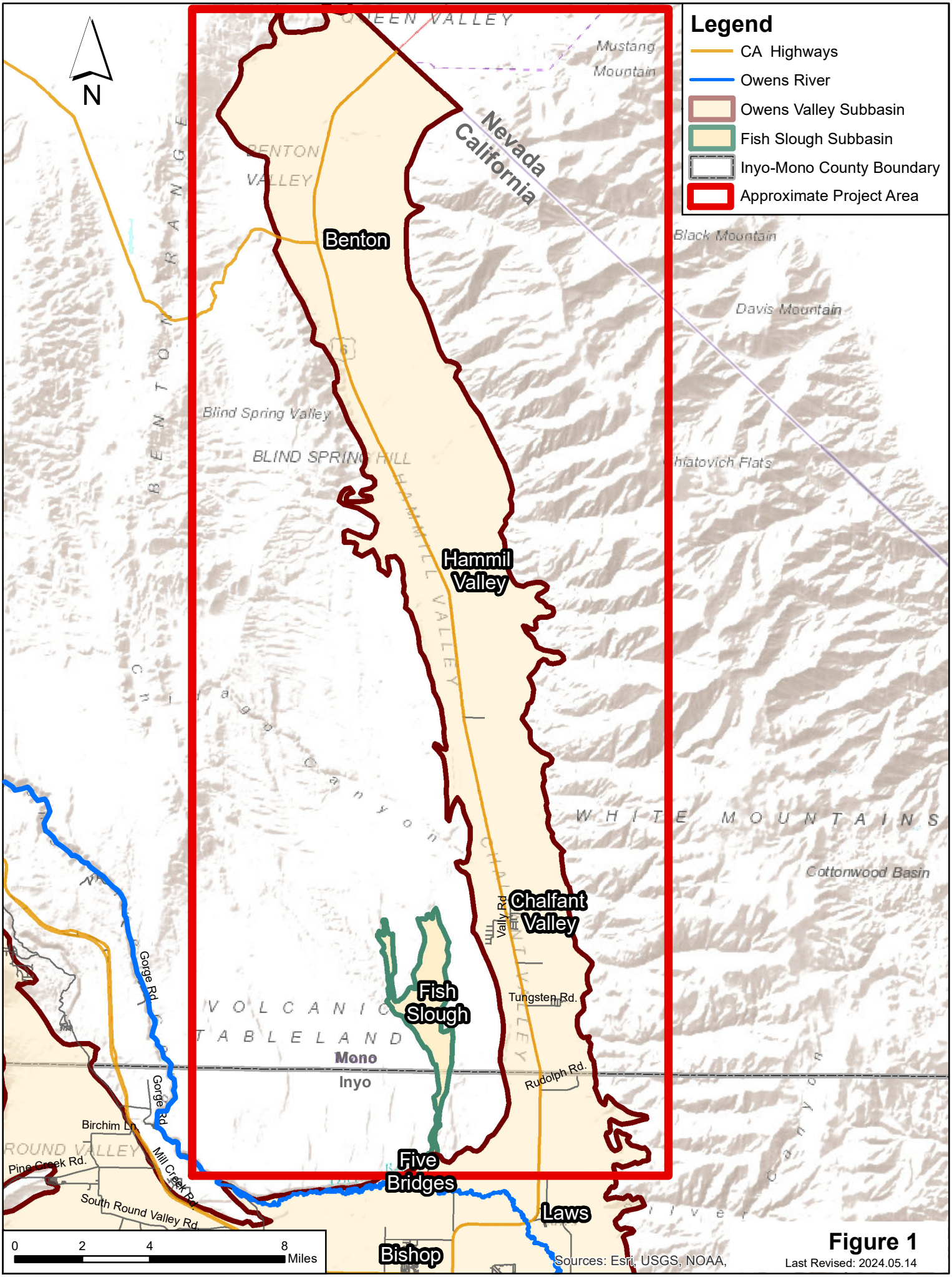
Hollett, K. J., W. R. Danskin, W. F. McCaffrey, and C. L. Walti. (1988). Geology and Water Resources of Owens Valley, California. U.S. Geological Survey Open-File Report 88-715.

Hollett, K. J., W. R. Danskin, W. F. McCaffrey, and C. L. Walti. (1991). Geology and Water Resources of Owens Valley, California. U.S. Geological Survey Water-Supply Paper 2370, Chapter B.

MHA. (2001). Task 1 Report: Preliminary Data Collection and Hydrologic Models for the USFilter Tri-Valley Surplus Groundwater Program, Mono County, California.

TEAM Environmental. (2006). Surface Water and Groundwater Availability Assessment Mono County Area. Prepared for Mono County Planning Department, Mammoth Lakes, California.

Zdon, A., Rainville, K., Buckmaster, N., Parmenter, S., & Love, A. H. (2019). Identification of Source Water Mixing in the Fish Slough Spring Complex, Mono County, California, USA. Hydrology, 6(1), 26.


Legend
CA Highways
Owens River
Owens Valley Subbasin
Fish Slough Subbasin
Inyo-Mono County Boundary
Approximate Project Area
N
Nevada
California
Benton
Hammil Valley
Chalfant Valley
Fish Slough
Five Bridges
Laws
Bishop
Mustang Mountain
Black Mountain
Davis Mountain
Blind Spring Valley
BLIND SPRING HILL
BENTON VALLEY
BENTON RANGE
WHITE MOUNTAINS
Cottonwood Basin
VOLCANIC TABLELAND
ROUND VALLEY
Mono
Inyo
Gorge Rd.
Tungsten Rd.
Rudolph Rd.
Birchim Ln.
Pine Creek Rd.
Mill Creek Rd.
South Round Valley Rd.
Owens River
0 2 4 8 Miles
Sources: Esri, USGS, NOAA,
Figure 1
Last Revised: 2024.05.14