MARCH 24, 2023

TO: **PLUMAS COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT**
1834 EAST MAIN STREET
QUINCY, CA 95971

ATTN: **ROB THORMAN, ASSISTANT DIRECTOR, PLUMAS COUNTY PUBLIC WORKS DEPARTMENT**

SUBJECT: **PLUMAS COUNTY WATERSHED FORUM CONCEPT PROPOSAL – SYNERGISTIC SIERRA VALLEY GROUNDWATER RECHARGE AND IRRIGATION EFFICIENCY PROJECT**

Dear Mr. Thorman and the Watershed Forum Technical Advisory Committee (TAC):

The Sierra Valley Groundwater Management District (SVGMD) submits this concept proposal in letter form in response to the Request for Proposals (RFP) issued on January 23, 2023, by the Plumas County Flood Control & Water Conservation District (FCWCD) on behalf of the Plumas Watershed Forum (Forum).

SVGMD is submitting a concept proposal for the Sierra Valley Subbasin that aligns with the priorities described in the Feather River Watershed Management Strategy and implements synergistic[1] Type 2 First Tier projects involving groundwater recharge and design and implementation of more water efficient irrigation methods and irrigation management.

The information requested in the RFPs is provided below.

PROJECT NAME

Synergistic Sierra Valley Groundwater Recharge and Irrigation Efficiency Project

PROJECT SPONSOR

SVGMD

[1] Defined in the Feather River Watershed Management Strategy as "the success of one goal is needed to ensure the success of another" where restoration will result in multiple resource benefits.

STATEMENT OF QUALIFICATIONS

The SVGMD has been working since its establishment in 1980 to implement practices aimed at better management of groundwater resources in Sierra Valley. Furthermore, the SVGMD began monitoring groundwater extraction from agricultural wells throughout Sierra Valley in 1989 thus providing historic data that is helpful to characterize groundwater use and levels.

The SVGMD worked in coordination with Plumas County to develop the Groundwater Sustainability Plan (GSP) for the Sierra Valley Subbasin (DWR Basin # 5-12.01) ranked a Medium-Priority Basin under the California's 2014 Sustainable Groundwater Management Act (SGMA). As such, the SVGMD has a comprehensive understanding of the conditions in the Basin and of the communities and its priorities and what is needed to ensure the sustainability of the region with respect to supporting residents, agriculture, and wildlife habitats. Therefore, the SVGMD is uniquely qualified to develop and implement the groundwater recharge and irrigation efficiency project included in this proposal.

The SVGMD will be supported in this effort by a technical team, led by Larry Walker Associates (LWA), who worked with the SVGMD to develop the GSP and continues to support GSP implementation efforts.

PROJECT LOCATION

Two locations in the Sierra Valley Subbasin have been identified for potential aquifer recharge, specifically the Little Last Chance Creek Recharge area to the northeast and the Smithneck Creek Recharge area to the southeast, as shown on the map in **Attachment 1**.

This proposal focuses on the Little Last Chance Creek Recharge area in the northeastern region of the Subbasin. Although there is the potential for recharge in the southeast, groundwater levels in the northeastern region fell below the minimum thresholds for groundwater elevations during the fall season of 2022, and, therefore, aquifer recharge will serve the greatest potential benefit in the Little Last Chance Creek Recharge area.

GENERAL PROJECT DESCRIPTION AND TYPE OF PROGRAM

The Feather River Watershed Management Strategy under the Watershed Restoration Priorities identifies the Sierra Valley groundwater basin as the highest priority for 'Groundwater Condition' restoration projects.

The Sierra Valley experiences periods of intensive drought that impact agricultural practices, drinking water resources, and the health and sustainability of groundwater dependent ecosystems (GDEs). Climate change is predicted to intensify drought conditions across California, particularly in the Sierra Nevada, and exacerbate overall precipitation variability and intensity (Pierce et al., 2018)[2]. In the face of current and future climate change impacts, it is crucial for the Sierra Valley to conserve and enhance groundwater resources for the sustainability of human and wildlife ecosystems.

[2] Pierce, D. W., Kalansky, J. F. & Cayan, D. R. Climate, drought, and sea level rise scenarios for California's fourth climate change assessment. Calif. Energy Comm. Calif. Nat. Resour. Agency (2018).

Groundwater levels in the Valley are largely influenced by two variables: supply, generally from snowmelt or seasonal precipitation, and consumption from groundwater pumping.

One promising opportunity to improve groundwater supply in the Sierra Valley is to implement a combination of conjunctive use—maximizing surface water irrigation when possible—and of diversion of excess surface water flow—water not owned for irrigation or other purposes—from streams and into infiltration basins or alluvial fans, (i.e., regions comprised of highly permeable sediment conducive to high water infiltration rates into the groundwater aquifer).

Notably, diversions for groundwater recharge are only enabled when river flows exceed an allowable threshold during storm events in the winter season, to avoid causing undue burdens on local ecosystems or habitats that largely depend on this water flow. Recharge can enhance availability of groundwater for both the deep aquifer used for agriculture and the shallow aquifer which is feeding the wetlands. In addition, irrigation efficiency practices can reduce the net consumption of groundwater from the system. Therefore, in conjunction with enhancing recharge to this region, improving irrigation efficiency should reduce the demand on groundwater resources.

The primary goal of the proposed project is to synergistically:

1) **conduct a managed aquifer recharge (MAR) demonstration to evaluate the potential for groundwater recharge to improve groundwater levels in agriculturally dependent regions and in the shallow groundwater that feeds the wetlands, and**
2) **evaluate and improve irrigation efficiency practices of ranches that are in close proximity to the Little Last Chance Creek Recharge area.**

This combined approach will provide insight on the possible extent of groundwater level improvement for an agriculturally dependent region like the northeastern portion of Sierra Valley and the impacts of irrigation efficiency practices and conjunctive use on the availability of water resources for recharge to support the wetlands and other wildlife habitat. Furthermore, this on-the-ground, dual purpose implementation project corresponds to the **Feather River Watershed Management Strategy as a Type 2 First Tier Project.** Objectives for this project support several goals of the Monterey Settlement, namely, to **improve groundwater retention and storage in major aquifers** as well as **improve upland vegetation management**.

The historical pattern of groundwater depletion in the northeastern Sierra Valley Subbasin has possibly contributed to subsidence (2015-2019 subsidence between 5-14 inches in the northeast; SV GSP, 2022[3]), which has the potential to adversely impact agricultural practices and agricultural planning. The leading use of groundwater resources in the Sierra Valley watershed occurs via agriculture irrigation practices (estimated at 80-90% of groundwater use in the Basin; SV GSP Section 2.2.1-6[3]). The regional geology includes fault zones that result in significant differences between the eastside and westside of the Valley terrains. The west side is steeper and more forested while the east side has broad valley floors that are subject to more loss of riparian and upland vegetation. Unlike other basins in the Feather River Watershed, the Sierra Valley is unique in that regional geology, specifically the presence of a thick impermeable clay layer in the central part of the Valley, prevents excess water used for irrigation from readily moving from the shallow to the deep aquifer. Therefore, excess groundwater pumped for irrigation does not

[3] Sierra Valley Groundwater Management District (SVGMD). 2022. Sierra Valley Subbasin Groundwater Sustainability Plan. https://sgma.water.ca.gov/portal/gsp/preview/125

readily recycle back into the aquifer system as recharge. Reducing excess groundwater pumping for irrigation is therefore essential to maintaining groundwater levels and storage in the Sierra Valley. Numerous irrigation efficiency measures can be employed to reduce recoverable losses (tailwater and deep percolation) and irrecoverable losses (transpiration, evaporation, and wind drift). Employing these on-the-ground implementation measures is essential to preserving water resources for agricultural use and domestic users, as well as GDEs.

The motivation for recharge implementation in addition to irrigation efficiency development is to improve water availability to the system amidst challenges associated with climate change such as drought. Increased climate-induced warming is anticipated to cause increased precipitation in the form of rain rather than snow during winter months, resulting in decreased formation of snowpack in the upstream mountain regions during the wet season. Melt from snowpack is an important water supply to this region; therefore climate-driven shifts in precipitation will likely limit water resources during the peak growing season. Diversion of excess winter surface flow into a recharge basin will ultimately increase the long-term availability of groundwater to the system, especially during spring and summer months when melt from snowpack becomes increasingly limited.

To date, no recharge projects have yet been implemented in the Sierra Valley to improve groundwater storage in the long-term.

Several irrigation efficiency demonstration projects have been implemented since 2018, with two spans of MESA (medium elevation spray application) equipped pivots converted to LESA (low energy spray application) sprinkler systems, one on the Grandi Ranch in 2018 and the other on the Goodwin Ranch in 2019. In addition, an ongoing, multi-year LEPA (low energy precision application) demonstration project is being conducted on the Roberti Ranch (located centrally in Sierra Valley) in implementation of the Sierra Valley GSP. The proposed project will build on these recent efforts and will explore other avenues for improved irrigation efficiency, including investigation of sprinkler types, evaluation of optimal irrigation system operations, exploring the needs for specific farms based on local practices, weather, soil type and land slope variation and crop conditions.

The Synergistic Sierra Valley Groundwater Recharge and Irrigation Efficiency Project is a unique opportunity to gain insight on the mutual and multiple resources benefits of enhanced groundwater recharge and improved irrigation practices.

The project will be conducted according to the following tasks:

Task 1: Administration and Management

The Sierra Valley Groundwater Management District will conduct administration and management tasks for this project in coordination with and in support of efforts by other applicable and affiliated Forum groups.

Deliverables for Task 1 monthly project status reports and invoices. The budget for Task 1 is $50,000, and will cover this effort throughout the duration of the project.

Task 2: Stakeholder Outreach

In coordination with the FCWCD and the Forum, the SVGMD will host a meeting with ranchers to establish willingness to participate in a synergistic recharge/irrigation efficiency project. Outreach will be to ranchers in the vicinity of the proposed recharge areas, focusing on the Little Last Chance Creek Recharge Area. The initial meeting will involve sharing information on the proposed recharge sites, as well as discussing design feasibility and the proposed approach to both recharge and irrigation efficiency implementation projects. During the meeting, the SVGMD will describe the mutual economic benefits to both ranchers and Plumas County, as well as seek feedback on components to consider prior to implementation. Ranchers interested in participation will be contacted for a follow-up meeting about project participation in ranch assessments.

After the first year of project implementation, a follow-up workshop for participating ranchers will be held by the SVGMD to share preliminary results and progress of the project, as well as collect feedback and consider next steps for implementation.

At the end of the project period, a final workshop will be held to present results to stakeholders, discuss overall benefits, and discuss possible future projects across the Sierra Valley.

Deliverables for Task 2 will include reports drafted and made publicly available on the County Website after each meeting, for a total of three reports, to summarize the status of the project. The reports will incorporate feedback and suggestions from ranchers and the general public on project implementation. Additionally, a final memo will be drafted at the end of the project to describe the effectiveness of outreach efforts in enhancing the project goals and implementation. This final memo will also include copies of all farm assessments conducted across the project region.

The budget for Task 2 is $50,000 and will span the full period of project implementation.

Task 3: Farm Assessments

Funds will be provided to the UC Cooperative Extension to conduct farm audits for farmers that express interest in participation in this project during the original stakeholder outreach meetings described in Task 2. Each farm audit will entail monitoring and will provide a detailed report for the corresponding farm on ways to improve irrigation efficiency in the future.

Deliverables for Task 3 will be a compilation of all farm audits that will be included in Task 2. The budget for Task 3 is $90,000.

Task 4: Preliminary Design and Permitting of Pilot Managed Aquifer Recharge (MAR) Project

During the first stage of Task 4, the MAR component of this project will require landownership discussions and both access and utilization agreements for stream gages, water conveyance routes, infiltration sites, monitoring well sites, water rights assessment, and legal descriptions. A stream gage will be installed at a water master point of measurement, and this stream gage will require routine maintenance and operational review throughout the project period. Identifying potential infiltration facilities will require updated hydrogeologic characterizations via numerical flow models, area-specific geophysics, phase I borings to confirm lithologies at prospective locations, and refinement of the numerical flow models to complete a mounding assessment and to assess the efficacy of the proposed work. The next phase of site assessment will require

geotechnical investigations, including upper soil profiles for proposed sites, phase 2 borings to the water table to characterize unsaturated zone soils at planned infiltration sites, and small basin flooded infiltration test measurements at planned bottom depths of infiltration basins, galleries or dry wells. Once geotechnical investigations are complete, the Precipitation Runoff Modelling System (PRMS) model will be updated based on preliminary stream gauge data, and 1-yr, 10-yr and 100-yr runoff event flows will be determined. Preliminary design of the pilot MAR infiltration system will be developed sufficient to advance water rights application and CEQA for the project implementation. The latter applications will comprise the final phase of Task 4.

Deliverables for Task 4 will be a report of both MAR design and permitting progress for water diversions and recharge as well as results of numerical model scenarios. The budget for Task 4 is $467,000.

Task 5: Construction of Pilot MAR Facilities at Little Last Chance Creek

Facilities required for the Pilot MAR Project will be constructed, including diversion works, conveyance systems, and infiltrations facilities. Part of this construction will require diversion gaging and water table and vadose zone monitoring at infiltration facilities. Subtasks for Task 5 include completion of the engineering design, securing necessary construction permits, bidding the project to select a contractor, construction with inspection services, and start-up testing and documentation of constructed facilities.

Deliverables for Task 5 include a memo detailing all costs and progress incurred during construction, and will include initial monitoring data at infiltration facilities. The budget for Task 5 is $370,000.

Task 6: Pilot MAR Performance and Monitoring

Monitoring of MAR performance will be conducted across two-years, until the end of the grant period. Performance evaluation will include bi-weekly monitoring during the diversion period, likely spanning approximately 4 months from December 1st through March 31st. Monitoring will also include regular quarterly reporting. Task 6 will also require standard minor basin and infrastructure maintenance each year.

Deliverables for Task 6 will include a summary of the regular (bi-weekly) monitoring reports. The budget for Task 6 is $70,000.

Task 7: Irrigation Efficiency Demonstration, LEPA & LESA Conversions

As the first step in the irrigation efficiency component of this project, Task 7 will involve collaboration with willing ranchers and 2-3 volunteer farmers on 3 center pivot fields and 2 additional baseline fields to convert 3 conventional MESA systems to LEPA systems, which release a reduced volume of water closer to crop level in an effort to reduce water loss from evaporation and wind drift and reduce overall energy and pumping required for irrigation. LEPA implementation will require the installation of 5 flow meters at pivot heads and 5 soil moisture systems, to evaluate both pivot water use and soil moisture before and after system conversion. In addition to the LEPA demonstration, this project will also convert 2 additional center pivots from the MESA systems to LESA equipment, in order to assess the efficiency of LESA in improving agricultural irrigation relative to one baseline field. LESA applies water more

uniformly than LEPA (Peters et al., 2016)[4], and may have different benefits or drawbacks that will be assessed for the northeast region of the Sierra Valley. LESA demonstration will require 1 to 2 volunteer farms, and installation of 2 LESA systems, 3 flow meters and 3 soil moisture systems.

Deliverables for Task 7 will include a compilation of monitoring data, before and after LEPA and LESA conversions, for the annual irrigation report detailed in Task 2. The budget for Task 7 is $250,000, as the cost for LEPA demonstration using 2 conversions is $140,000, and the cost for LESA demonstration using 2 conversions is $110,000.

Task 8: Wheel Line LEPA Conversion Demonstration (Optional Task)

This task will be conducted dependent on available resources and interest by the ranchers. One wheel line will be converted to a linear motorized system and converted to LEPA. This demonstration will require 1 volunteer farm. The monitoring results from Task 8 will be compiled with the monitoring result results from Task 7 in the annual reports.

Deliverables for Task 8 will include a summarized comparison between all irrigation implementation demonstrations (Tasks 7 and 8) in the northeastern region of the Sierra Valley for the final project report. The budget for Task 8 is $100,000.

Task 9: Soil Conditioning Demonstration (Optional Task)

This task will be conducted dependent on available resource and will require one volunteer farm to implement various soil amendments to improve water holding capacity. This Task will require amendment material compounds, and installation of three soil moisture monitoring stations.

Deliverables for Task 9 will include a summary of the soil conditioning demonstration results for the irrigation efficiency reports detailed in Task 2. Total budget for Task 9 is $100,000.

STATEMENT OF HOW THE PROJECT FULFILLS THE GOALS OF THE MONTEREY SETTLEMENT AGREEMENT

This project fulfils the goals in the Monterey Settlement to **improve upland vegetation management** and **improve groundwater retention and storage in major aquifers**. Notably, irrigation efficiency and recharge components of this project will work in synergy with one another to both increase supply of and decrease demand on water resources in the northeastern quadrant of the Sierra Valley. Restoration priorities listed in the Feather River Watershed Management Strategy also identify the eastside of the watershed as a priority region for restoration projects, and model results included in the Sierra Valley GSP support this finding. The Little Last Chance Creek in the eastside of the Basin holds substantial potential to increase both shallow and deep groundwater storage in the watershed, and proposed irrigation efficiency demonstrations and evaluations for this project hold the potential to substantially improve upland vegetation management in this agricultural region of the Sierra Valley.

[4] Peters, T., Neibling, H., Stroh, R., Molaei, B., and Mehanna, H., 2016, Low Energy Precision Application (LEPA) and Low Elevation Spray Application (LESA) Trials in the Pacific Northwest, p. 3. http://irrigation.wsu.edu/Content/Fact-Sheets/LEPA-LESA.pdf

STATEMENT OF HOW THE PROJECT MEETS PRIORITIES OF THE FEATHER RIVER WATERSHED MANAGEMENT STRATEGY

The proposed project meets the priorities of the Feather River Watershed Management Strategy by targeting a high priority area, namely the eastern agricultural region of the Sierra Valley, while focusing on restoration interventions that could offer substantial anticipated beneficial impacts to groundwater resources and storage. The Feather River Watershed Management Strategy notes that investigation into enhanced recharge in the eastern Sierra Valley groundwater basin should be a distinct priority for managing drought depletions. The proposed synergistic groundwater recharge and irrigation efficiency project aligns with a **Type 2 First Tier Project**, because it involves **groundwater recharge and design and implementation of more water efficient irrigation methods and irrigation management.**

GROSS COST ESTIMATE AND PROJECT SCHEDULE

To conduct the Synergistic Sierra Valley Groundwater Recharge and Irrigation Efficiency Project as described above, the budgeted estimated cost is $1,547,000. However, as noted, Tasks 8 and 9 are considered optional which would result in a total estimated budget of $1,347,000.

In addition, while the goal of the project is to evaluate the impact of improved irrigation practices on the effectiveness of a groundwater recharge effort, the SVGMD is willing to work with the Forum to modify the scope of this effort, as needed.

Task	**Budgeted Estimated Cost**	**Estimated Schedule**
Task 1 – Administration and Management	$50,000	Ongoing
Task 2 – Stakeholder Outreach	$50,000	Ongoing
Task 3 – Farm Assessments	$90,000	2024
Task 4 – Preliminary Design and Permitting of Pilot MAR Project	$467,000	2024-2025
Task 5 – Construction of Pilot MAR Facilities at Little Last Chance Creek	$370,000	2025
Task 6 – Pilot MAR Performance and Monitoring	$70,000	2025-2026
Task 7 – Irrigation Efficiency Demonstration, LEPA & LESA Conversions	$250,000	2024
Task 8 – Wheel Line LEPA Conversion Demonstration (Optional Task)	*$100,000*	*2024*
Task 9 – Soil Conditioning Demonstration (Optional Task)	*$100,000*	*2024*
TOTAL	**$1,547,000**	

FUNDING SOURCES

The SVGMD is currently applying for two other grants including DWR's SGMA Round 2 Implementation funding and funding for other groundwater recharge projects through the California Department of Fish and Wildlife (CDFW). In addition, this project builds on the initial irrigation efficiency projects implemented during initial GSP development and funded through DWR Proposition 68 grant funds for GSP development.

Currently, there are no funding sources for the tasks specified in this project proposal.

Stakeholders in the Sierra Valley are increasingly concerned about groundwater resources and the impact of drought on their agriculture practices, access to drinking water, and overall livelihood. Local funding is limited but extremely critical for the future of communities, ecosystems, and agriculture in the Sierra Valley.

By applying for multiple grant opportunities, the goal of the SVGMD is to layer funding to obtain the needed resources to implement the GSP and its numerous projects and management actions including restoration efforts.

In closing, thank you for the opportunity to present this concept proposal. Should you need additional information or have clarifying questions, please feel free to contact me at (530) 249-4520 or sierravalleygmd@sbcglobal.net or Laura Foglia, LWA, at (530) 753-6400 x240 or lauraf@lwa.com.

Sincerely,

Jenny Gant

Jenny Gant
SVGMD Board Clerk

Directors: Dwight Ceresola
Dave Goicoechea
Einen Grandi
Greg Ramelli
Jim Roberti
Paul Roen
Don Wallace

ATTACHMENT 1: PROJECT LOCATION MAP