Flow Measurement of Irrigation Canal Turnouts for Jefferson Irrigation Co, Limited – PHASE 2

WaterSMART Small-Scale Water Efficiency Projects Grants for Fiscal Year 2024 and Fiscal Year 2025

Funding Opportunity Number R24AS00059

January 14, 2025

Terreton, Idaho

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Terreton, Idaho

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Applicant
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Terreton, ID 83450-0075

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Prepared for:
U.S. Department of the Interior
Bureau of Reclamation

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Applicant Information

Date: January 14, 2025
Applicant Name: Jefferson Irrigation Co. Limited
City, County, State: Terreton, Jefferson County, Idaho
Applicant Category: A
Grant Funding Request: $118,815
Non-Federal Matching Funds: $118,816
Total Project Costs: $237,631
Federal Facility Denotation: This project is not located on a federal facility.

Jefferson Irrigation Company, LTD (JIC), located in eastern Idaho, is a Category A applicant. JIC will install water measurement devices on 25 canal turnouts to accurately measure and monitor deliveries to shareholders. Proposed devices will meet Idaho Department of Water Resources' (IDWR) minimum acceptable standards and include magnetic flowmeters for piped diversions and weirs, flumes, or other equivalent devices for open-channel turnouts. The total project estimated budget is $237,631. JIC is requesting one third of the project cost funding ($75,438) through the Idaho Water Resource Board's (IWRB) Aging Infrastructure Grant Program. JIC is requesting up to half of the funding through U.S. Bureau of Reclamation WaterSMART Grant programs ($118,815). JIC will self-fund the remaining portion ($43,378) thorough cash, assessments, in-kind services, and loans if necessary.

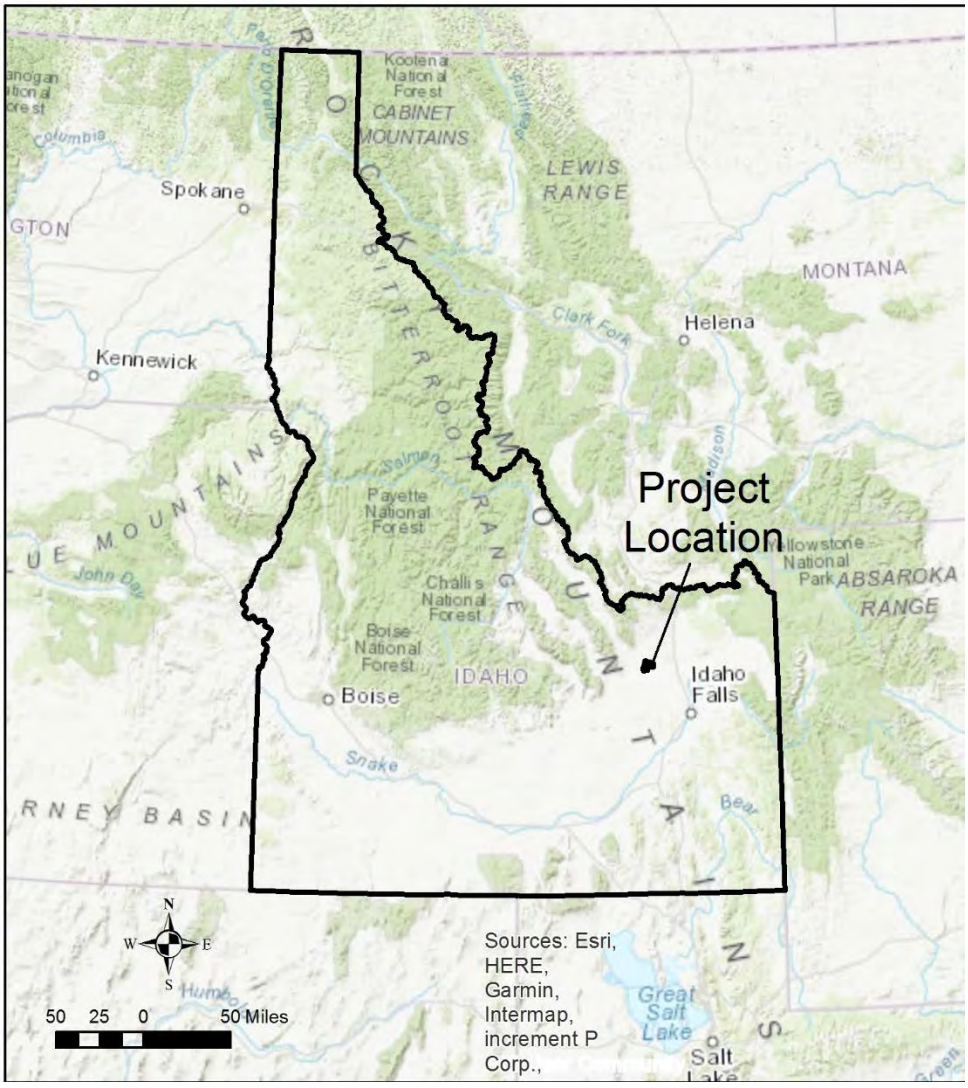
Improvements to accurately measure and monitor flow rates within JIC's distribution system will enhance the equitable distribution of water to shareholders, quantify annual volumetric deliveries to shareholders, quantify conveyance losses through the canal and lateral distribution system, and promote groundwater diversion reduction obligations required by the Jefferson Clark Groundwater District and Idaho Ground Water Association (IGWA)/Surface Water Coalition (SWC) Settlement Agreement.

Projected start date is October 2025, unless required to be extended due to USBR WaterSMART grant award conditions, and length of time for completion is estimated at 18 months.

Project Location

Jefferson Irrigation Company is in eastern Idaho, Jefferson County, approximately five miles northwest from Terreton, Idaho. The project latitude is 43°54' North and longitude is -112°32' East.

Figure 1. Proximity map for Jefferson Irrigation Company.



Technical Project Description

JIC diverts groundwater from multiple wells into a canal system and subsequently delivers water from the canals to company shareholders. Groundwater diversions are measured with a single main weir at the upper end of the main canal.

Downstream of the main weir, water is delivered from the main canal to four laterals identified in downstream order as East, South, North, and West. A pumping lift station raises water for delivery to the North and West laterals.

JIC's canal system has 47 active headgates for water delivery to shareholders. Approximately 32 turnouts are open-channel deliveries to laterals or ditches, 13 turnouts are equipped with one or more pumps, 1 turnout is a combination of pumped and open-channel delivery, and 1 turnout is a piped siphon.

Three of 32 open-channel deliveries are currently equipped with functional weirs, but the remaining are not equipped with measuring devices. Approximately half of the open-channel turnouts are infrequently used "flood" deliveries. The flood irrigated areas are smaller, irregularly-shaped fields, usually pivot corners, where the fields are flood-irrigated two to four times per year.

One or two of the pumped systems are currently equipped with a newer magnetic flowmeter, but the remaining are unmeasured.

The objective of this 2nd Phase of the measurement project is to equip medium- and high-priority, high use turnouts with accurate water measurement equipment. Weirs, flumes, or other devices will be installed on open-channel turnouts. Weirs will be constructed of steel with concrete abutments. Flumes will be pre-fabricated galvanized steel. Some sites may require Acoustic Doppler Velocimeters (ADVs) to be installed in concrete control sections.

The magnitude of individual site preparation will range depending on the site conditions and on the type of equipment being installed. Minimal site preparation will be needed for weir plates attached to existing concrete turnout structures and for magnetic flowmeters installed in existing pipelines. Flumes, ADVs, and some weirs will require localized excavation in existing ditches to place measuring equipment. Excavated soils will be used as backfill, spread locally, or applied to ditch embankments.

Motorized equipment used for device installation includes excavators, soil tampers, equipment delivery trucks, pickups, concrete trucks and/or portable concrete mixers. Pickups and portable generator/welder sets will be used for magnetic flowmeter installations.

Site laydown and mobilization will vary and will be coordinated with the individual landowners through JIC. Equipment and materials will be stored at existing company member's private shop yards pending installation.

Areas impacted by construction will be distributed among the sites where devices are to be installed. These sites have all been previously disturbed. Open channel flow

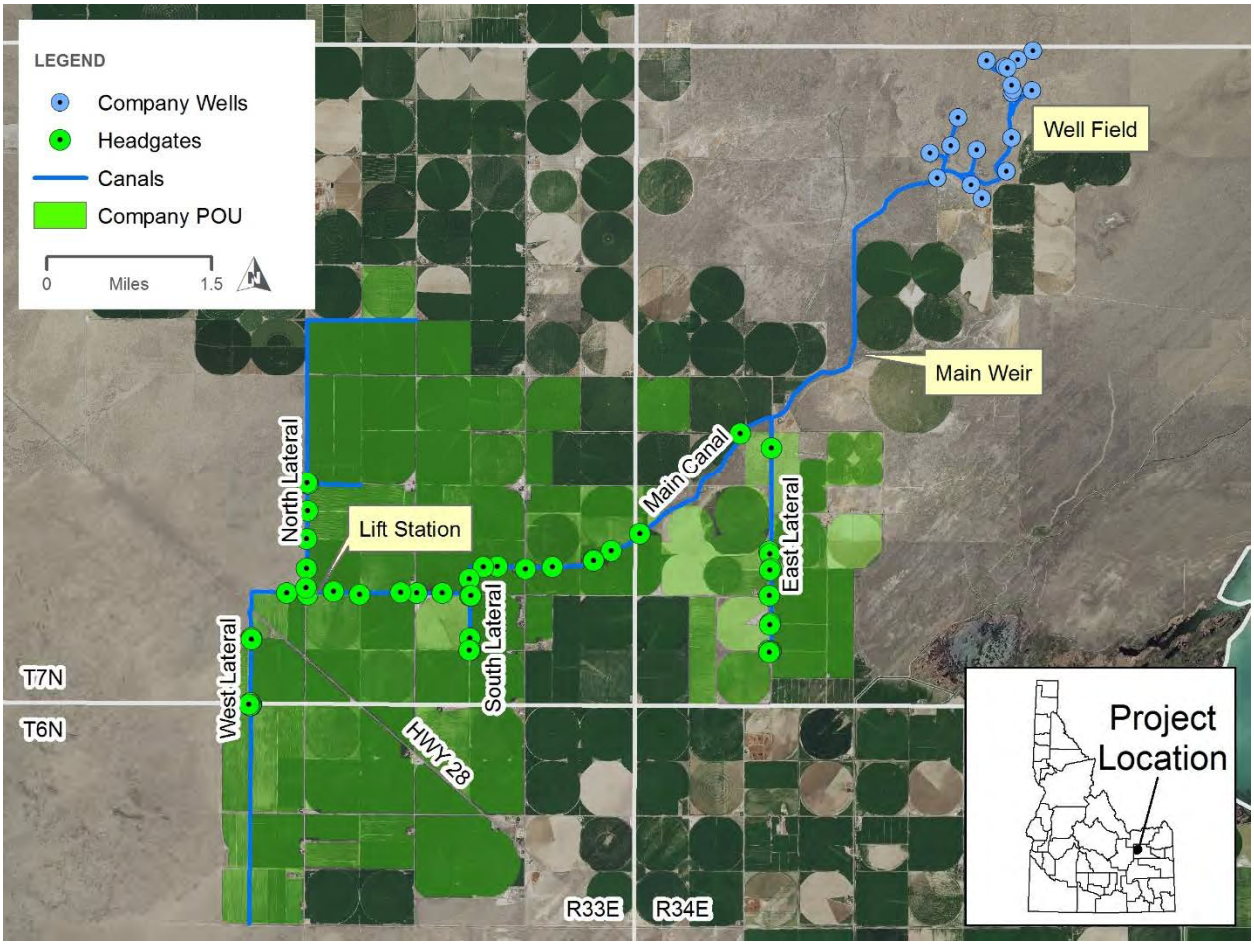
measuring devices will be installed on existing concrete structures or placed in existing ditches. Magnetic flowmeters will be installed on existing pipelines at existing pumping stations.

The frequently used open-channel turnouts will be equipped with stilling wells, water-level sensors, data loggers, and telemetry equipment, allowing JIC to track water use and determine annual delivery volume.

Stilling wells, water-level sensors, loggers, and telemetry equipment are not proposed for the infrequently-used “flood” turnouts. Instead, JIC’s watermaster will record staff gage readings, delivery flow rates, and operating time. This is a reasonable approach as these turnouts are typically operated at high flow rates for 8-to-12-hour periods, and only two to four times per irrigation season.

Full profile totalizing magnetic flowmeters will be installed on pumped turnouts. JIC’s watermaster will regularly check meter operation and record diversion rates and totalized volumes.

Figure 2. Jefferson Irrigation Company Facilities and Headgate Turnouts.



Evaluation Criteria

E.1.1. Evaluation Criterion A. Project Benefits (35 points)

Benefits to the Category A Applicant's Water Delivery System: *Describe the expected benefits to the Category A applicant's water delivery system. Address the following:*

This project will result in more efficient management of the JIC water supply. JIC, as with other groundwater users diverting from Idaho's Eastern Snake Plain Aquifer (ESPA), are committed to improving the overall health of the aquifer system.

> The ESPA is a key element of southern Idaho's economy and covers approximately 10,800 square miles of Idaho. The ESPA region produces approximately 21% of all goods and services within the State of Idaho—resulting in an estimated annual value of $10 billion. Water is the critical element for this productivity.

> For a variety of reasons, groundwater levels in parts of the ESPA have declined, leading to a cumulative decrease in aquifer storage, decreased spring flows, and changing Snake River flows that resulted in insufficient water supplies to satisfy existing beneficial uses. IWRB, at the request of the Idaho State Legislature, prepared and submitted a Comprehensive Aquifer Management Plan to address the water supply-and-demand imbalance.[1]

JIC is committed to efforts of the Jefferson Clark Groundwater District to meet aquifer enhancement goals through recharge efforts, diversion reductions, and other endeavors to meet Surface Water Coalition / Idaho Ground Water Users (SWC/IGWA) Settlement Agreement obligations[2]. This project is an important step toward meeting JIC's obligations as part of their commitments to the stewardship of the ESPA through the SWC/IGWA Settlement Agreement. Accurately measuring and monitoring water delivered to JIC shareholders will provide the following benefits:

- More equitable distribution of water to company shareholders, which in turn yields water supply stability, sustainability, and drought resiliency.
- Limit excessive shareholder deliveries which will result in decreased groundwater diversions.
- Provide transparency in water usage among company shareholders.
- Provide mechanisms for quantifying conveyance losses in JIC's delivery system.
- Provide mechanisms for quantifying conveyance losses in private laterals and ditches beyond JIC's system. This is likely to result in ditch lining, piping, and/or installation of pressurized sprinkler systems resulting in additional water savings.
- Improved overall health of the ESPA.

Water conserved because of this project will either be available to other company shareholders for irrigation use through equitable distribution improvements or will remain undiverted in the ESPA. Water left undiverted and remaining in the ESPA will improve aquifer conditions by increasing aquifer water levels, which in turn yields higher flows in the Snake River to be available for aquatic habitat, irrigation diversions, etc.

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[1] Eastern Snake River Plain Aquifer CAMP | Idaho Department of Water Resources

[2] Settlement Agreement Entered Into June 30, 2015 Between Participating Members of the Surface Water Coalition and Participating Members of the Idaho Ground Water Appropriators, Inc. | idwr.idaho.gov

Explain the significance of the anticipated water management benefits for the Category A applicant's water delivery system and customers. Consider:

The project will result in more efficient management of the water supply. As described above, the ESPA is a critical groundwater resource suffering from declining water levels. Increasing delivery efficiency through improved measurement of irrigation deliveries is expected to yield potential reductions in groundwater pumping with resultant improvement in groundwater levels.

JIC's shareholders are concerned that they do not receive their full water right during peak summertime demand periods. Some shareholders have threatened lawsuits against JIC for failure to measure and account for shareholder deliveries. This project will address these potential lawsuits. The consequences of not making improvements include:

- Potential lawsuits against JIC
- Continuation of potentially inequitable water distribution
- Continuation of potential excessive shareholder deliveries
- Ongoing lack of incentives for efficiency improvements such as ditch lining or piping

JIC shareholder water restrictions are currently required and will continue to be required in the future. Peak season irrigation demand currently exceeds well field production capacity. Implementing this project will greatly improve the equitable distribution given the limited available supply.

Broader Benefits:

Will the project improve broader water supply reliability at sub-basin or basin scale?

Monitoring will increase transparency among water managers in the JIC service area and within the broader region. Through this transparency, information sharing will improve.

The project is in an area that experiences water scarcity. JIC pumps groundwater from the ESPA. The ESPA is experiencing chronic long-term aquifer water level declines. JIC, as a member of the Jefferson Clark Ground Water District, along with other Ground Water Districts, are committed to reversing groundwater level declines through multiple efforts including pumping reductions, aquifer recharge, and efficiency improvements. This project will help address drought conditions through equitable distribution of shareholder water and meeting groundwater pumping reduction targets.

The project will positively impact agricultural economies and environmental conditions. Improving the equitable distribution of water will help shareholders crop yields. Measurement of turnouts is expected to identify seepage losses within shareholder ditches and encourage shareholders to line or pipe long earthen ditches conveying water past turnouts, with associated reductions in seepage and evaporative losses. If this project is successful in leaving more water in the ESPA, higher river return flows

and spring flows will contribute to higher flows in the Snake River, benefitting federally threatened and/or endangered species including salmon.

Higher volumes of water discharging from the ESPA would result in:

- More water available for downstream users.
- More water available for hydroelectric generation.
- Improved recreational opportunities in rivers and reservoirs.
- Improved scenic experiences at Shoshone Falls and other spring complexes in the Thousand Springs reach.
- Reduced water temperatures in the mid-Snake reach, which benefits aquatic habitat.
- Higher probability that downstream Snake River minimum stream flows will be met.
- Higher probability that downstream domestic, municipal, and irrigation wells will continue to function at their current depth.

• *Will the project complement work being done in coordination with NRCS in the area (e.g., the area with a direct connection to the districts water supply)? Please explain.*

JIC is submitting a funding request with the NRCS to replace the Jefferson Canal earthen north lateral with a pipeline. This project would have several benefits, including seepage and evaporative loss reduction, energy savings by avoiding lift station pumping, and simplifying flow measurement requirements.

E.1.2. Evaluation Criterion B. Planning Efforts Supporting the Project (25 points)

Plan Description and Objectives:

JIC engaged SPF Water Engineering to complete a canal efficiency investigation for the Jefferson Canal System in 2015. SPF conducted on-site investigation of the well field, main weir, primary canal, and user turnouts, pumps, and ditches. SPF's report provided recommendations for improving operations, addressing water rights, aquifer conditions, wells and pumps, main canal, and user ditches and pumps. Since this plan was developed, JIC has engaged HDR to implement the plan. Following the 2015 plan, HDR conducted a seepage run of the canal system during 2023 and checked accuracy of the canal's main weir. Also, HDR investigated the individual turnouts and provided a plan for installing measuring devices with specified type and size at shareholder turnouts. This grant application seeks funding to continue plan implementation with flowmeter installations.

Plan Development:

As stated above SPF Water Engineering and HDR developed the plan specifically for JIC and the geographic scope is within the JIC system. However, benefits from plan implementation extend beyond the JIC area to the ESPA aquifer and downstream watershed.

Support for the Project:

This project is specifically identified within the planning effort. SPF's 2015 report included measuring device installation as a specific recommendation. The project addresses a need identified in the existing planning effort. The goal is to accurately measure and monitor water delivered to company shareholders. The primary objective to meeting this goal is the installation of appropriate measuring and monitoring devices and instrumentation within JIC's water delivery system.

E.1.3. Evaluation Criterion C. Implementation and Results (20 points)

Project Schedule

JIC engaged HDR to provide engineering guidance with implementing this project. HDR's engineers visited the Jefferson canal system in late 2022 to gain an understanding of project needs and on-site conditions of canal turnouts. HDR subsequently provided a plan for turnout measurement including recommendations for individual devices, cost estimates, and installation priority ranking. The priority ranking for individual device installations fits a phased installation approach.

JIC plans to initiate measuring device installation after the SWEP funding award announcement, with equipment installation proceeding in phases. Project PHASE 1 coincides with SWEP Round 2 with anticipated award of funding in May 2025. PHASE 1 construction will begin upon completion of agreement with USBR under Round 2 and continue into early 2026.

Milestones: Phase 1 under SWEP Round 2

- Acquire 16 magnetic flowmeter by July 1, 2025
- Install 16 magnetic flowmeters September 1, 2025
- Acquire 4 weirs and 2 cutthroat flumes by September 15, 2025
- Install 4 weirs and 2 cutthroat flumes by December 1, 2025
- Acquire and install 1 ADV by July 15, 2025

- Acquire sensors, loggers and telemetry equipment and install on 4 weirs and 4 flumes by March 15, 2026.

PHASE 2 construction will begin upon completion of agreement with USBR under Round 3 (anticipated October 2025) and continue through 2026.

Milestones: Phase 2 under SWEP Round 3 (this funding cycle)

- Acquire and install 1 magnetic flowmeter by April 2026.
- Acquire 20 weirs and 4 flumes during fall and winter 2025.
- Acquire 9 sensors, loggers and telemetry equipment packages during fall and winter 2025.
- Install weirs and flumes with telemetry equipment on 9 high-use turnouts prior to the 2026 irrigation season (about April 15).
- Install remaining 15 weirs and flumes on low-use turnouts during the 2026 irrigation season with completion by September 30, 2026.

Table 1. Proposed installation schedule.

Phase	Period
Phase 1	May 2025 through March 2026
Phase 2	October 2025 through September 2026
Phase 3	As needed September 2026 through April 2027

HDR toured the canal system and identified the measurement device types anticipated for installation, as documented in the *Turnout Measurement Plan*. HDR subsequently provided a “Measurement Cost Estimate” memorandum in 2023. These reports provide specific measurement recommendations and estimated costs. Standard sharp-crested rectangular or Cipolletti weirs are appropriate for turnouts that have sufficient water surface elevation, or head, available for accurate weir operation. Turnouts with insufficient available head will be equipped with flumes, likely of the cutthroat or Parshall design. A few turnouts may not have sufficient head even for flume operation and may be equipped with a concrete section and ADV instrumentation.

Budget Narrative – PHASE 2

One turnout is equipped with a siphon-pipe conducive to use of a 12-inch magnetic flowmeter. This budget estimate assumes the watermaster will read magnetic flowmeters, as needed, and that telemetry is not required for these systems. The cost

estimate for the 12-inch diameter magnetic flowmeter equipment acquisition is $4,850 (see Table 2). Installation costs is estimated at $1,000 (see Table 3).

Table 2. Equipment cost estimates for closed-conduit magnetic flowmeters.

Size	Count	Cost Each	Total Cost
8	0	$ 3,150	$ -
10	0	$ 3,850	$ -
12	1	$ 4,850	$ 4,850
Totals	1		$ 4,850

Table 3. Installation cost estimates for closed-conduit magnetic flowmeters.

Installation Complexity	Count	Cost Each	Total Cost
Little to no plumbing modification	1	$ 1,000	$ 1,000
Moderate plumbing modification	0	$ 1,500	$ -
Substantial plumbing modification	0	$ 2,000	$ -
Totals	1		$ 1,000

Weirs are recommended whenever possible for cost efficiency, simplicity of installation and operation, and flexibility in adjusting weir crest height, if required. Cipolletti style weirs are recommended for most installations, with rectangular weirs recommended when they can be installed at existing concrete box structures.

Cutthroat style flumes are recommended for sites where sufficient head is not available for weir operation. Flumes are more expensive and are more difficult to adjust when set too low or high, but their operating head requirements can be up to one third to one half that of a comparable weir. This budget includes costs for galvanized steel flume material.

The budget includes stilling tubes with level sensing equipment, data logging, and telemetry for 9 sites with weirs and flumes. Budgeted equipment includes water-level sensors, data loggers, and telemetry. Sites without sensors, loggers and telemetry are infrequently used and volumes will be logged by the company watermaster.

One turnout with existing weir and high use (W52/53 Bare Holdaway) is budged for water-level sensing equipment, logger, and telemetry.

The size, type, number, equipment cost, and installation cost for open channel measuring equipment is provided in Table 4. This table also includes costs for 9 turnouts to be equipped with level sensors, loggers, and telemetry with 8 designated for new installations and 1 destined for an existing weir.

Table 4. Equipment and installation cost estimates for open-channel measuring and telemetry devices.

Size & Type	Count	Cost Each	Installation Cost Each	Total
1.5' Cipolletti	1	$ 1,800	$ 900	$ 2,700
3' Cipolletti	5	$ 2,500	$ 1,250	$ 18,750
4' Cipolletti	5	$ 3,000	$ 1,500	$ 22,500
5' Cipolletti	6	$ 3,500	$ 1,750	$ 31,500
6' Cipolletti	1	$ 4,500	$ 2,250	$ 6,750
4' Rectangular Weir	2	$ 3,000	$ 1,500	$ 9,000
54x12 Cutthroat	1	$ 6,465	$ 3,233	$ 9,698
54x24 Cutthroat	0	$ 8,690	$ 4,345	$ -
108x24 Cutthroat	3	$ 13,015	$ 6,508	$ 58,568
ADCP	0	$ 10,000	$ 5,000	$ -
Sensor, Logger, Telemetry	9	$ 5,000		$ 45,000
Total			$ 28,235	$ 204,465

Table 5 provides the total cost budget. In addition to this WaterSMART proposal, JIC submitted a funding proposal to Idaho Water Resource Board (IWRB). IWRB's Aging Infrastructure grant program may fund up to 1/3 of project costs. IWRB has announced this project is selected for funding. If required, JIC is prepared to self-fund all or some of the IWRB portion of the project.

Table 5. Total cost budget.

Item	Cost	IWRB Aging Infrustructure		USBR WaterSMART		JIC	
		Share (%)	Amount	Share (%)	Amount	Share (%)	Amount
Mag Meters and Installation	$ 5,850	33%	$ 1,950	50%	$ 2,925	17%	$ 975
Weirs, Flumes, ADCP, and Installation	$ 159,465	33%	$ 53,155	50%	$ 79,733	17%	$ 26,578
Sensors, Loggers, Telemetry	$ 45,000	33%	$ 15,000	50%	$ 22,500	17%	$ 7,500
Engineering	$ 16,000	33%	$ 5,333	50%	$ 8,000	17%	$ 2,667
Administration & Legal (5%)	$ 11,316	0%	$ -	50%	$ 5,658	50%	$ 5,658
Total	$ 237,631		$ 75,438		$ 118,815		$ 43,377

Contractors may need to secure state and/or county electrical permits when installing certain equipment, such as magnetic flowmeters. No other permitting is anticipated.

HDR has reviewed individual turnouts and specified size and type of measuring equipment at each site, along with cost estimates for equipment and installation. HDR will work with JIC and contractors during the equipment acquisition and installation process to verify the appropriate equipment is secured and installed properly.

JIC has access to land where measuring equipment will be installed. No additional easements or permissions are required to complete this project.

E.1.4. Evaluation Criterion D. Nexus to Reclamation (5 Points)

The applicant does not have a water service, repayment, or O&M contract with Reclamation.

The applicant is not a Reclamation contractor.

The work will benefit a Reclamation Project area or activity. The project's water measurement initiative is expected to yield reduced pumping from the ESPA and improved compliance with Jefferson Clark Groundwater District's pumping reduction requirements. Improved aquifer conditions will have a positive benefit to flows in the Snake River. Reclamation has projects on the Snake River that will benefit from increased river flows.

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BUDGET NARRATIVE

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Table 3. Equipment and installation cost estimates for open-channel measuring and telemetry devices.

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