Siskiyou County Flood Control and Water Conservation District

Building a Better Butte: Applied Science for Groundwater Sustainability

Applicant Name: Siskiyou County Flood Control and Water Conservation District

Applicant Address: 1312 Fairlane Road, Yreka, CA 96097

Project Manager Name: Matt Parker, Groundwater Sustainability Agency Manager

Project Manager Address: 1312 Fairlane Road, Yreka, CA 96097

Project Manager Email: mparker@co.siskiyou.ca.us

Project Manager Phone: 530-842-8005

Table of Contents

3. Executive Summary

3a. Date, Applicant, and Location Information

Date: July 8, 2026

Applicant: Siskiyou County Flood Control and Water Conservation District

Location: Yreka, Siskiyou County, California

3b. One-Paragraph Project Summary

The Siskiyou County Flood Control and Water Conservation District (District), the designated Groundwater Sustainability Agency (GSA) for the Butte Valley Groundwater Basin. The GSA is tasked with implementing Groundwater Sustainability Plans (GSP) under the state of California's Sustainable Groundwater Management Act (SGMA). The District through this proposal, respectfully requests $274,957 in federal funding (pre-award costs are claimed as non-Federal cost share, not as reimbursable Federal costs) to improve the hydrologic information and modeling tools that support sustainable groundwater management in the basin (Bulletin 118 Basin No. 1-003). The Project will refine the basin's groundwater model and its conceptual model of the aquifer system, incorporate improved agricultural water use and soil moisture data, update the basin water budget, develop a baseline water quality and isotope dataset at existing monitoring wells to distinguish the shallow and deep aquifer systems, assess groundwater-dependent ecosystem conditions, and apply established artificial intelligence tools, with human oversight, both to support model calibration and to build interactive tools that make groundwater science accessible to water managers and the public. These improvements respond directly to recommended corrective actions identified by the California Department of Water Resources (DWR) in its February 2025 approval of the basin's Groundwater Sustainability Plan (the specific corrective actions are described in Section B.2, and the DWR determination is provided as an attachment), and they advance the goals of this funding opportunity by giving the District the decision-support capability it needs to manage the basin reliably. The total estimated project cost is $611,207 of which the District and its partners will provide $336,250 (55 percent) in non-Federal cost share.

3c. Project Timeline and Estimated Completion Date

The Project will be completed over a two-year period of performance, with an estimated completion date of June 2029.

3d. Federal Facility Statement

The Project is not located on a Federal facility.

4. Technical Project Description

This section describes the work to be performed, the methods and tools to be used, and the goals of the Project. Project benefits are addressed under Criterion B; the schedule and work plan are addressed under Criterion C.

4a. Applicant Category

The applicant, the Siskiyou County Flood Control and Water Conservation District, is a Category A entity under this funding opportunity. The District is a local governmental entity organized under the California Water Code, with authority over water conservation and flood control within Siskiyou County. It serves as the exclusive Groundwater Sustainability Agency for the Butte Valley Basin under California's Sustainable Groundwater Management Act (the state's groundwater law), with authority established by Siskiyou County Resolution FLD17-01 (April 4, 2017). The District is in the Western United States, within a Reclamation State.

The District is the Category A applicant; no Category B partnership applies.

4b. Detailed Project Description

The Project consists of five technical sub-projects. The Butte Valley Basin is a 79,900-acre medium-priority groundwater basin in northern Siskiyou County, part of the larger Upper Klamath Basin volcanic groundwater system in Northern California, which is connected to the Klamath River. The Butte Valley groundwater basin is connected to adjacent basins through significant flow through highly permeable volcanic rock. Groundwater is the sole source of water supply for the basin's agricultural economy (primarily alfalfa, pasture, grain, and hay) and for its three small communities (Dorris, Macdoel, and Mount Hebron). The Basin contains 443 documented wells.

The District submitted the original 2022 Groundwater Sustainability Plan to DWR. Through the state review process, the DWR provided feedback and asked for clarification regarding how the basin's regional flow context, which involves large inflows from and outflows to the surrounding volcanic aquifer system, accounted for the local groundwater declines observed in long-term well records. The District revised its assessment and resubmitted the GSP, which DWR approved in February 2025, identifying recommended corrective actions to continue strengthening the plan. This iterative process of submission, review, and refinement is consistent with how the state's groundwater law is designed to work, and the recommended corrective actions provide the roadmap for the technical work proposed here.

The technical work proposed here responds directly to the recommended corrective actions in that determination. Most directly, Recommended Corrective Action 2 directs the District to update the basin's hydrogeologic model, provide more information on the presence of confined and unconfined conditions in relation to basin stratigraphy, supply additional rationale for the single principal aquifer interpretation or undertake investigations to better define the basin's aquifers, and propose a project and a schedule to fill the conceptual model's data gaps before the next 5-Year periodic evaluation (to be conducted in 2031). Included in this proposal responds to the determination's recommended corrective actions on groundwater elevation contour maps, groundwater-dependent ecosystems, and degraded water quality. Each sub-project below identifies the recommended corrective action it addresses.

The groundwater model currently in use is a coupled groundwater flow model with eleven layers, built on MODFLOW (the standard groundwater modeling software maintained by the U.S. Geological Survey) and linked to a U.S. Geological Survey watershed model and a soil-water budget component. Recent technical analysis produced a draft updated

conceptual model of the aquifer system that documents multiple lines of evidence suggesting the basin's aquifer system, previously thought of as a single confined aquifer, may be vertically stratified, with shallow unconfined conditions overlying a deeper semi-confined zone. Preliminary results from newly established well pairs suggest upward hydraulic gradients in parts of the central basin, and two preliminary age-dating data points suggest the deeper volcanic system may contain water with apparent ages approaching 11,000 years while the shallow system contains modern water. Further work is needed to delineate the extent of the shallow and deep systems, establish whether a confining or semi-confining layer is present across the basin, and determine what these findings mean for the numerical model, the representative monitoring point network, and the basin's sustainable management criteria.

The five sub-projects are described below.

Hydrologic Conceptual Model And Numerical Model Improvements

The Project will refine the basin's groundwater model to better represent basin conditions. This includes incorporating spatially distributed irrigation efficiency data and soil moisture characterization across the basin's primary crop types, developed through field data collection and mapping, to improve how the model represents agricultural consumptive use and recharge in its soil-water budget component. The Project will evaluate the draft conceptual model's preliminary evidence for aquifer stratification and test, within the existing modeling framework, whether restructuring the representation of aquifer storage improves model calibration and resolves inconsistencies in the current water budget. The current conceptual model includes significant inter-basin flows with adjacent groundwater basins.

The Project will use machine-learning methods to calibrate the model more efficiently by identifying promising parameter combinations, which are then evaluated using PEST++, the standard calibration software for this type of groundwater model. This approach helps the team arrive at well-calibrated parameter sets more efficiently than conventional calibration alone. To better quantify inter-basin connectivity with adjacent basins, such as the Upper Klamath River system, this model will be updated with improved basin boundary conditions. The Butte Valley model uses the same PRMS and MODFLOW methodology employed by the USBR and USGS on the Klamath River. The machine-learning techniques applied are established methods, not new algorithm development. This Project will produce updated water budget estimates and groundwater elevation contour maps referenced to mean sea level. The work uses established, widely used modeling tools applied to the basin's data; it does not develop new or novel modeling methods. This sub-project directly addresses Recommended Corrective Action 2, which directs the District to update the hydrogeologic model and better define the basin's aquifers, and Recommended Corrective Action 3, which directs the District to provide groundwater elevation contour maps referenced to feet above mean sea level.

Groundwater-Dependent Ecosystem Assessment

The Project will evaluate suspected groundwater-dependent ecosystems (GDE) near the Butte Valley Wildlife Area using the newly developed monitoring network at the study site (shallow wells installed in January 2026) together with remote sensing data. The Project will use tools developed with artificial intelligence assistance to implement the data analysis, relating groundwater levels recorded at the new monitoring wells to satellite

measures of vegetation health (vegetation-health indices derived from Landsat and Sentinel imagery). This analysis will produce updated maps and impact descriptions for the proposed groundwater-dependent ecosystems, directly addressing Recommended Corrective Action 4, which directs the District to continue identifying GDE's, and to refine the discussion of the impacts of groundwater extraction on these ecosystems using improvements in the groundwater level monitoring network.

Baseline Water Quality Dataset

This Project will develop a baseline water quality dataset from existing monitoring wells to help identify and distinguish the basin's shallow and deep aquifer systems. This baseline characterization will be developed through water quality sampling, manual measurement of water levels, and isotope sampling at the proposed wells, as appropriate at each location, with water quality samples analyzed by a California state-certified laboratory. The resulting dataset will establish chemical and hydraulic signatures that help separate the shallow and deep systems and will support the evaluation of the conceptual model and the design of the basin's monitoring network. It will also provide the data foundation the District needs to address Recommended Corrective Action 5, which directs the District to revise the sustainable management criteria for degraded water quality, and Recommended Corrective Action 8, which directs the District to revise the degraded water quality monitoring network. The Project will also compile and integrate existing publicly available datasets that have not yet been fully utilized, including the State Water Resources Control Board's groundwater quality monitoring program data, the Department of Water Resources' well completion reports, and climate and streamflow records, to support the model improvements and the evaluation of the conceptual model.

Isotope Sampling to Evaluate the Aquifer System

This Project will conduct targeted isotope sampling at critical wells to support evaluation of the basin's conceptual model of the aquifer system and evaluate inter-basin flow and intra-basin dynamics to refine model boundary conditions and internal stratification. Sampling at wells completed at different depths will help characterize the relationship between the shallow and deep aquifer zones, and inform whether a confining or semi-confining layer is present and how extensive it may be. This work directly supports the evaluation of the aquifer system and the determination of whether the basin should be managed as a stratified, multi-aquifer system, and the isotope results form part of the baseline characterization of the shallow and deep systems described above. In doing so, it supports Recommended Corrective Action 2, which directs the District to investigate and better define the basin's aquifers and the interconnectivity between them. Isotope analyses will be performed by an established laboratory using standard methods.

AI-Assisted Stakeholder Engagement

The Project will use artificial intelligence as a coding and development assistant to build more sophisticated interactive stakeholder engagement tools than would otherwise be feasible at this funding level. Artificial intelligence assistance allows the Project to translate the basin's complex hydrogeological datasets, including well records, aquifer geometry, modeled flow paths, and climate forcings, into accessible, browser-based experiences that the basin's residents, agricultural producers, and decision-makers can explore without specialized software, training, or technical background. Deliverables will include three-dimensional visualizations of the basin's aquifer system, interactive

websites, in-person demonstration materials, and short videos. Each product will pair standard hydrogeologic symbology with plain-language explanations so users can move between technical and everyday framings of the same feature on demand. The Project will also develop climate-informed scenario tools, built with the same approach, that help stakeholders understand how the basin's water resources may respond under different climate and management conditions. By compressing the engineering effort behind each engagement product from months of bespoke development into a guided process with an artificial intelligence assistant, the Project can deliver a level of refinement and audience-specific tailoring that conventional development would not support within the project budget, making transparent, defensible, and welcoming groundwater science the default for the basin. The artificial intelligence work applies established tools and methods to the District's data and model output; it does not develop new algorithms. These engagement products are scoped within the hours budgeted for Task 3 and reuse the Project's existing data and model outputs rather than requiring new data collection.

4c. Goals and Objectives

The preliminary goals of the Project are to:

1. Produce a revised conceptual model of the aquifer system that evaluates the evidence for aquifer stratification and provides recommendations on whether the monitoring network and management criteria should be updated.
2. Refine the basin's groundwater model using improved agricultural water use, soil moisture, and compiled public data.
3. Produce updated water budgets and groundwater elevation maps to support annual reporting under the state's groundwater law.
4. Assess groundwater-dependent ecosystem conditions at the Butte Valley Wildlife Area study site.
5. Apply artificial intelligence and machine-learning methods to support model calibration decision making and to build interactive public engagement and climate-informed tools accessible to water managers and the public.
6. Provide the technical foundation the District needs to evaluate projects and management actions for the basin's next periodic evaluation of its Groundwater Sustainability Plan.

5. Project Location

The Project is located in the Butte Valley Groundwater Basin (Bulletin 118 Basin No. 1-003), a 79,900-acre basin in northern Siskiyou County, California, within the Upper Klamath watershed. The basin lies along U.S. Highway 97 north of Weed, California, and extends to the Oregon border. The geographic focus includes the entire Bulletin 118 basin and portions of the surrounding upper watershed. A project location map is included as an attachment in PDF format (see Attachment #).

6. Data Management Practices

All spatially explicit data and tools developed under the Project will be produced in industry-standard, mapping-compatible formats, including Esri shapefiles, raster datasets, and file geodatabases, with metadata that follows the applicable federal geographic metadata standard. Model files will be delivered in the standard input and output formats used by the groundwater modeling and calibration software and archived. Water quality and monitoring data will be compiled in a structured, mapping-compatible database. The artificial intelligence assisted engagement tools will be built on open-source frameworks where practicable and made publicly accessible through the District's website. All data products will be made available to the Department of Water Resources through the state's groundwater reporting portal and to the public, consistent with the District's reporting obligations under the state's groundwater law.

7. Merit Review Criteria

Criterion A: Water Management Challenge(s) (20 points)

A.1 The water management problem in the project area. The Butte Valley Basin has experienced groundwater level declines since the mid-1970s. The District, as the basin's groundwater sustainability agency, is responsible for bringing the basin into sustainable management under the Sustainable Groundwater Management Act. To do so, it must make decisions about projects and management actions, monitoring, and sustainable management criteria. Those decisions depend on a clear understanding of the basin's aquifer system and a reliable modeling tool. The Department of Water Resources' review of the basin's Groundwater Sustainability Plan identified that the basin's conceptual model and numerical model require further development, and that the basin's water budget showed inconsistencies that need to be resolved. The central challenge this Project addresses is that the District needs improved hydrologic information and decision-support tools to manage the basin reliably. As the District's understanding of the basin has matured, it has become clear that some assumptions underlying the current model warrant revisiting; preliminary evidence suggesting semi-confined conditions in portions of the basin means that the appropriate storage parameters may differ from those currently used.

A.2 Severity of the problem. The basin has experienced groundwater level declines for more than four decades. State groundwater level records show that the most affected wells have experienced declines exceeding 40 feet. The representative monitoring points reflect a mix of well types, depths, and hydrogeologic settings, and the magnitude of decline at any individual well is influenced by its proximity to pumping, the aquifer zone it is completed in, and the timing of measurements. Groundwater levels remain below their historical highs; however, the basin currently meets the sustainability criteria established in its Groundwater Sustainability Plan. The need this Project addresses is that uncertainty in the basin's conceptual model and monitoring data limits the District's ability to confirm and sustain that condition over the long term. Long-term availability of groundwater is crucial for the survival of the local agricultural economy, and is the source for all domestic water use in the basin.

A.3 Consequences if the problem remains unaddressed. The Department of Water Resources' February 2025 determination notes that the recommended corrective actions

are important to addressing technical and policy issues and that, if not addressed before future evaluations, they may affect the outcome of those evaluations. Without improved tools, the District cannot confidently determine sustainable yield, evaluate which projects and management actions would be effective, or design a monitoring network that reliably tracks progress. If the basin were ultimately found out of compliance with the state's groundwater law, it could face State intervention under that law, including mandatory extraction reporting and State-administered fees levied directly on the basin's agricultural producers, domestic well owners, and communities. The Project gives the District the information it needs to continue making progress under its own locally governed plan and to avoid that outcome.

Criterion B: Project Benefits (25 points)

B.1 How the Project improves water management decisions. The Project provides the technical foundation the District needs to evaluate and prioritize projects and management actions for the next implementation period. The improved conceptual model will clarify what kind of aquifer system the District is managing; if the basin is confirmed to be vertically stratified, the implications for monitoring and management differ fundamentally from those for a single-aquifer basin. The refined model, incorporating improved irrigation efficiency and soil moisture data, will allow the District to evaluate management scenarios with greater confidence and operational flexibility. The baseline water quality dataset and groundwater-dependent ecosystem assessment will inform whether and where management attention is needed to protect beneficial uses. Together, these outputs inform the decisions the District must make; the Project does not prescribe specific management actions, which remain decisions for the District and its stakeholders.

B.2 Expected benefits. Upon completion, the Project will deliver a recalibrated groundwater model, a revised conceptual model of the aquifer system, updated water budgets, groundwater elevation maps, a groundwater-dependent ecosystem impact assessment, a baseline water quality dataset, isotope sampling results, and publicly accessible engagement tools. These products directly support the District's compliance obligations under the state's groundwater law and its ability to manage the basin reliably. The improved water budget supports more accurate annual reporting. The engagement tools give the basin's agricultural producers, communities, and managers better access to groundwater information, supporting more flexible and better-informed water management.

B.2.a How the Project was identified. The Project was identified directly from the recommended corrective actions in the Department of Water Resources' February 2025 determination approving the revised Groundwater Sustainability Plan. Recommended Corrective Action 2 specifically directs the District to propose a project and a schedule to fill the conceptual model's data gaps and to better define the basin's principal aquifers; the Project is the District's response to that direction, and its remaining sub-projects respond to the determination's corrective actions on groundwater elevation contour maps, groundwater-dependent ecosystems, and degraded water quality. The District's Butte Valley Groundwater Advisory Committee, a community-based committee established through an open application process with Board-appointed members representing diverse water interests, has reviewed the technical findings and supports the proposed

work. The Shasta Indian Nation has been invited to participate in the advisory committee process.

B.2.b Who will use the tools and who benefits. The beneficiaries include the basin's agricultural producers, who depend on reliable groundwater information to plan operations; the basin's three communities and domestic well owners; the District and its technical staff; the California Department of Fish and Wildlife, which manages the Butte Valley Wildlife Area; and the California Department of Water Resources, which receives the improved data through state reporting. The decision-support tools make the information accessible to anyone through the internet.

B.2.c How and when results will be applied. Project results will be applied on an ongoing basis through the District's compliance activities under the state's groundwater law. Annual reports prepared during the grant period will incorporate updated data and model results as they become available, providing interim documentation of the evolving understanding. The Project's primary deliverables will support the District's next periodic evaluation. During the implementation period, the District may begin selecting and instrumenting new representative monitoring points if the findings on the aquifer system support it. Decisions about revised sustainable management criteria and new projects and management actions will be evaluated through the Project but would be formally adopted through the periodic evaluation process, consistent with the implementation timeline under the state's groundwater law.

B.3 Applicability elsewhere and transferability. The methodology of evaluating whether a basin's initial conceptual model adequately represents its aquifer system, and working through the implications for the model, monitoring network, and management criteria, is directly transferable to other basins managed under California's groundwater law. The approach of pairing shallow monitoring well data with publicly available satellite imagery to assess groundwater-dependent ecosystems is low-cost and transferable to any basin with potential groundwater-dependent ecosystems. The artificial intelligence assisted engagement approach is transferable to other groundwater agencies seeking to make technical information accessible to stakeholders. The basin is part of the Upper Klamath volcanic system shared with adjacent basins (Tulelake, Lower Klamath), which face similar challenges in characterizing their aquifer systems and would benefit from the improved understanding. These methods are not specific to California; they can be applied in groundwater basins across the Western United States that face similar data constraints, including the volcanic-aquifer basins of the Upper Klamath system. Information exchange will occur through the channels described under Criterion D, including presentations at professional conferences such as the Groundwater Resources Association of California, and the decision-support tools will be publicly accessible on the internet to users beyond the basin.

B.4 Complements, not duplicates, similar efforts in the area. The Project complements the District's ongoing implementation of the state's groundwater law and the Periodic Evaluation, which the District is preparing separately. The grant does not duplicate work already completed; it funds the data collection, modeling, and tool development that the Periodic Evaluation will recommend but that the District cannot fund through its existing resources alone. Because the recommended corrective actions are directions from the California Department of Water Resources to improve and extend

work already under way, the Project by design adds to existing efforts rather than duplicating them.

B.5 How benefits will be assessed and verified. Benefits will be assessed against the current baseline (the existing model, water budget, and monitoring approach, as documented in the basin's Groundwater Sustainability Plan and most recent annual report). Verification metrics include improved model calibration statistics (such as root mean square error and residual distribution) relative to the current model, the number of monitoring data gaps addressed, and the delivery of decision-support tools in active use at District public meetings.

B.6 Cost per acre-foot of water created, conserved, or delivered. Cost per acre-foot is not a primary metric for an information and modeling project; the Project's value lies in enabling the District to make sound, defensible management decisions and to maintain local management of the basin under its own plan.

Criterion C: Project Implementation (20 points)

C.1 Approach and methodology. The Project applies established, mature methods: industry-standard groundwater modeling and calibration software (MODFLOW and PEST++), standard field methods for soil moisture and irrigation efficiency data collection, state-certified laboratory analysis for water quality, established satellite imagery for groundwater-dependent ecosystem assessment, and off-the-shelf machine-learning and artificial intelligence tools for calibration support and stakeholder engagement. This is the best available approach because it builds directly on the existing groundwater model (developed by the project team), uses methods proven in groundwater management worldwide, and produces tools the District can maintain and update. The team can proceed immediately upon award with no ramp-up period.

C.2 Work plan, schedule, milestones, and costs per task. The Project is organized into five tasks over a two-year period of performance. The schedule below shows the distribution of tasks; a milestone table follows.

Task	Description	Months
1	Hydrologic Model Improvements (evaluate the aquifer system, irrigation and soil moisture data, recalibration, water budgets)	1-20
2	Ecosystem and Baseline Water Quality (Butte Valley Wildlife Area assessment, baseline sampling at proposed wells)	1-24
3	AI-Assisted Stakeholder Engagement	12-24
4	Annual Reporting and Dissemination	6-24
5	Project Management	1-24

Milestone	Approximate Timing
Project kickoff and data compilation complete	Month 3

Milestone	Approximate Timing
Revised conceptual model evaluation complete	Month 12
First annual report incorporating updated data	Month 7
Model recalibration complete	Month 18
Groundwater-dependent ecosystem assessment complete	Month 20
AI engagement tools deployed	Month 22
Final report, model archive, and Reclamation webinar	Month 24

Costs per task. Estimated costs by task are provided in the separate Budget Narrative. In summary, Task 1 (model improvements) and Task 2 (monitoring) represent the largest shares of effort, followed by Task 4 (reporting), Task 3 (AI tools), and Task 5 (management).

C.3 Anticipated products. These are listed in the table below.

Product	Format
Revised conceptual model of the aquifer system (report)	PDF, mapping files (shapefiles)
Irrigation efficiency and soil moisture maps	Mapping files, PDF
Recalibrated groundwater model files	MODFLOW and PEST++ formats, archived
Updated water budgets and groundwater elevation maps	PDF, mapping files, spreadsheets
Groundwater-dependent ecosystem impact assessment with maps	PDF, mapping files
Baseline water quality dataset	Mapping-compatible database, standard metadata
Isotope sampling results supporting evaluation of the aquifer system	Data tables, PDF
AI-assisted public engagement tools (3D visuals, website, videos, demonstrations)	Web-based, digital
Climate-informed stakeholder tool	Web-based, digital
Annual reports prepared during grant period	PDF, submitted to the Department of Water Resources

Product	Format
Final project report	PDF
Reclamation webinar presentation	Digital

C.4 Quality assurance and quality control. Water quality sampling will follow U.S. Geological Survey National Field Manual procedures and U.S. Environmental Protection Agency Region 9 guidance, with field duplicates (minimum 10 percent of samples), equipment blanks, chain-of-custody documentation, and calibrated field instruments. Water quality samples will be analyzed by a California state-certified laboratory using methods approved by the U.S. Environmental Protection Agency. Model recalibration will follow standard PEST++ calibration protocols with documented parameter bounds and calibration performance evaluated using root mean square error, mean absolute error, and residual spatial distribution. All data will be maintained in a version-controlled database with metadata that follows the applicable federal geographic standard and reviewed for completeness and accuracy before use.

C.5 Project partners, roles, and stages of engagement. The District is the applicant and provides project oversight, stakeholder coordination, and field support; the District's Groundwater Sustainability Agency Manager serves as Project Manager. Larry Walker Associates, Inc., is currently contracted technical consultant responsible for the technical work products. The California Department of Fish and Wildlife provides monitoring data and access at the Butte Valley Wildlife Area. The City of Dorris provides municipal well data and access. University of California Cooperative Extension, Siskiyou County, supports agricultural stakeholder outreach. The University of California, Davis, Hydrologic Sciences Graduate Group provides academic collaboration and review. Letters of support from these partners will be provided prior to award.

C.6 Staff credentials and experience. The Larry Walker Associates project team has direct experience with the Butte Valley Basin through their consulting work for the District during the development and now implementation of the GSPs, development of the basin's groundwater model, and improved groundwater data collection methods and tools. The team built and calibrated the existing groundwater model, developed the draft update to the conceptual model of the aquifer system, manages the District's monitoring network, and prepared the annual reports and Groundwater Sustainability Plan revision that the Department of Water Resources approved in February 2025. Field staff are available at the firm's Yreka office, approximately 60 miles from the basin, enabling cost-effective field access.

C.7 Ability to proceed immediately. The team can proceed immediately upon award. All positions are filled; no additional staff selection or hiring is required.

Criterion D: Dissemination of Results (10 points)

D.1 Dissemination to Western water managers and technology transfer plan. In addition to the required Reclamation webinar, the Project will disseminate results through multiple channels. The public engagement tools developed under the Project, including interactive three-dimensional visualizations, a public website, demonstration materials,

and videos, are themselves a permanent dissemination resource that provides ongoing public access to basin information. Because these tools are built with artificial intelligence assistance, the Project can tailor them to multiple audiences, pairing standard technical symbology with plain-language explanations so any user can move between technical and everyday framings of the same feature.

D.2 Communication internally and with partners and stakeholders. Results may be presented at the District's public Advisory Committee and Board meetings as needed or requested, and reported in the District's annual reports, which are publicly available through the state's groundwater reporting portal.

D.3 Availability to other water managers in the West and likelihood of adoption. The team may present findings at relevant professional conferences such as the Groundwater Resources Association of California. The improved understanding of the Upper Klamath volcanic aquifer system has direct technology-transfer value to neighboring basins (Tulelake, Lower Klamath) and to other Western water managers working in volcanic terranes or revising initial conceptual models of their aquifer systems under data constraints. All data and model files will be archived in industry-standard formats for use by other water managers and researchers.

Criterion E: Presidential and DOI Priorities (20 points)

E.1 Unleashing American Energy: sustaining agriculture and the efficient use of energy (Executive Order 14154). Agriculture is the largest economic component of Butte Valley, and groundwater is the most significant source of water used in the basin's agriculture. Groundwater pumping is correspondingly a major energy demand, and the energy required to lift water increases as groundwater levels decline, on top of increasing energy costs. By giving producers and the District better information on where and how much groundwater can be sustainably pumped, the Project supports more energy-efficient extraction and helps limit the increases in pumping lift that drive energy use. In supporting the sustainable management of the water resource on which the basin's agricultural economy depends, the Project helps maintain that economy and the rural community it supports.

Improving Oversight in Federal Grantmaking (Executive Order 14332). The Project is structured for transparency and accountability consistent with Executive Order 14332. It produces concrete, measurable deliverables (a recalibrated model, defined data products, a groundwater-dependent ecosystem assessment, and public engagement tools); it applies established methods with predictable costs; and it provides clear metrics for verifying that Federal funds achieve their intended purpose. The publicly accessible nature of the data products and engagement tools ensures that the results of the Federal investment remain available to the public. The investment is also a durable one: by resolving the corrective actions on the Groundwater Sustainability Plan, a one-time Federal contribution helps the basin maintain local management of its groundwater and avoid the recurring costs that State intervention would impose on local water users.

E.2 Artificial intelligence for water management and public engagement (OMB M-25-21, Secretarial Order 3444). Artificial intelligence is a primary element of the Project, addressing the artificial intelligence priorities identified in Office of Management and Budget Memorandum M-25-21 (Accelerating Federal Use of AI through Innovation,

Governance, and Public Trust) and Secretarial Order 3444. The Project applies artificial intelligence in two distinct ways. First, it uses machine-learning methods to calibrate the groundwater model more efficiently, identifying promising parameter combinations that are then evaluated using PEST++, the standard calibration software for this type of model. This improves the efficiency and rigor of the technical work that underpins the basin's management decisions. Second, it uses artificial intelligence as a development assistant to build interactive public engagement tools, including three-dimensional aquifer visualizations, an interactive website, demonstration materials, and short videos, that would not be feasible at this funding level through conventional development. By compressing the engineering effort behind each engagement product from months of bespoke development into a guided process with an artificial intelligence assistant, the Project can deliver a level of refinement and audience-specific tailoring that conventional development would not support within the project budget. Both applications apply established artificial intelligence and machine-learning methods to the District's data rather than developing new algorithms, and both produce concrete, usable products.

E.3 Secretarial strategic objectives (Secretarial Orders 3417, 3418, 3419) and DOI Strategic Plan alignment. The Project advances the Department of the Interior's FY2026-2030 Strategic Plan emphasis on the science-informed, efficient management of the nation's water resources. By producing a reliable, data-driven basis for managing a groundwater basin that underpins a productive agricultural region, the Project ensures that decisions about a significant water resource rest on sound science rather than uncertainty, supporting the responsible stewardship of that resource over the long term.

E.4 Water management and operational flexibility in Reclamation States. The Project supports water management and operational flexibility in the Western United States. A model that reliably represents the basin's aquifer system lets the District evaluate targeted management options, for example adjusting the timing or location of pumping, rather than relying on uniform, basin-wide measures, allowing the basin to respond to dry and wet years with greater precision. The improved tools also allow the District to demonstrate measurable progress under its locally governed Groundwater Sustainability Plan. By resolving the corrective actions identified in the Department of Water Resources' determination on the Plan, the federal investment helps keep groundwater management in the hands of the local District and its stakeholders, rather than requiring the basin to default to State oversight and the associated State-administered fee structure that accompanies intervention under the state's groundwater law.

Criterion F: Cost Share Priority (5 points)

The District and its partners will provide $336,250 in non-Federal cost share against a total project cost of $611,207. Using the formula in this funding opportunity (non-Federal funding divided by total project cost), the non-Federal share is 55.0 percent, which exceeds the 50 percent minimum by 10.6 percentage points. The Project therefore qualifies for the maximum Criterion F points. The non-Federal cost share is composed of County staff time (the District's direct contribution) and the District's share of the technical consulting contract, and County-funded pre-award costs for monitoring, annual reporting and modeling, and the Periodic Evaluation. The Budget Narrative provides the detailed breakdown.

8. Environmental and Cultural Resources Compliance

The Project consists of data compilation, numerical modeling, water quality sampling at existing well and surface water locations, monitoring at existing wells, and software development. It involves no construction and no ground disturbance.

Will the Project impact the surrounding environment (air, water, animal habitat)? No. The Project involves data collection, modeling, and analysis with no ground disturbance and no impact to air, water, or habitat.

Are there listed or proposed threatened or endangered species or critical habitat in the project area? The Butte Valley Wildlife Area provides habitat for various species; however, the Project involves only monitoring and analysis and will have no effect on listed species or critical habitat.

Are there wetlands or other surface waters subject to Clean Water Act jurisdiction? Meiss Lake and managed wetlands exist within the basin; the Project involves only monitoring and analysis at these features and will not affect them.

When was the water delivery system constructed? Not applicable; the Project does not involve a water delivery system.

Will the Project modify or affect any irrigation delivery system? No.

Are any buildings, structures, or features listed or eligible for the National Register of Historic Places? None are affected; the Project involves no construction or disturbance.

Are there known archaeological sites in the project area? The Project involves no ground disturbance; no archaeological sites will be affected.

Will the Project affect Tribal lands or sacred sites? No. The Shasta Indian Nation participates in the Advisory Committee process; the Project involves no land disturbance.

Will the Project contribute to the introduction or spread of noxious weeds or invasive species? No.

9. Required Permits or Approvals

Permit / Approval	Applicable?	Compliance Plan
National Environmental Policy Act	Likely categorical exclusion	Coordinate with Reclamation; the Project involves no ground disturbance
Endangered Species Act, Section 7	Not anticipated	No effect to listed species from monitoring and analysis
National Historic Preservation Act, Section 106	Not anticipated	No ground disturbance; coordinate with Reclamation if required
Clean Water Act, Section 404	Not applicable	No dredge or fill

Permit / Approval	Applicable?	Compliance Plan
Clean Water Act, Section 401	Not applicable	No discharge
CA Fish and Game Code Section 1600	Not applicable	No streambed alteration
California Environmental Quality Act	To be confirmed	Monitoring and study activities are typically exempt

10. Letters of Support

No letters of support at this time, but will provide if awarded

11. Letter of Partnership (Category B Applicants Only)

N/A, Category A applicant.

12. Overlap or Duplication of Effort Statement

The activities, costs, and key-personnel time proposed in this application do not overlap with those in any other Federal proposal or award. The Project complements, but does not duplicate, the District's separately funded activities to implement the state's groundwater law and its preparation of the Groundwater Sustainability Plan Periodic Evaluation. The Federal funds requested here support the model improvements, monitoring, and tool development described in this application and do not fund the Periodic Evaluation itself.

13. Conflict of Interest Disclosure

No actual or potential conflict of interest exists with respect to this application.