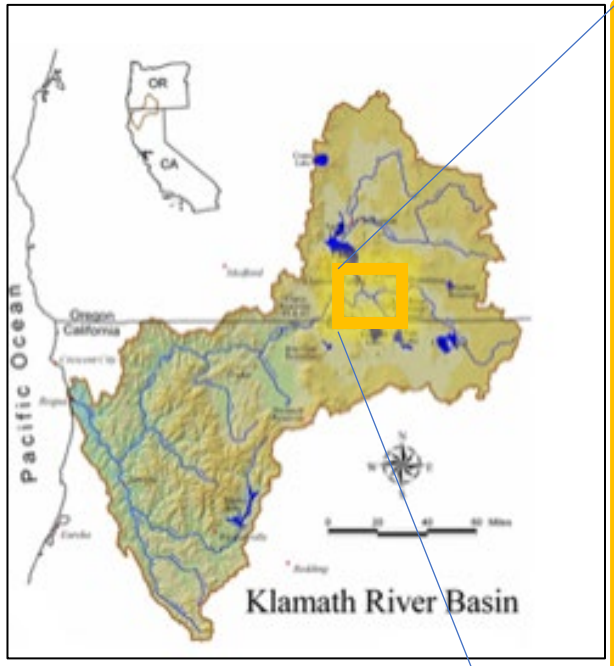
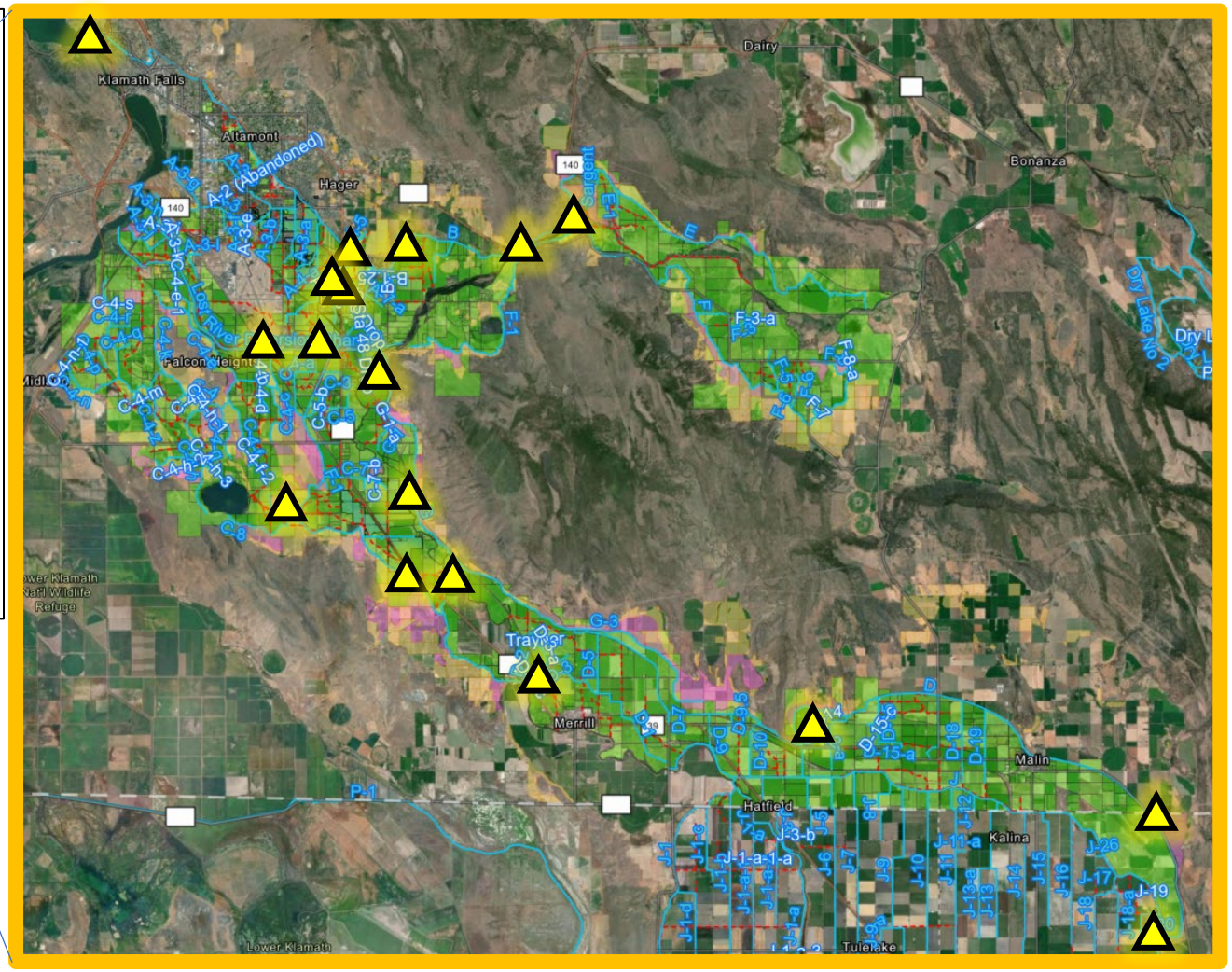
Klamath Irrigation District
- Project: SCADA Controls 2021-2022





Green Shading = Klamath ID

△ = Sensor Installation Needed

Affected Areas

Oregon:
- Klamath County
- Klamath Falls
- Merrill
- Malin
- Poe Valley

California:
- Modoc County
- J Canal (Tulelake)

ATTACHMENTS FORM

Instructions: On this form, you will attach the various files that make up your grant application. Please consult with the appropriate Agency Guidelines for more information about each needed file. Please remember that any files you attach must be in the document format and named as specified in the Guidelines.

Important: Please attach your files in the proper sequence. See the appropriate Agency Guidelines for details.

1) Please attach Attachment 1	1234-WS_Grant_SCADA_2021_Klam	Add Attachment	Delete Attachment	View Attachment
2) Please attach Attachment 2		Add Attachment	Delete Attachment	View Attachment
3) Please attach Attachment 3		Add Attachment	Delete Attachment	View Attachment
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14) Please attach Attachment 14		Add Attachment	Delete Attachment	View Attachment
15) Please attach Attachment 15		Add Attachment	Delete Attachment	View Attachment

KLAMATH IRRIGATION DISTRICT
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Phone: (541) 882-6661 Fax (541) 882-4004

11 September 2020

Reference: WaterSmart Grant Request: BOR-DO-21-F001

Title Page

Project Title: Klamath Irrigation District (Klamath ID) Supervisory Control and Data Acquisition and Automation (SCADA) 2021-2022 Improvements.

Brief Narrative: Klamath ID will install 21x new SCADA components to enhance operations efficiencies and assist in future efficiency planning efforts to improve irrigation delivery system resulting in water savings by reducing spills, over-deliveries, and seepage. 18x modern SCADA sensors will provide near real time data on flow rates, water elevations, control device statuses. Furthermore, installing 3x modernized automation components, allows for the remote operation of delivery system gates in near real time allowing for responsive and accurate control of water in near-real-time verses the 115 year old manual system currently in place which currently requires days of measurements to fine tune inefficiencies in operations.

Applicant: Klamath Irrigation District, 6640 KID Lane, Klamath Falls Oregon, 97603

Project Manager: Jaxsen Sikorski, 6640 KID Lane, Klamath Falls, Oregon, 97603

Jaxsen.Sikorski@KlamathID.org. (541) 882-6661.

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Gene R Souza

Gene Souza
Executive Director and District Manager
Klamath Irrigation District

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TECHNICAL PROPOSAL AND EVALUATION CRITERIA

EXECUTIVE SUMMARY

The Klamath Irrigation District (District), located in southern Oregon and northern California, will work with the Bureau of Reclamation (Reclamation) to install 21x modern supervisory control and data acquisition (SCADA) components on Federal facilities allowing water to be used more efficiently and to store water in the Upper Klamath Lake (UKL) reservoir longer into the water year as requested by the Klamath Tribes of Oregon and the United States Fish and Wildlife Service (USFWS) for endangered species. As outlined in the District's *Water Management and Conservation Plan 2020-2025*, modern sensors are needed to provide near-real-time information to enhance efficiencies in operations and to inform on-going planning efforts designed to improve the irrigation delivery system, maximize water savings, and enhance operational efficiency to reduce spills, over-deliveries and seepage. The overall result of this project is anticipated to conserve up to 39,000 acre feet of water per year. This project will likely increase the production of hydropower at the C-Drop Hydropower facility, reduce the risk of conflict between water users, enable farmers to make additional on-farm improvements in the future, including improvements that may be eligible for Natural Resources Conservation Service (NRCS) funding, and contribute to water supply reliability in the Klamath Basin. The duration of this effort is 18-24 months with an expected completion date in December 2022. The District will perform this work on Federal facilities known across Reclamation as the Klamath Project.

PROJECT LOCATION

Klamath County, Oregon & Modoc County, California (see Figure 1).

The Klamath Irrigation District is located in southern Oregon, south and east of Klamath Falls with a contractual obligation to provide operations and maintenance of Federal infrastructure for a small area of the Tulelake Irrigation District (ID) in Modoc County, California. This modernization effort will occur across the District as shown in Figure 1; the yellow triangles on the map of the District show SCADA component installation locations.

TECHNICAL PROJECT DESCRIPTION

Bottom Line: Recent improvements in water management SCADA technologies will allow for greater opportunities to enhance conservation stewardship, stretch scarce water supplies, and inform operational decisions. Klamath ID seeks to expand, enhance, and update its water management system to **reduce up to 39,000 acre feet of water loss in the District** as a portion of the loss identified by multiple studies of the Klamath Project.

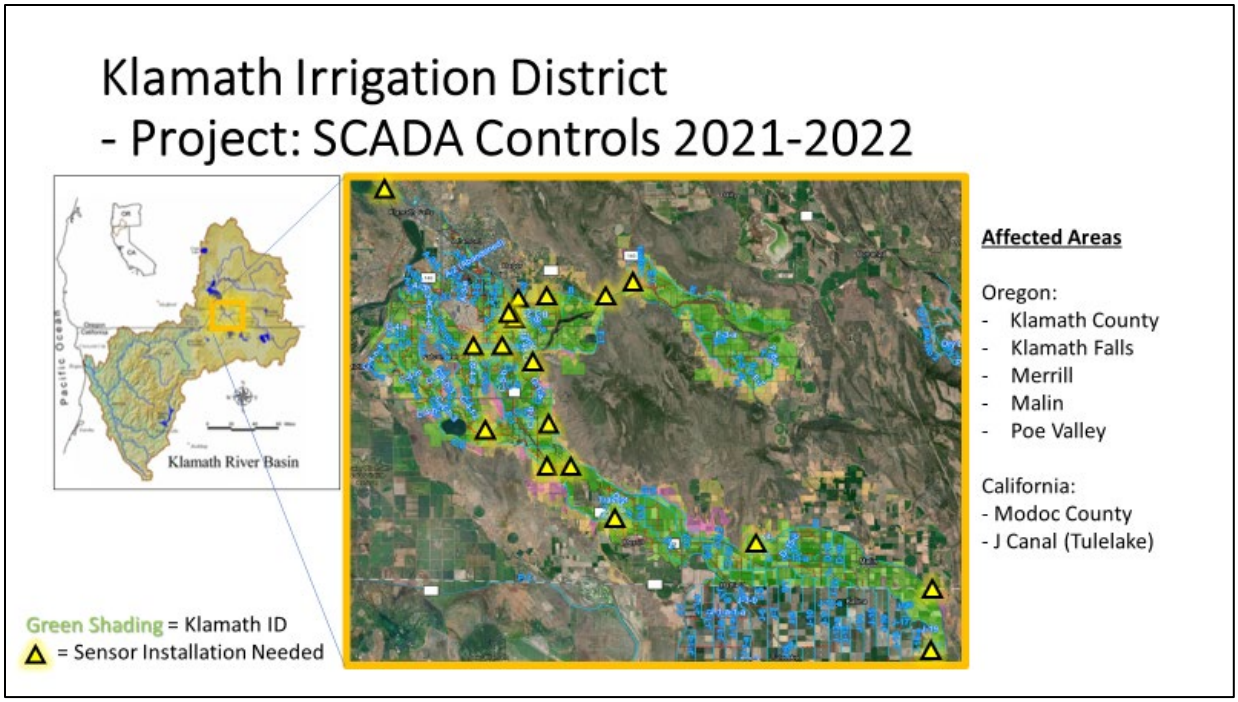


Figure 1 SCADA Upgrade Locations Within Klamath Irrigation District.

In July 2019, Klamath ID entered into contract with Sierra Controls to inspect and evaluate the current water management system controllers focusing our efforts on finding solutions to improve water savings, reduce spills, and reduce over-deliveries at critical points in the system by installing automation components and measuring devices. Completion of this project will positively impact the eight other irrigation districts reliant upon Klamath ID's delivery system. See Annex C for additional information on the planning work done with Sierra Controls in 2019. Planned upgrades will include:

1. **Upgrade and Modernization of the Office SCADA system as recommended by Reclamation[1], Irrigation Training and Research Center (ITRC)[2], and Sierra Controls[3].** *The existing system is incapable of providing increased efficiency or effectiveness of water distribution*. To efficiently and effectively control the delivery of irrigation water, the new system must significantly increase the number of connected sensors and gate controllers on a modern communication system. Therefore, Klamath ID

[1] Reclamation. April 2012. Klamath Project Yield and Water Quality Improvement Options Appraisal Study Workbook. Option 29: Overhaul the office SCADA System. Available at https://drive.google.com/file/d/1938aerLbqafgU-EqbnE6Mj_o0GZoksWq/view?usp=sharing

[2] Irrigation Training and Research Center. July 2007. Priorities for Improving Control and Measurement in the Klamath Reclamation Project.

[3] Sierra Controls. October 2019. Klamath ID SCADA Restoration Project. Provided as Annex C.

purchased and installed a new computer and server in 2020 which is fully capable to facilitate the migration to a modern SCADA Master Terminal Unit for near-real time monitoring and control of multiple components within the irrigation system. The computer and server upgrade was required prior to installing additional sensors, software, and gate controllers.

Figure 2 Example of a Modern Master Terminal Unit recommended by Sierra Controls

2. **Configure and install 18 new water flow sensors at critical points within the Klamath ID infrastructure as recommended in studies by Reclamation, ITRC, and Sierra Controls.** Flow data from the head of each canal (A, B, C, D, E, F, and G), the tail spill from the C and D canals, the spillway of the C-Siphon, the intake from pumping plants, and the flow of two drains are required to make accurate and timely decisions to near-real-time operational adjustments to diversions from the A Canal Headworks.

    a. Previously mentioned studies state additional data is needed along the A Canal to reduce over-deliveries to the B and C Canals. Numerous unsensored discharges and diversions along the A Canal inhibit an accurate measurement of water being delivered to the B and C Canals.

    b. The spill of the C Canal is currently not monitored. Installation of sensors which report back to the Klamath ID headquarters at the C Canal spill will improve opportunities to capture water savings by reducing flow at the head of the C Canal and allow simultaneous reporting to Tulelake Irrigation District operations allowing Tulelake ID to adjust diversions from Station 48 on the Lost River Diversion Channel based upon information from the C Canal spill into Lost River.

    c. Sensors at the C-G Cutoff are semi-inaccurate and do not facilitate remote operation of automated mechanical devices. A new sensor package is needed at the C-G Cutoff to reduce over deliveries, reduce spill, and facilitate the

installation of an automated gate structure. Below the C-G Cutoff, the G Canal flows southeast about 8 miles to discharge into the D Canal.

d. Improvements to the Covington Station sensor communication package on the D Canal is required to allow for integration of the data into a central control system from the Klamath ID headquarters to improve operational efficiency and reduce spill.

e. Installation of sensors, which report back to the Klamath ID headquarters at the D Canal spill, will improve opportunities to capture water savings by informing Tulelake Irrigation District operations to adjust diversions from Station 48 on the Lost River Diversion Channel. The spill from the D Canal goes directly into the J Canal operated by Tulelake Irrigation District. Currently the D Spill is uncensored and the inability to identify over-deliveries result in increased spill and operational cost for pumping by Tulelake ID.

f. The Number 1 (#1) Drain captures storm water, spring water, and irrigation runoff which is then deposited into the Lost River and delivered to Klamath ID patrons along the river, the City of Merrill, and Tulelake ID. The #1 drain currently is not monitored. Installing remote sensors, which report back to Klamath ID and Tulelake ID headquarters allows for both districts to adjust operations, reduce unneeded diversions, and attempt to recapture spill without waste.

g. The Number 5 (#5) Drain captures storm water, spring water, and irrigation runoff which are then deposited into the Lost River and delivered to Klamath ID patrons along the river, the City of Merrill, and Tulelake ID. The #5 drain currently is not monitored. Installing remote sensors, which report back to Klamath ID and Tulelake ID headquarters allows for both districts to adjust operations, reduce unneeded diversions, and attempt to effectively recapture spill without waste.

h. The District has seven reuse pumping stations (Miller Hill, Stukel, Adams, South Poe Valley, North Poe Valley, Melhase Ryan, and the #5 Pump) with a total of 17 pumps. These pumps require SCADA upgrades to facilitate control of variable frequency drives from a centralized SCADA operation system.

i. The newly constructed C-Siphon requires a sensor to monitor return flow into the Lost River Diversion Canal. Return flow to the Lost River Channel offsets the amount of water required at Link River Dam from Upper Klamath Lake for downstream flow requirements. Measuring spill into the Lost River Diversion Channel mitigates unnecessary reductions to Upper Klamath Lake levels.

j. Upgrade A Canal Headworks Sensor: Reclamation, ITRC, and Sierra Controls studies identified SCADA improvements are needed at the A Canal headworks to reduce over deliveries and allow for the installation of an integrated control system from the Klamath ID headquarters to improve operational efficiency. This improvement will include an improved modern sensor, improved communication

systems, and programing to integrate the improvement with the existing 20-year-old programmable logic controller (PLC) and Human Machine Interface Computer (HMI) installed by Reclamation in 2002.

3. **Install a modernized automated integrated control system to the B Canal headworks as recommended by ITRC.** Control of this infrastructure from the Klamath ID headquarters will improve operational efficiency; the current manually controlled system is inefficient, provides inaccurate flow rates, and operators are currently unable to make changes in near-real-time to the B Canal flow when inefficiencies are identified.

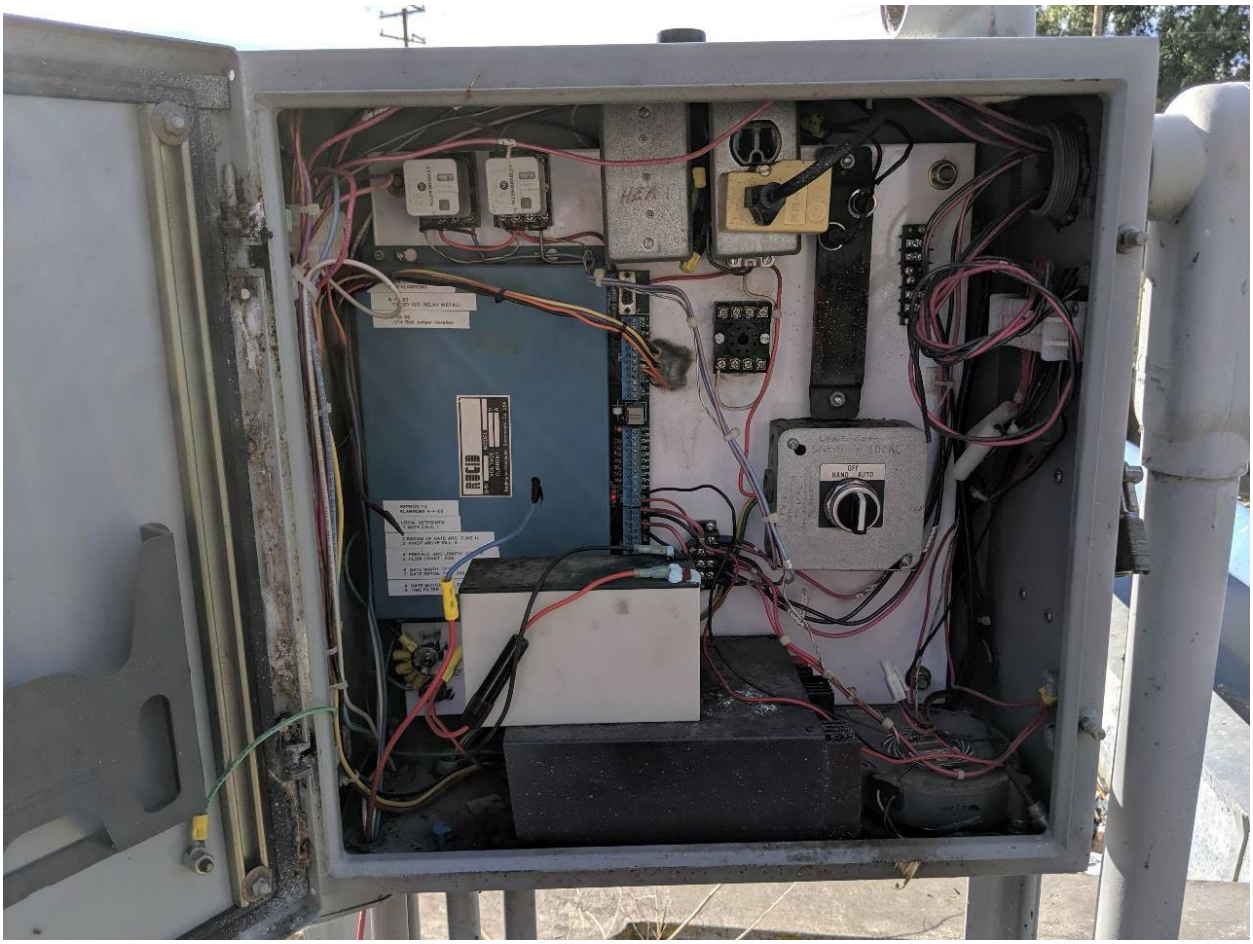


Figure 3 B Canal Control Structure. Remote automation controller and sensor package are needed to improve operational efficiency. Flow inaccuracies are common due to human error and a lack of accurate measurements at the gate.

4. **Install a modernized automated integrated control system to the head of the C Siphon**. Control of this infrastructure from the Klamath ID headquarters will improve operational efficiency; the current manually controlled system is inefficient, provides inaccurate flow rates, and operators are currently unable to make near-real-time changes to the C Canal flow when inefficiencies are identified.

Figure 4 C-Siphon Gate with no automated controls. Flow inaccuracies are common due to human error and significant guesswork in flows upstream from the gate.

5. **Install a modernized automated integrated control system to the head of the G Canal.** Control of this infrastructure from the Klamath ID headquarters will improve operational efficiency; the current manually controlled system is inefficient, provides inaccurate flow rates, and operators are currently unable to quickly make changes to the G Canal flow when inefficiencies are identified. Initial analysis indicates the G Canal head gates may need to be rebuilt to facilitate automated controls.

Figure 5 G Canal Head Gates are without automated controls. Flow inaccuracies are common due to human error and inaccurate measurement sensors at the gate.

EVALUATION CRITERIA

Evaluation Criteria: Scoring Summary	Points:
A. Quantifiable Water Savings	**30**
B. Water Supply Reliability	**18**
C. Implementing Hydropower	**18**
D. Complementing On-Farm Irrigation Improvements	**10**
E. Department of the Interior Priorities	**10**
F. Implementation and Results	**6**
G: Nexus to Reclamation Project Activities	**4**
H: Additional Non-Federal Funding	**4**
Total	***100***

Quantifiable Water Savings:

Amount of estimated water savings: **39,000 acre feet per year.**

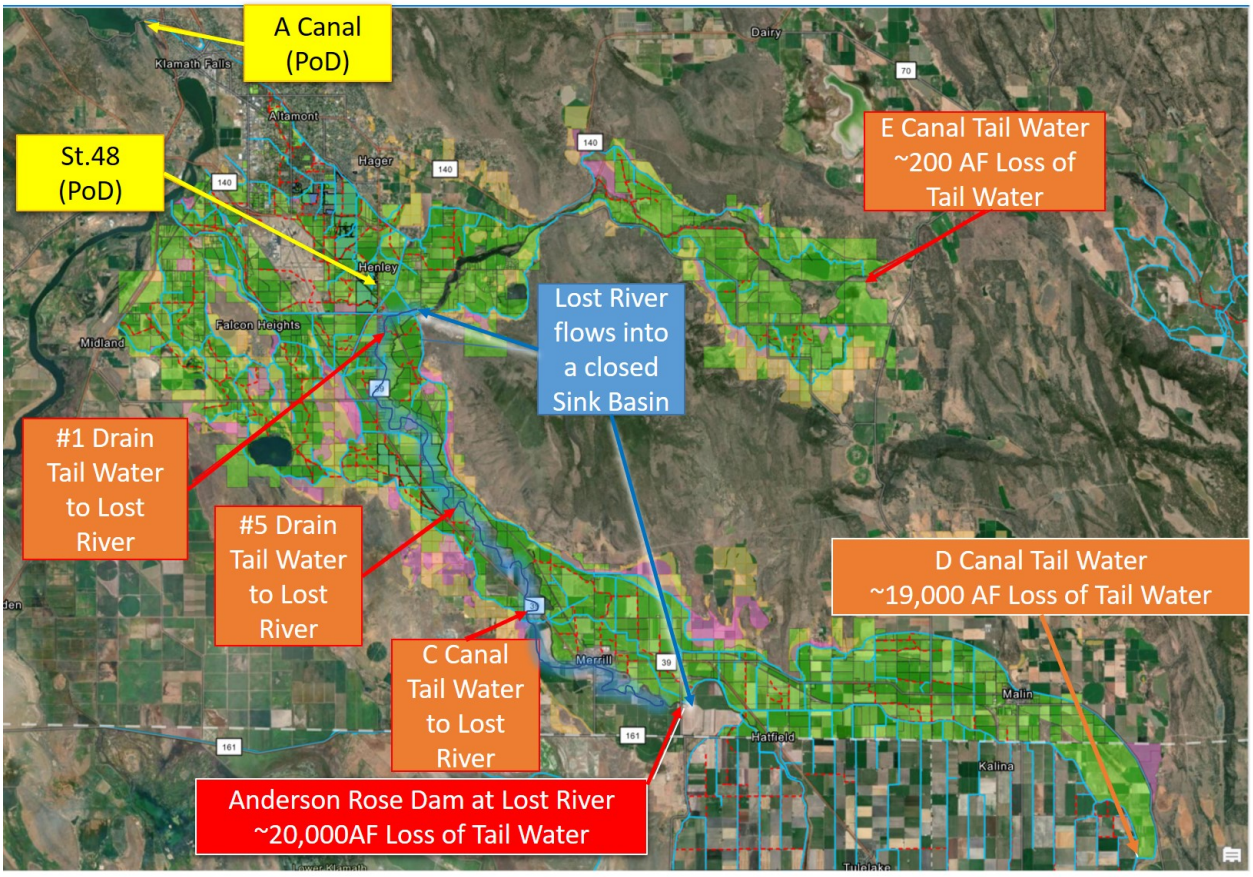


Figure 6 Klamath ID tail water flows southeast arriving at tail of the D Canal and Anderson-Rose Dam where any spill over the dam is lost to Project irrigators for beneficial use.

Describe current losses: Various studies over the past 30 years indicate Klamath ID loses 60,522 acre feet of water per year in tail water spill on average (refer to Figures 7 and 8).[4] In Klamath Project planning and construction between 1905 and 1922, the infrastructure operated by Klamath ID was designed to specifically spill into the Lost River and into the J Canal for overall Project efficiencies. This project seeks to address the most significant issues identified in studies by Reclamation and ITRC[5] to reduce losses by over 39,000 acre feet per year. Figure 6 highlights the location of District tail water spill into the Lost River; once water crests over Anderson-Rose Dam at the southern end of the District, the water is lost to the Project farmers for irrigation beneficial use. This design is inefficient with current regulatory policies and demands upon the water resources. Currently the spills into the Lost River and at the end of the

[4] David's Engineering. 1998. Project Water Use and Analytical Tool. Report shared on Google Drive at https://drive.google.com/file/d/1phTQ6tq80x0VU85V62jOcT1ZZM_Sdbf9/view?usp=sharing

[5] ITRC. 2008. Master Development Plan. Report shared on Google Drive at https://drive.google.com/file/d/1_MPcr7EpbZn-Dvmj7S5eWkOUf5GbsI0n/view?usp=sharing

D Canal are unmeasured which is inefficient, does not allow for near-real-time adjustments within the system, and significantly contributes to the waste of valuable resources.

Describe the support/documentation of estimated water savings:

a. How have average annual water savings estimates been determined? Provide all relevant calculations, assumptions, and supporting data.

Assumptions: The historical water losses at the Anderson-Rose Dam and D Canal Spills will continue without investment in SCADA sensors and control systems. Installation of sensors reporting to a centralized operations cell, in near real time, combined with automated control systems will directly result in reduced daily diversions, minimized incidental spill, and improve inter-district coordination.

Calculations:

Average Spill at Anderson-Rose Dam (20,000+ acre feet annually)
+
Average Spill from D Canal (19,000+ acre feet annually)
+
Estimated Spill from E Canal (200+ acre feet annually)

Total = 39,200+ acre feet Annual Water Savings

Supporting data:

The Klamath Project system is complex; to understand potential water savings requires in-depth analysis of the Project and how it was constructed between 1887 and 1917 and further expanded in the 1920s and 1930s as Tulelake ID was developed. Installing SCADA sensors and controls intends to reduce incidental spill from the #1 Drain, #5 Drain, and C Canal Tail Water from cresting over Anderson-Rose Dam to 0 cfs (cubic feet per second) resulting in a saving over 20,000 acre feet per year as highlighted in Figure 11. Anderson-Rose Dam spill losses reported by Tulelake ID for the 2017 water year is an example of a typical irrigation year; the data provided is extracted from Tulelake ID reports to Reclamation's local area office.

BACKGROUND DATA and PREVIOUS STUDIES SYNOPSIS

Klamath ID is the backbone to Reclamation's Klamath Project in southern Oregon and Northern California.[6] Klamath ID provides service to eight (8) additional irrigation / improvement districts within the Project to include operations and maintenance on the Project's "Main Unit" lands and Warren Act lands **with over 400 miles of canals and drains** serving over 122,000 acres of cropland, of which 53,638 irrigatable acres are within the District's boundaries.[7] Most measuring points in the District **currently require staff gauge measurements collected by hand**. Outflow points for the District are unmeasured in real-time,

[6] United States Reclamation Service. I.S. Voorhees. 1913. History of the Klamath Project. Available at https://drive.google.com/file/d/1dlBjtJiURi-FVvrBmvf0WXRj6Zd_pWjL/view?usp=sharing

[7] Klamath Irrigation District. 2020. *Water Management and Conservation Plan 2020-2015 - Draft.*

often resulting in excess spill, thus the immediate need for this project to reduce loss in the system created by unnecessary end spills due to limitations in near-real-time water flow reporting.

Klamath ID is the hub of the Klamath Project providing direct service to over 3,200 parcels and delivers irrigation water to spoke Districts outside its boundaries.[8] The District has one major diversion, from Upper Klamath Lake into the A Canal, with a capacity of 1,150 cfs. The primary crops grown in Klamath ID are alfalfa, pasture, potatoes, and cereal grains; however, row crops, orchards, strawberries, and landscape plants are also irrigated from the District's system.

10 Year Study Month	Net supply	**Lateral Tail Water Average Loss**		Lateral losses		Delivered to farms in Klamath ID	
	acre-feet	acre-feet	% of Net	acre-feet	% of Net	acre-feet	% of Net
Apr	17,707	6,276	35%	2,458	14%	6,931	39%
May	45,286	10,069	22%	4,990	11%	28,943	64%
Jun	54,830	9,591	17%	6,522	12%	38,500	70%
Jul	67,685	10,341	15%	9,752	14%	47,456	70%
Aug	61,063	10,934	18%	9,080	15%	41,030	67%
Sep	40,221	9,689	24%	6,011	15%	24,504	61%
Oct	11,284	3,622	32%	1,865	17%	5,752	51%
Total	298,076	**60,522**	20%	40,678	14%	193,116	65%

Note: A small amount of water, approximately 1% of the net supply, is not accounted for in the above table. This quantity of water is believed to be part of the main canal losses which includes the initial filling of the system and the end of year draining of the system.

Figure 7 Extract from MBK Engineers Study. Appendix A to Klamath ID Water Management and Conservation Plan 2003

[8] I.S. Voorhees. 1912. *History of the Klamath Project*. Available at https://drive.google.com/file/d/1dlBjtJiURi-FVvrBmvf0WXRj6Zd_pWjL/view?usp=sharing

Figure 7 captures data from a study on the existing **water loss data for the District which reports approximately 20 percent (60,522 acre feet per year) of diverted water is lost** to the District in end spills (tail water).[9] The District's irrigation delivery infrastructure is generally unchanged since 1917. Figure 8 from the *On-Project Plan Technical Memorandum #3*, developed by the Klamath Water and Power Agency[10] supports data in David's Engineering report delivered in 1998,[11] used in the 2003 MBK Engineer Study for Klamath ID Water Management and Conservation plan, and is still relevant today.

Total KID Water Requirements
Irrigation and Water Requirements/Demands for the On-Project Plan Area

Requirement	Demand (Acre-feet)		
	Low Demand	Average Demand	High Demand
Initial Spring Fillup[a]	4,000	4,000	4,000
Conveyance Losses: Seepage and Evaporation[b]	18,150	20,880	24,260
Operational Spills[c]	45,390	52,200	60,640
On-field Water Requirement[d]	114,000	131,710	153,670
Total District Water Requirement	**181,540**	**208,790**	**242,570**

[a] Based on assumed distribution system length and canal geometry.

[b] Estimated to be 10% of total District demand.

[c] Estimated to be 25% of total District demand.

[d] Accounts for crop consumptive use with adjustments for non-pristine crop conditions, effective precipitation, available soil moisture, and field-level irrigation system efficiency.

Figure 8 Extract from the On-Project Plan Technical Memorandum #3 (2012). Klamath ID Operational Spill Analysis[12]

Figure 9 is an extract from *Reclamation's Master Development Plan, Conceptual Overview of System Improvements for the Klamath Project*, created by the Irritation Training and Research Center (ITRC), dated March 2008.[13] This study includes Category 1 recommendations for new

[9] MBK Engineers. 2003. Appendix A to Klamath ID *Water Management and Conservation Plan*

[10] Klamath Water and Power Association. 2011-2014. On-Project Plan Technical Memorandums 1 through 7 referenced by Reclamation at https://www.usbr.gov/mp/kbao/programs/spcl-projects/on-prjct.html The OPP Final Summary Report is available at http://www.klamathcouncil.org/wp-content/uploads/2015/11/OPP-Summary-Report-FINAL.pdf

[11] Reclamation and David's Engineering. October 1998. Klamath Project Historical Water Use Analytical Study. Available at https://drive.google.com/file/d/1phTQ6tq80x0VU85V62jOcT1ZZM_Sdbf9/view?usp=sharing

[12] KWAPA. 2012. On Project Plan Technical Memorandum #3. Available at https://drive.google.com/file/d/1xKv7ReaYm7UIS2VHIem6mnWJ4z8ePyuk/view?usp=sharing

[13] Reclamation and ITRC. March 2008. Master Development Plan, Conceptual Overview of System Improvements for the Klamath Project.

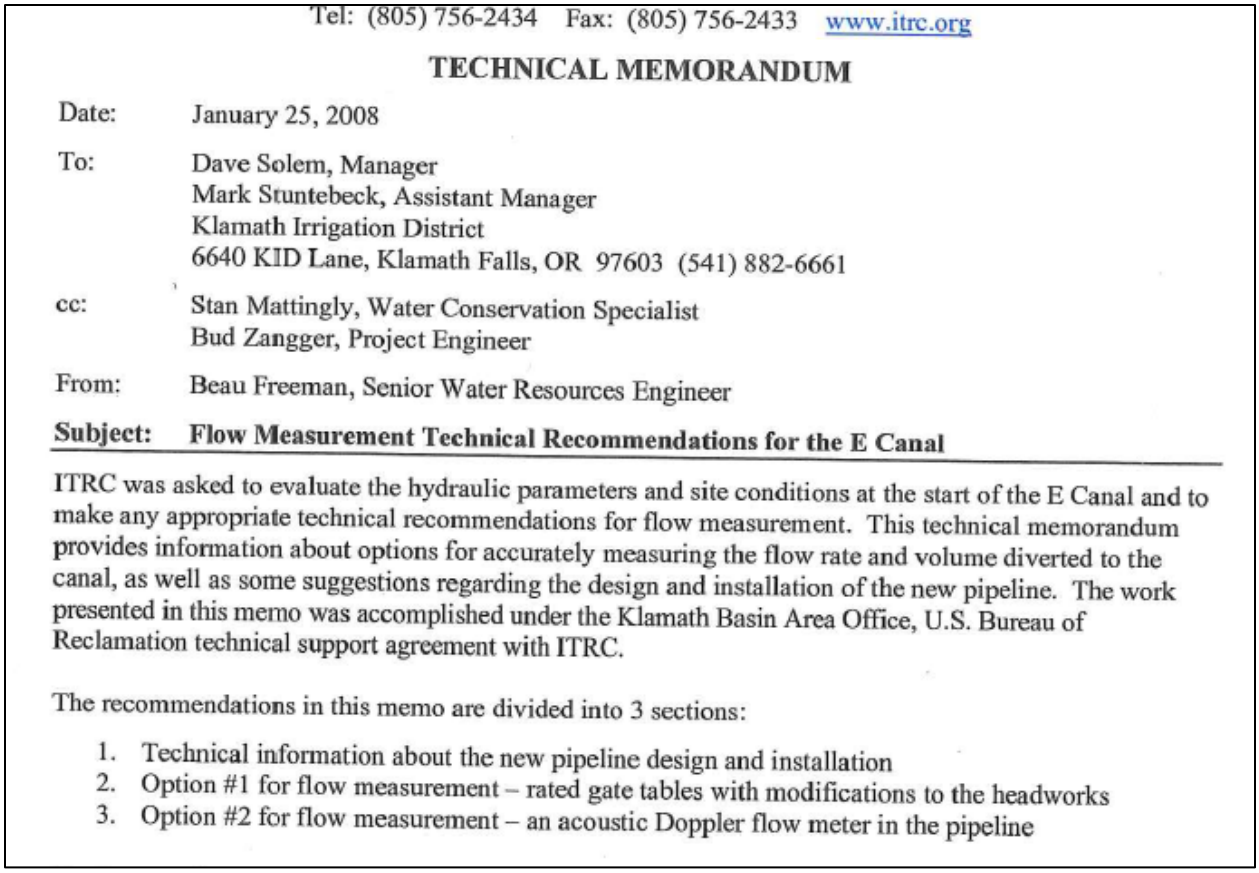
monitoring stations and office SCADA improvements, automated flow control of the G Canal, remote monitoring of spill into Tulelake ID, and monitoring stations for return flows to the Lost River addressed by this modernization effort.

Recommended System Improvement Projects in the *Master Development Plan*	Volumetric Allocation	Improved district operation and water delivery service	Improved basic data for water balances and long-term planning	Reduction in pumping costs	Maintain in-stream flows in the Lost River	Reduced O&M and labor costs	Facilitate compliance with water quality regulations	Reduction in operational canal spill
Category 1								
Long-crested weirs – C Canal and J Laterals	√	√	√	√		√		√
Automated flow control headings – G Canal	√	√	√	√		√		√
Modifications to the end of the Lower C Canal		√			√	√		√
Replogle flumes at major lateral headings	√	√	√					√
Improved control structures at the B, E and F Canals	√	√	√	√		√		
VFD controls at the A Pumping Plant		√		√		√		
Upgrade flow measurement in the J Canal	√		√					
Remote monitoring of spill in Tulelake ID		√	√	√		√	√	√
Upgrade SCADA system at Station 48		√	√					
Pipelines from Wells #4 and #5 to the J Canal		√						
Monitoring stations for return flows to the Lost River	√		√				√	√
Overhaul office SCADA systems	√	√	√	√			√	√
Automated trash screens at pumping plants		√		√		√		

Figure 9 Category 1 Recommendations from the ITRC Master Development Plan Extract for the Klamath Project[14]

As shown in Figure 10, the ITRC also recommended acoustic doppler flow meters to improve efficiencies for the E Canal in a Technical Memorandum titled *Flow Measurement Technical Recommendations for the E Canal* dated 25 January 2008 by Beau Freeman of ITRC.

[14] Reclamation and ITRC. March 2008. Master Development Plan, Conceptual Overview of System Improvements for the Klamath Project. Table 1. Available at https://drive.google.com/file/d/1_MPcr7EpbZn-Dvmj7S5eWkOUf5GbsI0n/view?usp=sharing



Tel: (805) 756-2434 Fax: (805) 756-2433 www.itrc.org

TECHNICAL MEMORANDUM

Date: January 25, 2008

To: Dave Solem, Manager
Mark Stuntebeck, Assistant Manager
Klamath Irrigation District
6640 KID Lane, Klamath Falls, OR 97603 (541) 882-6661

cc: Stan Mattingly, Water Conservation Specialist
Bud Zangger, Project Engineer

From: Beau Freeman, Senior Water Resources Engineer

Subject: Flow Measurement Technical Recommendations for the E Canal

ITRC was asked to evaluate the hydraulic parameters and site conditions at the start of the E Canal and to make any appropriate technical recommendations for flow measurement. This technical memorandum provides information about options for accurately measuring the flow rate and volume diverted to the canal, as well as some suggestions regarding the design and installation of the new pipeline. The work presented in this memo was accomplished under the Klamath Basin Area Office, U.S. Bureau of Reclamation technical support agreement with ITRC.

The recommendations in this memo are divided into 3 sections:

1. Technical information about the new pipeline design and installation
2. Option #1 for flow measurement – rated gate tables with modifications to the headworks
3. Option #2 for flow measurement – an acoustic Doppler flow meter in the pipeline

Figure 10 Title Page from ITRC recommending acoustic Doppler flow meter at the head of the E Canal[15]

These studies support Reclamation's *Klamath Project Yield and Water Quality Improvement Options Appraisal Study Workbook* (April 2012) recommending SCADA upgrades in Options 27, 29, 30, and 32. The titles to these recommendations are listed below:

Option 27: Improve Existing Control Structures at the B, E, and F Canals[16]

Option 29: Overhaul the Office SCADA Systems[17]

[15] ITRC. 25 January 2008. Technical Memorandum – *Flow Measurement Technical Recommendation for the E Canal.* Available at https://drive.google.com/file/d/1q_j06NknLTZ9QHgHFEDVPp-aZCzt37MG/view?usp=sharing

[16] Reclamation. 2012. Option 27. Improve Existing Control Structures at the B, E, and F Canals. Available at https://drive.google.com/file/d/1mwVbQGFVwVqSi8LYrW5B3vaoS1vRVTUU/view?usp=sharing

[17] Reclamation . 2012. Option 29. Overhaul the Office SCADA Systems. Available at https://drive.google.com/file/d/1938aerLbqafgU-EqbnE6Mj_o0GZoksWq/view?usp=sharing

Option 30: Attach Measurement Devices to SCADA[18]

Option 32: Automate the Flow Control at the Head of the G Canal[19]

Furthermore, Reclamation's *Technical Report of Findings Appraisal-Level Design Alternatives for the "A" Canal, Klamath Project, Oregon*, dated September 2014 (the data within the document is For Official Use Only and thus no additional information from the report is provided in this document) further recommends additional SCADA instrumentation and carried as Category 2 recommendation item number 2011-2-A for nearly 10 years[20].

In October 2018, Klamath ID entered into a partnership with Farmers Conservation Alliance to begin exploring opportunities to modernize the irrigation infrastructure system. This project directly addresses the District's ability to minimize end spills with a more responsive system which can correct spills within hours versus the days it currently takes to travel and measure flows across over 400 miles of infrastructure.

This project will also enhance and inform Klamath ID's Water Management and Conservation Plan impacting multiple stakeholders across the Klamath Project. The improvements in this endeavor are planned to be installed over 18 months. Site surveys, planning, and contractor coordination occurred in 2019. Unfortunately, COVID-19 policies delayed 2020 site preparation activities and environmental assessments although the budget was available. Klamath ID anticipates commencing these activities upon the lifting of COVID restrictions and the approval of this grant. The next steps following environmental compliance assessment require SCADA equipment purchases, site preparation, and sensor calibration prior to installation.

DATE	STATION 48	**ANDERSON-ROSE DAM SPILL**	J CANAL	TULE LAKE PRECIP	TULE LAKE SNOW	**D PLANT PUMPING**	TULE LAKE ELEV.
2017 WY AF Total	71259.2	**23,337.9**	122259.0			**30,603**	

Figure 11 Tulelake ID Daily Report Extract - Incidental Spill over Anderson-Rose Dam (loss to Project) in 2017[21]

[18] Reclamation. 2012. Option 30. Attach Measurement Devices to SCADA System. Available at https://drive.google.com/file/d/1q_j06NknLTZ9QHgHFEDVPp-aZCzt37MG/view?usp=sharing

[19] Reclamation. 2012. Option 32. Automate the Flow Control at the Head of the G Canal. Available at https://drive.google.com/file/d/1LlhyEa_WR8dGivdYCmU0f5UwACb-ULyo/view?usp=sharing

[20] Reclamation. 2011-2020. Technical Report of Findings Appraisal-Level Design Alternatives for the "A" Canal, Klamath Project. FOUO.

[21] Tulelake Irrigation District. 2017. TID Daily Report WY 1016-2017. Available at https://drive.google.com/file/d/1zfm5Bp9PX6Z4zUXi5Q9bjZFWenCdlZO_/view?usp=sharing

With near-real time sensors on the C Canal spill, #1 Drain, and #5 Drain, operations personnel can make immediate adjustments to the A Canal Headworks to reduce diversions from Upper Klamath Lake, make adjustments to the C-Siphon head gate to reduce flows, and to inform Tulelake ID to modify its diversions through Station 48 which will inform and prevent uncontrolled spill over Anderson-Rose Dam. *Near-real time sensors and automated control systems reduce rection time and facilitates the ability to capitalize on water savings.*

The data in Figure 12 was collected for a project with students attending the Oregon Institute of Technology utilizing data loggers connected to a low-fidelity flow meter in an unimproved channel. This data clearly demonstrates the need to understand outflow into the #1 Drain system into the Lost River which ultimately arrives uncontrolled at the Anderson-Rose Dam.

KID #1 DRAIN FLOW SUMMARY 2018-2019

Flows measured at KID No. 1 Drain. The weir is located approximately 200' east of hwy 39

Peak Monthly (cfs)																	
2018								2019									
May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October
204.43	221.72	257.98	418.42	418.42	240.10						109.63	257.98	257.98	257.98	257.98	418.42	147.97
Total Monthly Discharge (acre-ft)																	
2018								2019									
May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October
3028.59	12387.57	16867.78	14286.95	8628.68	86.75						1797.32	15596.37	15331.37	15203.27	18535.70	21760.30	0.00
Seasonal total for 2018 = 55286.32								Seasonal total for 2019 = 88224.33									
Average Monthly Flow rates (cfs)																	
2018								2019									
May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October
40.90	138.80	178.91	224.51	244.30	212.43						72.55	183.29	178.99	179.09	171.14	199.71	47.64

Figure 12 Klamath ID #1 Drain Flow Study 2018-2019 shows 55,000 & 88,000 acre feet of loss to the #1 Drain into Lost River contributing to spill loss at Anderson-Rose Dam

An additional 19,000 acre feet of operational spill may be reduced at the D Canal with a modern SCADA system. Figure 13 provides data extracted from a 2012 Reclamation Study to Improve Project Yield showing Klamath ID spill on the D Canal; there has been no change to the infrastructure nor operations on the D Canal since this study was published. On average, over 19,000 acre feet is lost annually to operational spill from the D Canal and its laterals.

Year	D Canal Operational Spill (ac/ft)	D Canal Lateral Operational Spill (ac/ft)
2006	9,704	11,419
2007	9,504	10,357
2008	7,678	8,639
2009	9,723	11,177
2010	Short Water Year	Partial Year Irrigation
2011	9,951	9,350
	Average: 9,312	**Average: 10,188**

Figure 13 Extract from Klamath ID Multi year Study. Average D Canal and Lateral Spills. A scheduled 2019 Study by the Farmers Conservation Alliance was delayed due to COVID-19 and Drought Conditions in the Klamath Project.

An additional 200-acre feet of operational spill can be reduced by accurately measuring the E Canal. As identified by ITRC their 25 January 2008 study which states, "At present, the District measures the diverted flow rate using calibrated ratings for the sluice gates by measuring upstream water level, downstream water level, and gate opening. The maximum flow rate is approximately 35 cubic feet per second. The available head across the gate is only a few tenths of a foot (0.2 to 0.5ft), which makes good flow rate control difficult. The less head drop there is

across the headworks, the more sensitive the diverted flow rate is to water fluctuations."[22] Currently ditch riders make adjustments to the E Canal head gates only when E Canal spill is in excess of 10cfs due to the sensitivity of the system.

b. Have current operational losses been determined? If water savings are based on a reduction of spills, please provide support for the amount of water currently being lost to spills.

Documentation of water lost due to spill is shown in Figures 11, 12, and 13 and further supported by documentation provided in the following Reclamation publications:

- David's Engineering Inc report for the period of 1961 through 1997 titled *Klamath Project Historical Water Use Analysis,* specifically focusing on water flowing passing Anderson-Rose Dam plus the water flowing out of the D Canal is estimated that Klamath ID operation spill is between 30,000 (dry year) to 200,000 (wet year) acre feet per year.[23]

- MBK Engineers provided data from a 10-year study as Appendix A to Klamath ID's 2003 *Water Management and Conservation Plan*[24] showing a 10-year average loss of 60,522 acre feet per year and summarized in Figure 7.

- Various individual ITRC reports between 2000 and 2012 support Reclamation's *Klamath Project Yield and Water Quality Improvement Options Appraisal* specifically focusing efforts to reduce the losses identified by MBK's 2003 report.

- Reclamation's 2012 *Klamath Project Yield and Water Quality Improvement Options Appraisal* dated 2012 specifically focused on Options 27, 29, 30, & 32 discussed later in this document. This appraisal is in response to the previous studies mentioned.

- *On-Project Plan, Technical Memorandum #2* developed by the Klamath Water and Power Agency, published in April 2012, states in part 7.1.3. "return flows from Klamath ID… have been measured…measurements of drainage flow at these locations range from approximately 23,000 to 85,000 acre-feet."[25]

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[22] ITRC. 25 January 2008. Technical Memorandum. Flow Measurement Technical Recommendation for the E Canal. Available at https://drive.google.com/file/d/1QlM0oCTXod5VwmDZqrVIfNviWZHuRTNI/view?usp=sharing

[23] David's Engineering Inc. 1998. Klamath Project Historical Water Use Analysis. p13. Available at https://drive.google.com/file/d/1phTQ6tq80x0VU85V62jOcT1ZZM_Sdbf9/view?usp=sharing

[24] MBK. 2003. Klamath ID Water Management and Conservation Plan Appendix A. Available at https://drive.google.com/file/d/17bbDHNC60QqoszZtAMThZVhKru4W0vjU/view?usp=sharing

[25] KWAPA. 2012. On Project Plan Technical Memorandum #2. Available at https://drive.google.com/file/d/1PLvbT_gZsooYg5S5yUn5RrhL6C-tlZgz/view?usp=sharing

- Tulelake ID daily reporting of spill at Anderson-Rose Dam (received 24-72 hours after spill) – See Figure 10 for an extract of the 30 September 2017 report which shows 23,337 acre feet of tail water spill over Anderson-Rose Dam.[26] A one month extract is provided in Annex A.

- Tulelake ID daily reporting of D-Plant Pumping (received 24-72 hours after pumping occurs.) See Figure 10 for an extract of the 30 September 2017 report which show 30,603 acre feet pumped from the sump below Anderson-Rose Dam.[27] A one month extract is provided in Annex A.

- Tulelake ID telephone calls in 2019 to complain on excessive D Canal spill (requires 48+ hours to address and fix)

- Tulelake ID telephone calls in 2019 to complain on excessive D Canal Lateral spill into drains (requires 72+ hours to address and fix)

- Oregon Institute of Technology WADRS Program and Internship Program participants.

c. Are flows currently measured at proposed sites and if so what is the accuracy of existing devices? How has the existing measurement accuracy been established?

Flows at Anderson-Rose Dam are currently monitored by the Tulelake Irrigation District and reported to Klamath ID 24-72 hours after spill has occurred. Accuracy is assumed confirmed by Reclamation's local office.

The contributing spill from the #1 Drain, #5 Drain, and C Canal Spill which impact flows at Anderson-Rose Dam are not currently measured on a daily basis. Data loggers installed by students from Oregon Institute of Technology connect to surface level sensors with a +/- 40cfs error rate are on the #1 and #5 drains which are checked periodically by physically visiting each site.

Flow at the Stukel Pump Plant is not currently monitored in real time, variable frequency pumps are set 1 time per day and not automated. Stukel Pumps directly reuse water enroute to Anderson-Rose Dam, currently there is no mechanism in place to understand how much reuse water is available for pumping from this location. Accuracy of the three pumps at the Stukel pumping plant is estimated within 1% of measured velocity on the VFD.

Flow at the Adams Pump Plant is not currently monitored in real time by the headquarters, pumps are set 1 time per day and are not automated. Adams Pumps directly reuse water enroute to Anderson-Rose Dam, currently there is no mechanism in place to understand how much reuse water is available for pumping from this location. Accuracy is estimated to be within 1% of measured velocity on the VFD.

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[26] TuleLake Irrigation District. 2017. TID Daily Report WY 2016-2017. Available at https://drive.google.com/file/d/1zfm5Bp9PX6Z4zUXi5Q9bjZFWenCdlZO_/view?usp=sharing

[27] Ibid

Flow at the head of the B Canal is monitored by the headquarters in near-real-time. The accuracy varies throughout the year, and its reliability is less than 50%. The current device is not sufficient to automate the B Canal headworks.

Flow at the C-Hydro facility is automated by a PLC which is not currently controlled by the existing SCADA system. Flow is not reported through the C-Hydro facility; therefore its accuracy cannot be determined.

Flow at the head of the C-Siphon is monitored with a SonTek SL 1500. Accuracy of this sensor is within +/- 1% of measured velocity and is reliable over 90% of the time.

Flow at the C-Siphon spillway is not monitored.

Flow at the D Canal Statsney Check is monitored 1 time per day by a ditch rider making manual adjustments to the check structure. Accuracy is dependent upon human error.

Flow at the D Canal spill is monitored one time per day by a ditch rider with a manual staff gauge. This information is only reported to Klamath ID headquarters when flows are excessive and an adjustment to the point of diversion is the only option to reduce or increase the flow. Accuracy of the staff gauge measurement is unknown.

Flow at the E Canal spill is monitored one time per day by a ditch rider with a manual staff gauge. This information is only reported to Klamath ID if an adjustment to excessive spill over 20cfs cannot be recaptured by recirculation pumps. Accuracy of the manual staff gauge measurement is unknown and ditch riders have requested automated sensor assistance supporting ITRC's recommendations.

Flow at the head of the G Canal is monitored one time per day by a ditch rider with a manual staff gauge. Accuracy is dependent upon human error. The automated reporting of the flow at the G Canal head gates is often inaccurate.

Flow at the S. Poe Valley Pump Plant is not currently monitored in real time. Pumps are set 1 time per day and not automated. Accuracy is within 1% of measured velocity on the VFD.

Flow at the Melhase Pump is not currently monitored in real time, nor automated and can effect levels of Anderson-Rose Dam through the #5 drain. Pumps are set 1 time per day and not automated. Accuracy is within 1% of measured velocity on the VFD.

Flow at the Spring Lake Sump is not currently monitored, not automated and can effect the levels of Anderson-Rose Dam through the #5 drain. Pumps are set 1 time per day and not automated. Accuracy is within 1% of measured velocity on the VFD.

Flow at the Miller Hill pumping station is currently monitored and accuracy to +/- 1% is confirmed by Reclamation's local office on a routine maintenance schedule. An upgrade to this communication system is anticipated with this project.

Flow at the A Canal Headworks is currently monitored by the District and USGS. In an email received from Reclamation's local office in July 2020, there is concern for the accuracy of the installed flow meter as it is nearing 20 years old, is no longer supported by the manufacturer, and a similar replacement sensor is not available. An upgrade to this communication system is also anticipated with this project.

d. Provide detailed descriptions of all proposed flow measurement devices, including accuracy and the basis for the accuracy.

SonTek SL (3G) Series[28] – accuracy is based upon programming & channel construction is anticipated to be +/- 1% of measured velocity.

SonTek-SL (3G) takes advantage of the latest advances in electronics technology. the new SL (3G) platform is significantly faster and much more powerful than previous models. With increased processing power, the SL (3G) can ping faster and operate intelligently in the field using sophisticated SmartPulseHD algorithms. SonTek-SL (3G) is a faster Doppler engine, which permits a higher ping rate, at least four times faster than previous models. Sound speed profiling cells are smaller, down to 4 cm, and the SonTek-SL (3G) has up to 128 sound cells to work with. From any site, the SonTek-SL (3G) delivers higher resolution data, faster data processing and, ultimately, cleaner data.

SonTek-SL SPECIFICATIONS

	SL3000 (3G)	SL1500 (3G)	SL500
Sampling Range[1]	0.1 to 5m (0.3 to 17 ft)	0.2 to 20m (0.7 to 66 ft)	1.5 to 120m (5 to 400 ft)
Minimum Channel Width	0.5m (1.6 ft)	1.0m (3.3 ft)	6.5m (21 ft)
Acoustics			
-Horizontal Beam Width[2]	1.4°	1.4°	1.4°
-Vertical Beam Width[2]	1.4°	2.9°	3.8°
-Side Lobe Suppression[3]	>60dB	>60dB	>60dB
Multi-cell Velocity Profiling	Up to 128 cells	Up to 128 cells	Up to 10 cells
SmartPulseHD®	Yes	Yes	n/a
SonTek Compass/Tilt	Tilt	Tilt	Compass/Tilt
Internal Nonvolatile Memory	4GB	4GB	4MB
Water Velocity			
-Range	±7 m/s (23 ft/s)	±7 m/s (23 ft/s)	±6 m/s (20 ft/s)
-Resolution	0.0001 m/s (0.0003 ft/s)	0.0001 m/s (0.0003 ft/s)	0.001 m/s (0.003 ft/s)
-Accuracy	±1% of measured velocity; ±0.005 m/s (0.015 ft/s)	±1% of measured velocity; ±0.005 m/s (0.015 ft/s)	±1% of measured velocity; ±0.005 m/s (0.015 ft/s)
Water Level			
-Vertical Beam Range	0.1 to 5.0 m (0.3 to 17 ft)	0.15 to 10 m (0.5 to 33 ft)	0.2 to 18.0 m (0.7 to 59 ft)
-Vertical Beam Accuracy	(depth < 3 m): ±0.3 cm (0.01 ft) (depth ≥ 3 m): ± 0.1%	(depth < 3 m): ±0.3 cm (0.01 ft) (depth ≥ 3 m): ±0.1%	(depth < 6 m): ±0.6 cm (0.02 ft) (depth ≥ 6 m): ±0.1%
-Pressure Sensor Range	30 m	30 m	20 m
-Pressure Sensor Accuracy (FS)	0.10% FS	0.10% FS	0.25% FS
-Wave Height Spectra	Optional	Optional	Optional
Power			
-Input	9-15 VDC	9-15 VDC	7-15 VDC
-Consumption[4]	0.8	1.0 W	0.7 – 1.0 W
Physical			
-Weight in Air	0.45 kg (1.0 lb)	0.90 kg (2.0 lb)	6 kg (13.2 lb)
-Weight in Water	0.15 kg (0.3 lb)	0.20 kg (0.5 lb)	1.1 kg (2.5 lb)
-Pressure Rating (Max Depth)	30 m (98 ft)	30 m (98 ft)	30 m (98 ft)
-Mounting Plate Dimensions	25 x 17 x 1 cm (10" x 6.7" x 0.4")	25 x 17 x 1 cm (10" x 6.7" x 0.4")	35.5 x 22.9 x 1.5 cm (14" x 9" x 0.6")
-Operating Temperature	-5° to 60°C (23°F to 140°F)	-5° to 60°C (23°F to 140°F)	-5° to 60°C (23°F to 140°F)
-Storage Temperature	-10° to 70°C (14°F to 148°F)	-10° to 70°C (14°F to 148°F)	-10° to 70°C (14°F to 148°F)
Communications			
-Standard Protocols	RS232/SDI-12/Modbus	RS232/SDI-12/Modbus	RS232/SDI-12

Figure 14 SonTek-SL Accuracy +/- 1% of measured velocity[29]

[28] SonTek 2020. SL Series White Paper. https://www.sontek.com/media/pdfs/sontek-sl-white-paper.pdf

[29] Sontek. 2020. SL Series Specifications. https://observator.com/wp-content/uploads/2019/07/sontek-sl-brochure.pdf

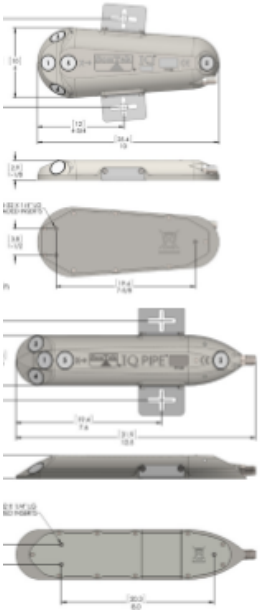
SonTek-IQ Series[30] – accuracy based upon programming & channel construction similar to the SL Series is anticipated to be + 1% of the measured velocity.

SonTek-IQ ACCESSORIES AND SPECIFICATIONS

ustom-fit for the IQ Pipe, this easy use mounting ring will make stem installation a breeze. Fits ipe diameters from 16 in (41 cm) to 2 in (183 cm).

With the press of a single button, data is yours with the SonTek-IQ Flow Display. No PC required!

Product Dimensions



Specifications	SonTek-IQ Standard	SonTek-IQ Plus	SonTek-IQ Pipe
Application	Regular Canals	All Open Channels	Pipes & Culverts
Velocity Measurement			
-Sampling Range	0.05 – 1.5 m (0.16 - 5 ft)	0.05– 5.0 m (0.16 - 16 ft)	0.05 – 5.0 m (0.16 - 16 ft)
-Number of Cells	1	Up to 100	Up to 100
-Cell Size	Dynamically integrated	2 cm – 10 cm (0.8 - 4 in)	2 cm – 10 cm (0.8 - 4 in)
Advanced Data Reprocessing	N/A	✓	✓
Increased Number of Data Fields	N/A	✓	✓

Velocity Measurement	
-Velocity Range	±5 m/s (16 ft/s)
-Resolution	0.0001 m/s (0.0003 ft/s)
-Accuracy	±1% of measured velocity, ±0.5 cm/s (0.2 in/s)
Water Level	
-Vertical Beam Range	0.05 – 1.5 m (0.2 - 5 ft) (Standard); 0.05 - 5.0 m (0.2 - 16 ft) (Plus/Pipe)
-Water Level Accuracy	0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater
-Pressure Sensor Range[1]	30 m (98 ft; 42 psi)
-Pressure Sensor Accuracy	0.1% of full scale
Acoustics	
-Acoustic Frequency	3.0 MHz
-(2) Along Axis Beams	25° off vertical axis, along axis of channel
-(2) Skew Beams	60° off vertical and 60° off center axis of channel (Standard/Plus); 37° off vertical and 45° off center axis of channel (Pipe)
Communications	RS232, SDI-12, Modbus, Analog (via optional Flow Display)
Data Storage	4 GB (approximately 1 year)
Operating/Storage Temperature	-5 to 60° C (23 - 140° F)
Temperature Sensor	Accuracy ± 0.2° C; Resolution ± 0.01° C
Tilt Sensor	Accuracy ± 1.0°
SmartPulse[HD]	Yes
Power	
-Input	9-15 VDC
-Consumption	0.5 – 1.0 W (0.02 when idle)

[1]For use in pressurized pipes. Housing rated to 42 psi.

Figure 15 SonTek IQ Specification indicate accuracy to +/- 1% of measured velocity[31]

[30] SonTek 2020. IQ Series information. https://www.xylem-analytics.no/sontek-iqreg-series/

[31] SonTek. 2020. SonTek IQ Brochure. https://www.sontek.com/media/pdfs/sontek-iq-brochure.pdf

Klamath ID, working in concert with Sierra Controls, Reclamation, USGS, and the Oregon Institute of Technology WADRS will measure, program, install, and validate the accuracy of the sensors.

e. Will annual farm delivery volumes be reduced by more efficient and timely deliveries? If so, how has this reduction been estimated?

Yes. Current manual methods of calculating for a one-time-daily adjustment for farm deliveries include an opportunity for human error at all levels of the system between the farmer, the ditch rider, the operations team, and the water master; the current infrastructure and operations procedures are unresponsive to on-farm needs for irrigation deliveries for under 24 hour sets, changes of wheel lines, or infrastructure limitations due to weeds, seepage, evaporation, or breaks. Near-real time visibility from a centralized, automated control system will improve efficient deliveries by reducing diversions from the reservoir when excessive spill is identified. With decreased loss to operational spill, water can remain in the reservoir for a longer period of time, thus providing a more reliable water supply during droughts and into the fall irrigation season for farm deliveries.

Calculation: Anticipated measured spill above a threshold of 1.5 cfs at the C Canal and D Canal spill will result in an automated response from a centralized SCADA system resulting in the operations team modifying automated gates controlled through the SCADA system at any time during the day. Currently, spot checking these spills at various times during the day indicate a loss range of 5-75 cfs after the system is set in the morning hours.

Furthermore, reducing diversions and controlling gate structures will directly reduce or eliminate unnecessary spill on the C Canal and D Canal. By informing Tulelake Irrigation District of spill from the #1 and #5 Drains, water diverted by that District at Station 48 can be more precisely controlled and thus reducing or eliminating spill at Anderson-Rose Dam.

f. How will actual water savings be verified upon completion of the project?
Anderson-Rose Dam spill is monitored, recorded, and calculated daily by Tulelake ID with several years of data. Year to year examination of the recorded spill over Anderson-Rose Dam will validate water savings.

D Canal spill and pumping from D Canal Lateral drains is monitored, recorded, and calculated by Tulelake ID with several years of data. Year to year examination of the recorded spill from the D Canal and pumping records from the drain will validate water savings.

Water Supply Reliability

1. Will the project address a specific water reliability concern?

Yes. The anticipated savings of nearly 39,200 acre feet of water from Upper Klamath Lake can significantly contribute to numerous water reliability concerns. Water reliability in the

Klamath Project has been a concern since 1992 with the introduction of regulatory policies.[32] In the elements of water reliability the following benefits are addressed:

Drought Planning: Implementing a modern SCADA system in Klamath ID addresses the critical element of drought planning: water control. A SCADA system provides information to leaders to make informed decisions about where and when water diversions needs to be adjusted. The current system is unresponsive and results in unnecessary waste due to a lag in discovering lateral spill and the inability to quickly make adjustments to the system.

Increased demand: Over the past 30 years an increasing demand on the waters of the Upper Klamath Lake have resulted in copious amounts of litigation. Natural waters below the Klamath Project have been diverted away from the Klamath River (such as the historic natural runoff from Howards Prairie, Hyatt Lake, and the Trinity River). This change to the natural flow has resulted in environmental extremist groups, such as Earth Justice and Water Watch, to demand more water out of the Upper Klamath Basin, above and beyond what nature can provide. While installing a SCADA system will not resolve this issue, it does demonstrate to stakeholders the Klamath ID is conserving water to maximize the available supply.

Environmental water: In water year 2020, environmental groups demanded over 430,000 acre feet of water to come from the UKL when only 288,000 acre feet of water was forecasted for inflow. In addition, these same groups demanded two feet of water (about 120,000 acre feet) above natural lake level minimums in historic dry conditions remain in the UKL reservoir. In total, environmental water demand on UKL is 262,000 acre feet more water than nature is anticipated to provide in 2020. While installing a SCADA system will not resolve this issue, it will keep water in UKL longer into the season as requested by the Klamath Tribes and USFWS. Project supply water will be stored in Upper Klamath Lake for a longer period, increasing lake levels and reducing lake temperatures which may be beneficial for the **Upper Klamath Lake Shortnosed Sucker, an endangered species**.

Conflicts in water management: There are numerous claims to water rights in the Klamath Project area.[33] Klamath ID is one of many that lay claim to the KA 1000 water right; Klamath ID also holds the KA 1004 water right, and is responsible for delivering the KA 1001 water right. Installing a SCADA system will assist in addressing Klamath ID KA 1000 water rights with other KA 1000 water right holders to include Tulelake ID, Shasta View ID, Malin ID, Van Brimmer Ditch Company, Enterprise Irrigation District, Pine Grove Improvement District, Klamath Basin Improvement District, Poe Valley Improvement District, and Sunny Side Improvement District which Klamath ID serves.

Tribal Trust: Tribes along the Klamath River will benefit by having water stored in Upper Klamath Lake for in-stream water rights for longer periods. This project will promote and encourage collaboration between Klamath ID, Tulelake ID, Reclamation, U.S. Fish and Wildlife

[32] Klamath Basin Crisis News. 2020. http://klamathbasincrisis.org/

[33] Klamath Basin Crisis News. 2020. http://klamathbasincrisis.org/

Service, Klamath Tribes, Yurok Tribes, and other stakeholders. With increased efficiencies, a water-related crisis or conflict may be mitigated with improved understanding of water demands, deliveries, and usage. The U.S. Fish and Wildlife Service supports all efforts to find efficiencies in the Klamath Project.

Reduced deliveries: Klamath ID has been subject to reduced deliveries since 2001, the most significant is today in 2020 as available water is reallocated to environmental solicitors. The installation of SCADA system improvements will increase the fidelity in quantity of the water delivered. Reducing operational spill results in a water savings which can be recaptured for beneficial use and potentially eliminate reduced deliveries to over 26,000 acres of farmland served by Warren Act contractors (shut off in 2020 with a history of reduced deliveries)[34], nearly 51,000 acres of USFWS land in the Lower Klamath National Wildlife Refuge currently without an allocation of water from the UKL, and PacifiCorps use of water for Hydropower production on the Lower Klamath River.

2. **Will the project make water available to achieve multiple benefits or to benefit multiple water users?**

Yes. This project will promote and encourage collaboration between agriculture, environmental, recreational, and tribal sectors to include **Klamath Tribes,** Yurok Tribes, Reclamation, **U.S. Fish and Wildlife Service**, Klamath ID, Tulelake ID, Shasta View ID, Malin ID, Van Brimmer Ditch Company, Enterprise Irrigation District, Pine Grove Improvement District, Klamath Basin Improvement District, Poe Valley Improvement District, and Sunny Side Improvement District, California Water Fowl Association, Duck Unlimited, and other stakeholders. With increased efficiencies, a water-related crisis or conflict described by Klamath Basin Water Crisis[35] may be mitigated with improved understanding of water demands, deliveries, and usage. The U.S. Fish and Wildlife Service supports all efforts to find efficiencies in the Klamath Project.

a. **Will the project benefit species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance)?**

Yes. This project will maintain water stored in Upper Klamath Lake for a longer period, increasing lake levels and reducing lake temperatures which may be beneficial for the **Upper Klamath Lake Shortnosed Sucker and Southern Oregon & Northern California Coho Salmon, both listed as endangered species**. Various Reclamation documents between 2013 and 2020 state, "Wetland availability for developing (**Upper Klamath Lake Shortnosed Sucker, an**

[34] Klamath Water Users Association. 21 April 2020. What is the water supply this year? What programs exist? Available at https://kwua.org/what-is-the-water-supply-this-year-what-programs-exist/

[35] Klamath Basin Crisis. 2020. KBC News. Available at http://klamathbasincrisis.org/

endangered species) larvae in the without -action scenario would be significantly reduced. The majority of wetlands important for larval and juvenile suckers are at lake elevations greater than 4,138 ft, and very little wetland-edge habitat is available for lake elevations less than 4,138 ft….Lake elevations that decrease quickly [may] reduce (Upper Klamath Lake Shortnosed Sucker, an endangered species) larval survival by reducing food resources, increasing exposure to predation, or by displacement. Decreasing lake elevations under the PA are associated with decreases in accretions and inflows, increased water deliveries, and increased flows in the Klamath River…Increase in UKL elevation to provide endangered sucker habitat needs…throughout the fall/winter period and the following spring/summer period, as well as increase storage for spring/summer (Environmental Water Account for **Endangered Sothern Oregon and Northern California Coho**) EWA releases."[36]

b. Will the project benefit a larger initiative to address water reliability?

Yes. While the water is stored in Upper Klamath Lake, **wildlife under the inspection of the California Waterfowl Association, Ducks Unlimited, and local communities may benefit** from increased lake levels which may reduce water temperature and algae blooms and increase water quality. Conserved water may **benefit the Lower Klamath National Wildlife Refuge** as unused supply is authorized for diversion to the Refuge. Conserved water may be delivered to the Lower Klamath National Wildlife Refuge through the system operated by the Klamath Drainage District as addressed by many conservation groups.[37]

c. Will the project benefit Indian tribes?

Yes. The Klamath Tribes request higher lake levels throughout the year for their fisheries[38]; conserving and minimizing water diverted from the UKL reservoir addresses The Klamath Tribes request. "the overall risk to the tribal fisheries and the associated environmental justice would be reduced for Lower Klamath Basin Tribes and maintained for The Klamath Tribes."[39]

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[36] Reclamation. 2020. Final 2020 Klamath Project Operations Biological Assessment. Pages 52, 198, 440. Available at https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=42926

[37] California Waterfowl Association. 2020. Save the Lower Klamath National Wildlife Refuge. Available at https://www.calwaterfowl.org/lower-klamath/

[38] The Klamath Tribes. 2018. Restoring fish and a dying lake. Available at https://klamathtribes.org/restoring-fish-and-a-dying-lake/

[39] Reclamation. 2020. Environmental Assessment – Water for Fish and Wildlife Purposes. Page 22. Section 3.2.8. Available at https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=45884

Additionally, **The Yurok, Karuk, and Hoopa Tribes** demand water flows out of UKL to meet their fishery needs.[40] By keeping more water in UKL during the irrigation season, water becomes available for flushing flows in the following year as outlined in Reclamation's Environmental Assessment which clearly states, "Increase UKL elevation to provide endangered sucker habitat needs…throughout the fall/winter period and the following spring/summer period, as well as increase storage for spring/summer (Environmental Water Account) EWA releases and irrigation deliveries."[41]

d. **Will the project benefit rural or economically disadvantaged communities?**

Yes. "The existing constraints on the availability of water from the Project for irrigation purposes may result in involuntary land idling, resulting in reduced employment of agricultural workers to raise and harvest crops. Agricultural employment is a potential environmental justice issue due to the fact that agriculture employs a higher proportion of minority and low-income workers than are employed in the general workforce."[42] The additional benefactors include the rural communities in Oregon Klamath Falls, Merrill, Malin, Keno, and California's rural communities surrounding Tulelake and Newell. Potential benefactors also include The Klamath Tribes town of Chiloquin, and historical rural lands of the Yurok peoples. Each of these communities is served by the Klamath Project. More efficient use of water by Klamath ID increases opportunities across these communities. Ensuring an annual water supply ensures the economic ability to house workers, sell commodities, facilitate restaurant and hotel revenues, and maintain the tax base in addition to providing water to their parks, schools, recreational, and tourist areas.

e. Describe how the project will help to achieve these multiple benefits.

Numerous studies (many previously mentioned) have recommended SCADA modernization efforts to improve efficiencies in the irrigation delivery system in reducing Klamath ID tail water and operational spill, this water can be retained in the UKL reservoir to serve multiple purposes for various stakeholders to include the Klamath Tribes. Improved efficiencies allow for the delay of water diversions out of Upper Klamath Lake (UKL) by Klamath ID which increases the amount of water available for longer periods into the irrigation season to the benefit of fish and wildlife, the Klamath Tribes, and recreational activities. There is high potential for the saved

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[40] EarthJustice. 2020. Yurok Tribe and EarthJustice Statement on the Bureau of Reclamation Shut Off of Needed Klamath River Flows. Available at https://earthjustice.org/news/press/2020/yurok-tribe-and-earthjustice-statement-on-bureau-of-reclamation-shut-off-of-needed-klamath-river-flows

[41] Reclamation. 2020. Final 2020 Klamath Project Operations Biological Assessment. https://www.usbr.gov/mp/kbao/docs/klamath-2020-ba.pdf page 52.

[42] Reclamation. 2020. Environmental Assessment – Water Acquisitions for Fish and Wildlife Purposes. Page 22. Section 3.2.8 Environmental Justice. Available at https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=45884

water to be made available to other stakeholders such as other agricultural benefactors, wildlife refuges, USFWS, and Tribes.

3. **Does the project promote and encourage collaboration among parties in a way that helps increase the reliability of the water supply?**

Yes. There is currently widespread support of the project from Senator Merkley's office, Reclamation's local area office, USFWS, the Klamath Water User's Association, Family Farm Alliance, Farmers Conservation Alliance, sister Irrigation Districts, California Waterfowl Association, and Ducks Unlimited. Once the benefits of the SCADA system are demonstrated as improving efficiencies within Klamath ID, we anticipate increased collaboration with the Klamath and Yurok Tribes, in addition to conservations groups.

4. **Will the project address water supply reliability in other ways not described above?**

Yes. Water quality in UKL is a concern for the communities reliant upon its waters. By reducing the amount of water taken out of UKL through the A Canal, more water is available into the late summer and early fall to dilute the harmful algae blooms observed in UKL as shown by the U.S. Geological Survey in Figure 16. "Water temperature and water level are related: The shallower the water, the easier it is for the sun to warm it and the more likely a bloom will form."[43]

Figure 16 Photo of UKL algae bloom by Kurt Carpenter, U.S. Geological Survey

Tulelake ID – shared information from Klamath ID SCADA may inform and influence diversions from Station 48 on the Lost River Diversion Channel. This project may further reduce

[43] Alex Schwarts. 2 August 2020. How microscopic organisms shape the water quality of Upper Klamath Lake. Hearld and News. https://www.heraldandnews.com/news/local_news/how-microscopic-organisms-shape-the-water-quality-of-upper-klamath-lake/article_b50900a6-73f4-5a94-8faf-d555b92ed947.html

the need for Tulelake ID to incur costs for pumping spill to Lower Klamath National Wildlife Refuge.

Klamath Drainage District (KDD) – shared information may allow KDD to understand project supply available for diversion to the Lower Klamath National Wildlife Refuge through their system at minimal cost.

U.S. Fish and Wildlife Service (USFWS) – shared information may allow USFWS to have information on available Project supply, which may inform leaders on the ability to supply water to the Lower Klamath National Wildlife Refuge.

Reclamation – shared information may increase information on water diversions across the Project for better annual operations planning.

Klamath Tribes – shared information may allow scientists and researchers to identify if higher lake levels or lower water temperatures may improve the survivability of juvenile short nosed suckers.

These sensors are anticipated to inform future modernization and improvement projects under development in partnership with Farmers Conservation Alliance.

Implementing Hydropower

This project will incorporate sensors and improve capacity and increase hydropower production at the C-Drop Hydroelectric plant, a 1100KW facility currently installed. Improved sensors will allow for maximum flow of water by measuring return flows to the Lost River Diversion Channel to Klamath River and facilitate a more accurate calibration of the turbine.

This project is also a precursor to installing Hydropower facility on the C-G-Drop. Information from the SCADA system will inform the feasibility of installing a new Hydropower facility and the development of future Hydropower opportunities through Energy Trust of Oregon.

a. **Describe the energy capacity.** Current capacity of the C-Drop Hydropower facility is 1100KW/hr as presented in State of Oregon's Certificate of Water Right 94798 and has a 700 cubic feet per second diversion right from Upper Klamath Lake[44]; however, inefficiencies in the system due to a lack of an integrated SCADA system prevent maximum power output as the flows back into the Klamath River cannot be accurately measured. The improvements in this plan is anticipated to increase power output by correctly calculating flow at the C-Drop Hydropower facility, allowing for correct positioning of the wicket gates and maximizing flows during drought conditions or on the shoulder season.

[44] State of Oregon. 2019. Water Right Certificate 94798. Available for review at https://drive.google.com/file/d/1wi51nUwAObrb7OH87sKlUvFnwsRO6eBC/view?usp=sharing

The installation of a sensor at the C-Siphon spill gate into the Lost River Diversion Channel will enable increased power generation when irrigation demand is low. In 2020, Klamath ID has been unable to capitalize on the C-Drop Hydropower facility due to the inability to accurately measure water spilling into the Lost River Diversion Channel from the C-Siphon. Our electricity generation in 2020 has been limited to 12,157 KWh as shown in the purchase agreement with PacficCorp.[45] By installing a sensor on the C-Siphon, Klamath ID can accurately report to the Reclamation operations team the amount of water being returned to the Klamath River, thus reducing the amount of water Reclamation releases over the Link River Dam on Upper Klamath Lake, and allowing Klamath ID to maximize the energy production at the C-Drop Hydropower facility for the benefit of Klamath Project patrons, Reclamation, and other stakeholders.

The data generated from this SCADA project will inform the energy capacity for the development of a future Hydropower Facility further downstream.

b. **Describe the amount of energy generated.** With the installation of SCADA sensors, C-Drop Hydropower Facility can see an **increase of 3,064,362 kilowatt hours per year** for a total of 4,841,145 kilowatt hours per year. The water right for 700cfs is annual and extends beyond the irrigation season; furthermore, water diverted for the powerplant can be returned to the Klamath River without impeding downstream flow requirements. However, without proper sensors to record return flow to the Klamath River, the C-Drop Hydropower Facility is unable to meet its potential for energy generation. Installing sensors on the C-Siphon spill allows Klamath ID to maximize energy generation. Figure 17 below is an extract from the C-Drop Hydropower Facility invoice from 2018; if sensors were installed, it is anticipated the facility will produce 537,905 kilowatt hours per month as shown in Figure 18 for the month of July in 2017.

Assuming an average year of operation can produce 537,905 kilowatt hours per month for 9 months, this is an increase of 3,064,362 kilowatt hours than what Klamath ID produced in 2018 or 4,828,988 kilowatt hours more than produced in 2020.

[45] PacifiCorp. 2020. C Drop Hydro LLC Power Purchase Agreement. 27 May 2020. Available for review at https://drive.google.com/file/d/1BIC9Lr0b5EeV71QokuKL8u3wqH-HpR5V/view?usp=sharing

DATE	KW-HR FROM POWER GENERATION STATEMENT	TOTAL MW-HR (DIVIDE KW BY 1,000)	MW-HR UNDER 3,000	MW-HR OVER 3,000
5/1/18 - 5/31/18	7,222	7.222	7.222	0.000
6/1/18 - 6/30/18	385,292	385.292	392.514	0.000
7/1/18 - 7/31/18	497,245	497.245	889.759	0.000
8/1/18 - 8/31/18	469,739	469.739	1,359.498	0.000
9/1/18 - 9/30/18	354,406	354.406	1,713.904	0.000
10/1/18 - 10/31/18	62,879	62.879	1,776.783	0.000

Figure 17 Extract of C-Drop Hydropower Generation Statement for inefficient 2018 operations (regulatory drought year)

DATE	KW-HR FROM POWER GENERATION STATEMENT	TOTAL MW-HR (DIVIDE KW BY 1,000)	MW-HR UNDER 3,000	MW-HR OVER 3,000
5/1/17-5/31/17	457,527	457.527	457.527	0.000
6/1/17-6/30/17	419,196	419.196	419.196	0.000
7/1/17-7/31/17	537,905	537.905	537.905	0.000

Figure 18 Extract of C-Drop Hydropower Generation Statement for 2017 operations maximizing power generation.

c. **Describe any other benefits of the hydropower project.**

The generation of revenue from the C-Drop Hydropower facility off-sets the operations and maintenance cost-per-acre assessed to each farmer in the District, and is rolled over to the other 8 Districts which charge a percentage of Klamath ID's assessment fees to their customers. Increasing revenue may reduce the need to make future increases to costs to farmers. Thus, the C-Drop Hydropower facility benefits the entire Project. Klamath ID annual budgets account for hydropower revenue payments which directly reduce costs to farmers.

Reclamation also benefits as a portion of the proceeds from the C-Drop Hydropower facility are provided to Reclamation.

On-Farm Improvements

Installing SCADA equipment may create opportunities to partner with Klamath County Soil and Water Conservation District's and the Natural Resources Conservation Service work with local farmers. On-going work with Farmers Conservation Alliance will likely utilize information provided from the SCADA system to inform RCCP and EQIP programs.

A modernized SCADA system is required to take advantage of the following planned improvements with the Natural Resources Conservation Service:

Piping and pressurizing private ditches in suburban areas. Currently the city of Klamath Falls and its suburbs rely upon the 120-year-old gravity irrigation system with mostly open ditches and no pressurization. There are significant inefficiencies and losses to the drain system from these open channels. Klamath ID is requesting private landowners to apply for funding through EQIP to pipe nearly 30 miles of private ditches which may save upwards of 1,700 acre feet of water each year from spilling into the #1 Drain system. Without an improved SCADA sensor on the #1 Drain, and sensors on the A Canal, the preliminary data required to target problem areas, control flows, and understand the scope and scale of the problem does not exist. A sketch-map of the problem area is provided in Figure 19; the ditches in orange are private, inefficient open channels, which spill into the #1 Drain system.

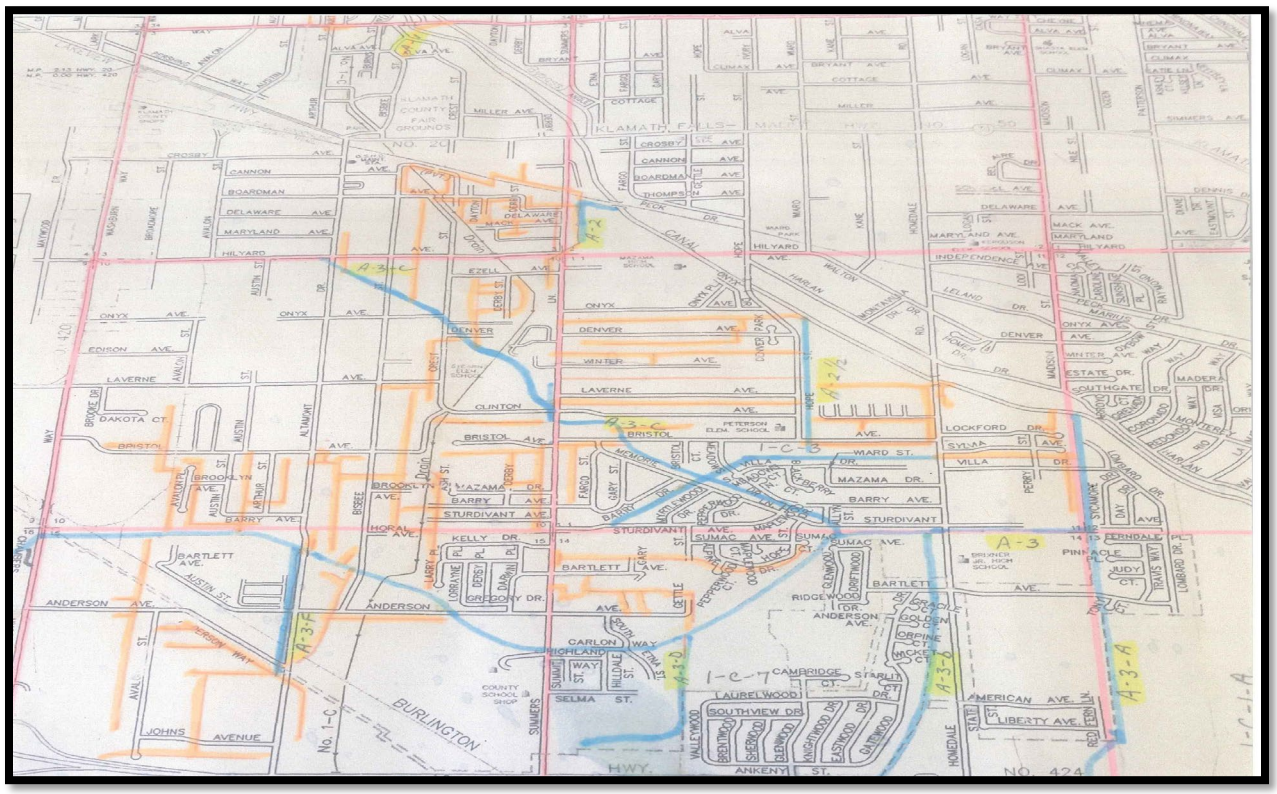

Figure 19 Suburban Private Ditches (in orange) which need NRCS efficiency improvements within Klamath ID

Individual Farmer Turnout/Pump Modernization with Flow Meters. Currently deliveries to each farm are recorded utilizing 2,000 year old+ technology where ditch riders manually measure each turnout and write the amount being delivered in a log-book. Klamath ID wants to encourage farmers to be more efficient with the water delivered by our system, to do this flow meters need to be installed which can communicate with a modernized SCADA system. Klamath ID works with the Natural Resources Conservation Service to promote these on-farm improvements; however, a modern SCADA system is required to maximize efficiencies gained by installing the flow-meters.

D Canal Regulating Reservoirs. Reclamation suggested three regulation reservoirs are needed along the D Canal as Options 15, 16, and 17 in Reclamation's *Klamath Project Yield and Water Quality Improvement Options Appraisal Study Workbook*.[46] As mentioned in these options, Klamath ID would require these regulating reservoirs to be developed on privately owned land. The SCADA improvements from this project will likely inform the additional studies required to implement this EQIP project to determine the exact location and capacity of each reservoir.

Klamath ID has discussed Reclamation's options with members of the California Wildfowl Association, Ducks Unlimited, Duncan Family Farms, and other conservation groups to find support to funding this greatly needed project to become more efficient at the tail end of Klamath ID's extensive system across 47 miles of relatively flat surfaces with little drop in elevation.

Department of the Interior Priorities

This project addresses the following Department of the Interior Priorities:

1. Creating a conservation stewardship legacy second only to Teddy Roosevelt
This project addresses subsections a, d, e, and f of the announcement. The installation of SCADA systems is the best utilization of science to identify best practices to manage land and water resources and adapt to changes in the environment to save 39,200 acre feet of water. Furthermore, SCADA systems provide detailed data needed to identify opportunities to resolve conflicts and expand capacity in storage, transportation, and distribution systems. This project specifically foster relationships with conservation organizations such as California Waterfowl Association and Ducks Unlimited in advocating for improved stewardship of the irrigation water while improving late fall water in Upper Klamath Lake which supports hunting and fishing in the Pacific Flyway.

2. Utilizing our natural resources
Installing a modern SCADA system will greatly improve the ability to generate power through the C-Drop Hydropower facility by over 3,000,000 kilowatt hours, thus ensuring American Energy is available to meet our security and economic needs.

3. Restoring trust with local communities
Utilizing technology to better manage and deliver irrigation water demonstrates Klamath ID is attempting to be a better neighbor with those closest to our resources. Utilizing the data from the SCADA system may improve dialogue and relationships with entities bordering our District and reliant upon our return flows, specifically Tulelake ID and indirectly affecting Klamath Drainage District, Shasta View ID, Malin ID, Sunnyside ID, Van Brimmer Ditch Company, Enterprise ID, Pine Grove ID, Klamath Basin Improvement District, and Poe Valley Improvement District. Furthermore, the SCADA system may expand the lines of communication with Oregon State

[46] Reclamation. April 2012. Klamath Project Yield and Water Quality Improvement Options Appraisal Study Workbook.

Water Resource Division to inform our Governor and state natural resource offices, Fish and Wildlife offices, water authorities, county commissioners, Tribes, and local communities.

4. Striking a regulatory balance
The Klamath Project is at the blunt end of the Endangered Species Act club where decisions have ignored the National Academies of Science findings on the Klamath Project published after the 2001 water crisis. This SCADA system may help educate and inform the development of strong science and minimize arguments about inefficiencies and waste in the system.

5. Modernizing our infrastructure
The irrigation system operated and maintained by Klamath ID is relatively unchanged since the development of the system between 1887 an 1917. Installing SCADA sensors and components supports the White House Public/Private Partnership Initiative to modernize U.S. infrastructure.

Reclamation Priorities

1. Increase Water Supplies, Storage, and Reliability under WIIN and other Authorities.
The installation of SCADA sensors and infrastructure may facilitate more effective operations by Klamath ID, thus reducing the amount of water the District diverts from Upper Klamath Lake early in the season, allowing for up to 39,200 acre feet of water to be stored for use later into the fall resulting in more reliability in the supply, in addition to increasing storage levels for critical habitat during periods of sensitive lake levels determined by USFWS, and provides the potential for unused stored water supply to benefit refuges and downstream needs after the irrigation season.

2. Streamline Regulatory Processes and Remove Unnecessary Burdens to Provide More Water and Power Supply Reliability.
Utilizing a SCADA system will provide the ability to increase Power Supply Reliability through the C-Drop Hydropower Facility. In 2020, the facility has, for the most part, been unable to produce electricity due to the lack of flow from regulation and the inability to measure and account for return flows to the Klamath River. The SCADA system will provide this capability in near real time to inform an C-Drop Hydropower operations plan to improve power production.

3. Leverage Science and Technology to Improve Water Supply Reliability to Communities.
The technology in the proposed Klamath ID SCADA project may reduce Klamath ID's over diversions from UKL and improve water supply reliability later into the fall irrigation season by reducing the diversions earlier in the year. The additional water supply may then be available for other Districts with junior water rights, USFWS, or other water right holders.

4. Address Ongoing Drought
2020 is one of the four driest years in the period of recent record for the Klamath Basin, and the worst regulatory year on record. A modern SCADA system informs Klamath ID operations team on how to better operate the system, reduce unneeded diversions, and capitalize on near-real-time information to stretch out a short water year. Without a SCADA system to inform the Klamath ID operations team, thousands of acre-feet of water are lost to unnecessary and uncontrolled spill or result in under deliveries to farmers resulting in crop damage and losses.

5. Improve the Value of Hydropower to Reclamation Power Customers.
Installing SCADA components on the C-Siphon will greatly enhance the C-Drop Hydropower Facility power production by increasing production by 3,064,362 kilowatt hours, of which Reclamation is a party to receive a portion of the proceeds through contract.

6. Improve Water Supplies for Tribal and Rural Communities
The Klamath Basin is a conglomerate of Tribal and Rural Communities. Every improvement in efficiencies by Klamath ID provides improved water supply reliability for all stakeholders in the Basin. Improving the efficiency of Klamath ID by reducing 39,200 acre feet of spill provides a full allotment of water for 15,680 acres of farmland in 6 other Districts.

7. Implementation of new Title Transfer authority pursuant to P.L. 116-9.
Klamath ID plans to pursue title transfer in the near future; having a modern SCADA system will facilitate Section 9 of Reclamation's CMP 11-01 Directives and Standards. A SCADA system will likely minimize Reclamation's concerns for high and significant hazard potential on urban portions of the A and C Canals.

Implementation and Results

Project Planning

1. *Water Conservation Plan.* Klamath ID has a **Water Management and Conservation Plan** on file with both Reclamation and the Oregon Water Resources Department as part of the On-Project-Plan[47] developed in 2014. Reclamation supports the On-Project-Plan to align irrigation water supply and demand for portions of the Klamath Project to provide certainty of supply for Project irrigators and reduce conflicts over water in the Klamath Basin as outlined at https://www.usbr.gov/mp/kbao/programs/spcl-projects/on-prjct.html.
2. *Meeting goals towards applicable planning efforts.* Installing a modern SCADA system is central to modernization efforts across Klamath ID and part of on-going planning with Farmers Conservation Alliance, California Waterfowl Association, Ducks Unlimited, and other stakeholders. An update to the Water Management and Conservation plan[48] is anticipated for public review in 2020; in ongoing efforts with Farmers Conservation Alliance, the SCADA system update is being developed to improve the Project (Klamath Project system wide) with Klamath ID as the central hub to these plans. See attached Annex B "FCA_Klamath District Brief".

[47] Klamath Water and Power Agency. 2014. On-Project-Plan. Summary available through Reclamation at https://www.usbr.gov/mp/kbao/programs/spcl-projects/on-prjct.html

[48] Klamath ID. 2020. DRAFT Water Management and Conservation Plan. Available for review at https://drive.google.com/file/d/1a4Nno6e10UwGnPqxvAzG5LhkR-sbcsRc/view?usp=sharing

Performance Measures

Performance Measure A.2.b.: Irrigation Measuring Devices. This project includes installing 18 flow meter sensors linked to a SCADA system for accurate and timely water measurement. Currently, most measurements across the District are conducted by-hand, with manual instruments, without the ability to observe and analyze in near-real-time. Installing the 18 sensors in this project provide a 100% improvement, allow for more accurate record keeping, and allow for the implementation of future system improvements such as including automated meter gates.

Pre-project flows measured over the past 20 years by various organizations with temporary measurement devices indicate the need for permanent measuring. As noted by David's Engineering, MBK Engineers, and Reclamation, current losses exceed 60,000 acre feet as noted in Figures 7 and 8.
Post-project methods for quantifying the benefits of the projects to install measuring devices can be identified by the following measures of effectiveness:

> Measure of Effectiveness #1: Zero spill at Anderson-Rose Dam during irrigation season.
> Measure of Effectiveness #2: Reduce, uncontrolled spill into Tulelake to historic lows, which require pumping through D-Plant.
> Measure of Effectiveness #3: Reduce A Canal diversions from Upper Klamath Lake for agricultural purposes to under 85% of the historical median.

Performance Measure A.3: SCADA and Geographic Information Systems (GIS). This project specifically focuses on the modernization and expanding the Klamath ID SCADA system, integrated with our ArcGIS program, to provide near-real-time data on flow rates and volumes at key points in the irrigation system which facilitate a more accurate and timely delivery of water, reduce over-deliveries and spillage at the end of the canal.

Pre-project conditions. The 22-year-old radio based system utilized by Klamath ID is currently outdated and only provides near-real-time visibility on diversions from UKL. There are no sensors at the head gates to the D, E, and F canals. There are no sensors on the spills from these canals, nor on the drains, specifically the tail of the D Canal, the C-Siphon Spill, the #1 and #5 drains. Existing sensors at the head of the A, B, C, and G Canal's are feeding an outdated Human Machine Interface which failed with the update to the Windows 10 operating system.

Post-project expectations. The installation of a modern SCADA system will provide near-real time information at each head gate, and on key-spill structures which will then inform automated adjustments at critical structures to reduce or eliminate unnecessary spill. Having the ability to observe spill in near real time provides the ability to make immediate adjustments to the system.

Installing these SCADA components is anticipated to eliminate spill at the Anderson-Rose Dam (see Measure of Effectiveness #1). This is currently tracked and measured by Tulelake ID.

This project is also intended to reduce tailwater and spill from the D Canal which contribute to Measure of Effectiveness #2). This is currently tracked and measured by Tulelake ID.

This project intends to:

a) Improve irrigation water season duration. 39,000 acre feet is roughly 20 days of supply.
b) Mitigate impacts of drought years on Klamath ID and other Districts. 39,000 acre feet could provide full water right deliveries to 15,680 acres across 6 Districts in drought years.
    a. Measure of Effectiveness #4: Unused Project supply is put to beneficial use by other Districts or stakeholders.
c) Reduce waiting lists for water deliveries. In 2020, Klamath ID changed from a demand based system to a supply based system of delivery in response to regulator drought conditions resulting in lengthy waiting lists for sensitive crops. Being able to control the 39,000 acre feet of spill reduces the risk associated with long waiting lists.
d) Installing SCADA sensors and controllers reduces mileage and after hours emergency responses by operators on dark, narrow, dusty ditch banks in hazardous conditions, and further reduces damage to canal banks and hazards associated with limited visibility travel over unimproved surfaces.

Future opportunities. Having a modern SCADA system provides opportunities to expand automated controls at critical infrastructure and gates, it allows for the identification of loss due to seepage or breaks in the canal, and promotes the expansion of measuring devices on turnouts. Implementation of modern SCADA reduce uncontrolled spillage and enhance productivity.

Response to failures or outages of SCADA. Klamath ID is well versed in failure of the outdated SCADA system which failed when upgraded to Windows 10. Klamath ID has entered into contract with Sierra Controls for 24/7 access and support to this project. This condition allows for technical experts to provide immediate response to sensor or automation failure. Furthermore, hand controls will remain in place to control the gates.

Performance Measure A.4 Automation. This project intends to automate 3x head gates at the B, C, and G Canals and upgrade the communication system for the A Canal head gate to integrate with the new SCADA system. This is a long-term automation plan dependent upon a modern SCADA central controller system capable of expansion and integration with modern computer operating systems. Plans for this SCADA system include future addition of automated gates at critical infrastructure as determined by data provided by the sensors placed with this project.

Automating the head gate of the B Canal provides heightened operational control on the rest of the system. The B Canal feeds Pine Grove Irrigation District, Poe Valley Improvement District, Klamath Basin Improvement District, the E and F Canals and individual Warren Act contractors, thus allowing for adjustments to supply/demand mismatch in this complex system across 30 miles of primary canals.

Automating the head gate of the C Canal provides operational control of the C1, C2, C3, C4, C5, C6, C7, C8, D1, D2, and D3 laterals in addition to deliveries to Van Brimmer Ditch Company which also supplies the Sunnyside Irrigation District. The automation of this structure provides near-real time adjustments for supply/demand mismatches across 50 miles of primary delivery infrastructure.

Automating the head gate of the G Canal provides operational control of the G1, G2, G3, and D Canal with 25 laterals across 100 miles of primary delivery infrastructure which feeds Shasta View ID, Malin ID, portions of the Klamath Basin Improvement District, individual Warren Act contractors, and terminates with uncontrolled spill into Tulelake ID.

Upgrading the A Canal communication system for automation is central to the entire Klamath Project. A Canal feeds 8 other Districts through the B, C, D, E, F, G canals covering over 200 miles of delivery structures and an additional 200 miles of drains. A Canal also feeds Enterprise ID. A Canal communication systems must be upgraded to integrate with modern SCADA controllers.

The maintenance of the SCADA system and automation technologies will occur through a professional development and education plan. Klamath ID is currently in contract with Sierra Controls to develop the system, to train our operators and maintainers, and to be available 24/7 for support.

The benefit of the automating the B, C, and G Canal head gates allows for near-real-time adjustments to water flows when downstream sensors indicate an imbalance in demand resulting in unnecessary spill. Flow rates determine the responsiveness of the system; during high-demand periods, adjustments can be seen at the tail of these canals in 24-36 hours; in low-flow periods, such as the 2020 regulatory drought, adjustments are not seen for over 96 hours. Through an integrated SCADA system with sensors reporting flows at key areas above the spills, the operations team can make adjustments to the head gates earlier, and thus reducing the likelihood of creating unnecessary spill. The current system only allows for operators to understand over-deliveries are occurring when spill is identified once every 24 hours.

Pre-project estimations of baseline data. Tulelake ID currently tracks and reports spill over Anderson-Rose Dam, pumping requirements from the drains associated with the D Canal, and tailwater of the D Canal into the J Canal. This baseline data is provided in Figures 11 and 13.

Post-project methods for quantifying benefits of spillage reduction projects is consistent with Performance Measure A.2.a. and can be identified by the following measures of effectiveness:

> Measure of Effectiveness #1: Zero spill at Anderson-Rose Dam during irrigation season.
> Measure of Effectiveness #2: Reduce, uncontrolled spill into Tulelake to historic lows, which require pumping through D-Plant.
> Measure of Effectiveness #3: Reduce A Canal diversions from Upper Klamath Lake for agricultural purposes to under 85% of the historical median.

Performance Measure A.5. Drain and Spill Water Reuse Projects. This project includes placing SCADA controls on the following pump stations: Stukel Pumping Plant, Adams Pumping Plant, #5 Drain Pump, Melhase Pump, and S.Poe Valley Pumping Plant in addition to updating the communication system at the Miller Hill Pumping Plant.

Pre-project estimations and baseline data. The pumping records and activities at each of these pumping stations is currently tracked by handwritten notes turned into the headquarters at the end of every month. There are multiple years of data available recording the information from the reuse pumps; however, the information is not available in near-real-time, nor are the pumps able to be controlled by automation or a SCADA system. Currently, the pumps are basically set one time per day based upon demand and observed flows.

Post-project methods for quantifying benefits. The use of a SCADA system which records data and can control the pumping stations remotely provides the ability for the operations team to increase the reuse of drainage flows in near-real-time. The SCADA system will be able to identify where excess drainage water is available for recirculation in near-real time, therefore increasing flexibility for the operations team.

Performance Measure B: Projects with Hydropower Benefits. The C-Drop Hydropower facility is underutilized in power generation due to the inability to measure return flow into the Lost River Diversion Channel. This project will install a flow sensor on the C-Siphon which will inform Reclamation's Klamath Basin Area Office operations team on the amount of water Klamath ID is returning to the Klamath River which will then offset the amount of water Reclamation releases from the Link River Dam. In 2020, the C-Drop Hydropower facility was shut down early in the irrigation season due to low water flow from the A Canal; there was not enough flow to turn the turbine. Installing SCADA sensors and controllers will extend the operation of the C-Drop Hydropower facility to the shoulder seasons in March through November, and maximize power generation. The estimated incremental hydropower capacity is an increase of 3,064,362 kilowatt hours produced.

Readiness to Proceed

In March of 2020, Klamath ID purchased a centralized SCADA computer system compatible with the planned upgrades.

Federal Communications Agency Permits for the initial set of frequencies to be used are in place, repeaters are installed, and radio systems are available.

Sierra Controls will need to update their proposal to Klamath ID for initial project upgrades from the October 2019 estimate provided. Klamath ID is sending this grant proposal to Sierra Controls simultaneously to submitting the request for Federal assistance.

Klamath ID has coordinated with the Klamath Basin Area Office on the specifics of this project; as KBAO, nor Regional Environmental Teams are available, Klamath ID will contract for an Environmental Assessment upon award of the grant.

Adkins Engineering is on contract to provide consultation support if required.

No policies or administrative actions are required to implement the project.

Schedule:

Fall 2020 – Submit operations plan to the KBAO for C-Drop Hydro shoulder season operations
Winter 2021 – Set conditions, purchase equipment, prepare sites for installation
Spring 2021 – Upgrade software components, update existing sensors to new system
Summer 2021 – Install new flow meter sensors and upgraded sensors, begin testing.
Summer 2021 – Engineer/design automation controls for the B, C, and G Canals
Fall 2021 – Troubleshoot and refine sensors with upgraded system.
Winter 2022 – Install Automation systems on gates and control systems on pumps
Spring 2022 – Troubleshoot and refine automation systems

Nexus to Reclamation Activities.

Klamath ID is a Reclamation District.
Klamath ID operates and maintains the "Main Unit" of the Klamath Project on Reclamation Lands.
Klamath ID is in the same basin as Reclamation's Klamath Basin Area Office.
This project may contribute to water efficiencies for other Districts and stakeholders in the Klamath Basin.
This project may benefit the Klamath Tribe.

Additional Non-Federal Funding

Klamath ID will provide the 100% of non-Federal funding or 53.5% of the total cost.

$571,774 Non-Federal Funding
$1,071,774 Total Project Cost

PROJECT BUDGET

FUNDING PLAN AND LETTERS OF COMMITMENT

Klamath ID is prepared to provide $571,774 from annual O&M from FYs 2020, 2021, and 2022 budgets for this project as non-Federal contribution. $290,513 in funds were approved from the Klamath ID FY 2020 budget. Additional funding was approved by the Klamath ID Board of Directors on 13 August 2020 to apply for matching funds in the FY 2021 and 2020 budget. Funds will be available for immediate project use.

Costs have already been incurred for this project. Klamath ID has entered into contract with Sierra Controls in September 2019 to conduct an initial site survey, and develop an equipment proposal, and implementation plan. Klamath ID has further purchased an upgraded SCADA computer system. Klamath ID is also in contract with Adkins Engineers to design and retrofit gates for automated controllers.

PROJECT EXPENDATURES PRIOR TO AWARD	AMOUNT	DATE	BENEFIT TO PROJECT

Farms Conservation Alliance consultation, site survey, and GIS data review	$2,242	20 Mar 2019	Narrow scope of work Review previous studies Identify funding sources Identify qualified contractor
Sierra Controls site survey	$5,071	31 Oct 2019	Communication equipment upgrade assessment
Upgrade SCADA Water Computer	$3,899	01 Mar 2020	Compatible with modern systems
Radio retrans site survey	$380	17 Aug 2020	Frequency management

BUDGET PROPOSAL

Project Cost Table

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal funding	$ 500,000
Costs to be paid by the applicant	$571,774
Value of third party contributions	$ 0
TOTAL PROJECT COST	$1,071,774

Budget Proposal Format provided in BOR-DO-21-F001

	COMPUTATION		Quantity Type	TOTAL COST
	$/Unit	Quantity		
Salaries and Wages				
Project Manager Onsite Supervision Project Oversight Contracting Officer Budget Management Timeline Management Contract Coordination Project Synchronization Stakeholder Interest Onsite Inspections	$109,140/annual	208	hrs	$10,914

Logistics Management Public Communication				
Program Manager Budget Oversight Onsite Inspections System Testing Final Inspection Public Affairs	$133,469/annual	62	hrs	$4,004
District Water Master Consulting Expert Logistics Coordinator Master Trainer Education Coordinator Purchasing Agent Onsite Inspections Final Inspection System Testing System Validation Equipment Operator	$108,546/annual	312	hrs	$16,281
Assistant District Water Master Installation Manger SCADA Controller Systems Integrator System Programming Measurement validation All testing All inspections System Validation All training schedules Contract Supervision Travel Coordinator Equipment Operator	$42,933/annual	1040hrs	hrs	$21,467
Intern System Testing System Validation Equipment Operator	$5,000/annual	80	hrs	$1,250
Maintenance Supervisor Project Supervision Installation Assistance Contractor deconflict	$84,601/annual	62	hrs	$4,230

Maintenance Level II Site Prep and Install	$62,633/annual	300	hrs	$20,669
Maintenance Level II Site Prep and Install	$62,633/annual	224	hrs	$15,683
Maintenance Level II Site Prep and Install	$62,633/annual	134	hrs	$9,395
Ditch Rider Site Labor & Education System Validation	$62,633/annual	134	hrs	$9,395
Ditch Rider Site Labor & Education System Validation	$62,633/annual	134	hrs	$9,395
Ditch Rider Site Labor & Education System Validation	$62,633/annual	134	hrs	$9,395
Ditch Rider Site Labor & Education System Validation	$62,633/annual	134	hrs	$9,395
Ditch Rider Site Labor & Education System Validation	$62,633/annual	134	hrs	$9,395
Ditch Rider Site Labor & Education System Validation	$62,633/annual	134	hrs	$9,395
Fringe Benefits				
None				$
Travel				
Site Survey, 2 days Sierra Controls Sales Farmers Conservation Alliance	$1200 ea	3 pax/1.75 days	Per Diem	$6,300

Training & Education 3pax, 3 days SonTek Trainer Sierra Controls Trainer HMI Trainer	$1200 ea	3 pax/3 days	Per Diem	$10,800
Headworks Installation – 4 days each Sierra Controls Engineer	$1200 ea	1 pax/12 days	Per Diem	$14,400
Headquarters Installation – 7days Sierra Controls Engineer	$1200 ea	1 pax/7days	Per Diem	$8,400
Troubleshooting Sierra Controls Engineer	$1200 ea	2 pax/14 days	Per Diem	$33,600
Inspections Sierra Controls Engineer	$1200 ea	1 pax/10 days	Per Diem	$12,000
Equipment				
SCADA Sensors	$8,500 ea	18	each	$153,000
SCADA Controlled Gates	$35,000ea	3	each	$105,000
SCADA Computer	3,785ea	1	each	$3,785
Radio Controllers	$4,000	21	each	$84,000
PLU Upgrade	$25,000	1	each	$25,000
Solar Power Cells	$13,000	15	each	$195,000
Supplies and Materials				
Cables	$10	1000	feet	$10,000
HMI	$85,000	1	License	$85,000
Concrete	$18	1000	Yard	$18,000
Rebar	$2	600	feet	$1,200
Wooden Forms	$2	1000	feet	$2,000
Contractual/Construction				

Sierra Controls - SCADA	$125	360	hour	$45,000
Stacey & Dennis – IT	$125	120	hour	$15,000
Adkins Engineering	$135	80	hour	$10,800
IT Engineer	$125	120	hour	$15,000
SCADA Engineer	$125	120	hour	$15,000
Electrician	$125	100	Hour	$12,500
Environmental Assessment	$14,000	1	Ea	$14,000
Third-Party Contributions				
None				$
Other				
Reclamation Environmental Review				$16,000
TOTAL DIRECT COSTS				$1,071,048
Indirect Costs				
Bookkeeper	$72,559/annual	1%	% of time	$726
TOTAL ESTIMATED PROJECT COSTS				$1,071,774

BUDGET NARRATIVE

Salaries and Wages

Jaxsen Sikorski is the Klamath ID Director of Operations and Project Manager for this project. The project manager is expected to dedicate 10% of his annual effort to ensuring the completion of this project and submitting updates and reports. Costs estimated above are based upon a fixed annual salary.

Additional Klamath ID employees, at their annual salary, will contribute efforts as indicated in the chart above. Tasks for employees will include site preparation, installation, troubleshooting, inspections, and testing the system.

Fringe Benefits

None anticipated

Travel

Travel costs are based upon six (6) scheduled site visits from SCADA experts at the standard per diem rate, airfare, rental car, and hotel costs. Costs for this category have already been incurred by Klamath ID.

Sierra Controls have completed three site survey visits to begin analysis and planning.

Members of Klamath ID will require training and education on the updated system prior to installation.

Installation of PLC modules and software on upgraded computer systems requires SCADA expertise.

Based upon observations, we anticipate two (2) weeks of on-site troubleshooting the system when placed into operation in 2020.

Final inspections by SCADA experts are expected to occur to finalize all contracts.

Equipment

Klamath ID plans to purchase 18 modern SCADA measurement devices, three (3) automated gate controllers, PLC modules, radio controllers, computers, and solar power generation systems as indicated above.

Materials and Supplies

Wiring for power and control are required. Updated SCADA software and internet services is required to control the system from a centralized location.

The project also anticipates requirements to rebuild the radial head gate at the G Canal.

Contractual

Klamath ID has entered into contract with Sierra Controls for consulting, training, education, troubleshooting, and inspections of SCADA systems. This contract is at an hourly rate.

Klamath ID has entered into contract with Stacey and Dennis IT Solutions for consulting, troubleshooting, and integration of SCADA systems with the existing IT network. This contract is at an hourly rate.

Klamath ID has entered into contract with Adkins Engineering for consulting on the repair of the head gates if required. This contract is at an hourly rate. This contract was publicly announced and awarded in July 2019.

Klamath ID anticipates contracting the environmental assessment requirements.

Third Party In-Kind Contributions

None currently identified.

Environmental and Regulatory Compliance Cost

Klamath ID anticipates $30,000 in cost for environmental review. Cost will be incurred by Reclamation and by a contracted review team.

Indirect Costs

Billing, budgeting, and invoicing costs are anticipated for this project and included as indirect costs.

ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

Upon initial consultation with Reclamation's Klamath Basin Area Office, no immediate issues are identified. The proposed modifications to the infrastructure are within scope of current operations and maintenance contract.

REQUIRED PERMITS OR APPROVALS

Klamath ID currently has a permit with the Federal Communication Authority for radio retransmission of the SCADA system.

LETTERS OF SUPPORT

The following letters of support are included:

1. U.S. Senator Merkley (Oregon)
2. Lower Klamath National Wildlife Refuge (USFWS)
3. Klamath Water Users Association
4. Tulelake Irrigation District
5. Farmers Conservation Alliance
6. Ducks Unlimited
7. Intermountain West Joint Venture

United States Senator Jeffrey A. Merkley,

JEFF MERKLEY
OREGON

COMMITTEES:
APPROPRIATIONS
BUDGET
ENVIRONMENT AND PUBLIC WORKS
FOREIGN RELATIONS

United States Senate
WASHINGTON, DC 20510
Sept. 8, 2020

Bureau of Reclamation
Financial Assistance Operations
Attn: Mr. Ned Weakland
P.O. Box 25007
Denver, CO 80225

Dear Mr.Weakland,

I am writing in support of Klamath Irrigation District's application for WaterSMART grant funding to install 21 Supervisory Control and Data Acquisition and Automation (SCADA) devices around the district. The installation of these devices will improve water delivery in the Klamath Project and help conserve water in Upper Klamath Lake.

The Klamath Irrigation District currently relies on manual readings, performed by hand, to measure water in the canals. This is an inefficient system and often results in spillover or over-deliveries that leads to wasted water and higher pumping costs. The use of SCADA devices will allow for near real-time monitoring and decision making that will not only benefit the Klamath Irrigation Districts but also the eight other irrigation districts that get their water through the canals.

The ability to monitor the water in real-time will improve the water delivery system in place and help conserve over 39,000 acre feet of water. The water will remain in the lake longer into the irrigation season, which will improve water quality and provide better habitat for fish and wildlife including the Coho Salmon and Suckers, both of which are endangered.

The installation of the SCADA devices will also lay the groundwork for future modernization projects such as automatic gates, control systems on pumps, and canal piping. These improvements will save additional water and provide long-term benefits for both irrigators and the environment.

The goals of Klamath Irrigation Districts SCADA project are consistent with the intent of the Bureau of Reclamation's WaterSMART program to conserve water for the benefit of farmers and the environment. Thank you for your full and fair consideration of the Klamath Irrigation District's application. If you have any questions regarding this matter, please contact BJ Westlund in my Central Oregon office at 541-318-1298.

Sincerely,

Jeffrey A. Merkley
United States Senator

313 HART SENATE OFFICE BUILDING
WASHINGTON, DC 20510
(202) 224-3753
FAX (202) 228-3997

121 S.W. SALMON STREET
SUITE 1400
PORTLAND, OR 97204
(503) 326-3386
FAX (503) 326-2900

US Fish and Wildlife Service

United States Department of the Interior
FISH AND WILDLIFE SERVICE
KLAMATH BASIN NATIONAL WILDLIFE REFUGES
4009 Hill Road
Tulelake, California 96134
Phone: (530) 667-2231 Fax: (530) 667-8337

September 30, 2019

Bureau of Reclamation
Financial Assistance Support Section
WaterSMART Grant for Fiscal Year 2020
Attn: Darren Olsen

Dear Mr. Olsen,

On behalf of the Klamath Basin National Wildlife Refuge Complex, I am writing to express support of Klamath Irrigation Districts (KID) funding proposal for the installation of Supervisory Control and Data Acquisition and Automation (SCADA) components that will improve operational efficiency and irrigation water savings.

The Klamath Basin NWR Complex is comprised of 6 different refuges located in southern Oregon and northern California, with two of the refuges located within the footprint of the Klamath Reclamation Project. The refuges lay in one of the richest areas for biological diversity in the Pacific flyway and are recognized for the large numbers of migrating and wintering tundra swans, white pelicans, ducks, geese and eagles it supports.

The installation of SCADA components is anticipated to enhance inter-district communications, reduce spills, and decrease over-deliveries in the District and can provide some relief from shortages in Project water supply, in addition the project may provide water availability for the Refuge when efficiencies are realized.

I support the efforts of KID as they seek funding to find efficiencies through the modernization of water infrastructure throughout their District, especially as water is becoming scarcer throughout the Klamath Basin.

Sincerely,

Greg Austin
Project Leader

TAKE PRIDE INAMERICA

Klamath Water Users Association

Klamath Water Users Association
Phone (541) 883-6100 Fax (541) 883-8893 ~ 735 Commercial Street, Suite 3000 Klamath Falls, Oregon 97601

1 October 2019

For: Grant Approval Authority at the Bureau of Reclamation

Reference: Letter of Support for Klamath ID's 2020 Modernization Efforts

The Klamath Water Users Association supports Klamath Irrigation District's modernization planning which includes Supervisory Control and Data Acquisition and Automation (SCADA) improvements, piping and canal lining improvements, hydropower, and solar projects.

The installation of SCADA components will enhance inter-district communications, reduce spills, and decrease over-deliveries. This project will benefit all eight (8) Districts linked to Klamath Irrigation District and has potential to benefit the U.S. Fish and Wildlife Service, Klamath Tribes, and several endangered species.

Efforts to improve canals with piping and liners will reduce seepage and other losses due to weed control measures. These savings can be applied and used by numerous stakeholders.

Energy projects to create renewable energy are beneficial to the entire Project and Basin.

Furthermore, this initiative will improve visibility of water deliveries across the three (3) largest Districts in the Klamath Project.

Sincerely,

Mark Johnson
Deputy Director
Klamath Water Users Association

Tulelake Irrigation District

Tulelake Irrigation District
P. O. Box 699 * 2717 Havlina Road * Tulelake, CA 96134
Phone: 530-667-2249 * Fax: 530-667-4228 * Email: tid@cot.net

1 October 2019

For: Grant Approval Authority at the Bureau of Reclamation

Re: Letter of Support for Klamath ID's 2020 Modernization Efforts

The Tulelake Irrigation District supports Klamath Irrigation District's modernization planning which includes Supervisory Control and Data Acquisition and Automation (SCADA) improvements, piping and canal lining improvements which will have a positive impact on Tulelake Irrigation District operations.

The installation of SCADA components is anticipated to enhance inter-district communications, reduce spills, and decrease over-deliveries. This project will benefit Tulelake Irrigation district as in allowing for visibility on Klamath Irrigation District spills into our District, and will reduce our overall pumping costs. We believe these projects have potential to benefit the U.S. Fish and Wildlife Service when efficiencies are realized.

Efforts to improve canals with piping and liners will reduce seepage and other losses due to weed control measures. These savings can be applied and used by numerous stakeholders, to include Tulelake Irrigation District.

We anticipate this initiative will improve visibility of water deliveries across the three (3) largest Districts in the Klamath Project.

Sincerely,

Brad Kirby
District Manager
Tulelake Irrigation District

Farmers Conservation Alliance

RESOURCE SOLUTIONS FOR RURAL COMMUNITIES

office 102 state street . hood river . oregon . 97031 telephone 541.716.6085 website www.fcasolutions.org

October 1, 2019

U.S. Bureau of Reclamation
Financial Assistance Support Section
Attn: Ms. Janeen Koza
P.O. Box 25007, MS 84-27814
Denver, CO 80225

RE: Letter of Support for Klamath Irrigation District Project WaterSMART Water and Energy Efficiency Grant Program

Dear Ms. Janeen Koza,

This letter expresses Farmers Conservation Alliance's (FCA's) support for Klamath Irrigation District's Supervisory Control and Data Acquisition and Automation (SCADA) Improvements Project.

FCA has been actively working with Klamath Irrigation District to help the district modernize the infrastructure that it operates in a manner that benefits both agriculture and the environment. The SCADA Improvements Project will help the district meet both of these goals.

The SCADA Improvement Project will reduce incidental spills from Klamath Irrigation District by almost 25,000 acre-feet per year. It would improve inter-district communications, reduce end spills and over-deliveries, decrease pumping costs, and increase conveyance efficiencies, thereby reducing Klamath Irrigation District's diversions out of Upper Klamath Lake and increasing the amount of water available for other interests.

Klamath Irrigation District is currently working with Tulelake Irrigation District, Klamath Drainage District, US Fish and Wildlife, Bureau of Reclamation, and the Klamath Tribes to improve its infrastructure. The SCADA Improvement Project will complement and facilitate future infrastructure improvements currently under consideration.

This project aligns with long-term community goals, and, when complete, will yield agricultural and environmental benefits. Investments by the Bureau of Reclamation in the SCADA Improvement Project would accelerate the implementation of the project and the realization of these benefits, and FCA fully supports these investments.

Sincerely,

Julie Davies O'Shea
Executive Director

Ducks Unlimited

Western Regional Office
3074 Gold Canal Drive
Rancho Cordova, CA 95670
Ph: 916-852-2000, Fax: 916-852-2200
www.ducks.org

September 3, 2020

U.S. Bureau of Reclamation
Financial Assistance Support Section
P.O. Box 25007, MS 84-27814
Denver, CO, 80225

Re: Klamath Irrigation District Supervisory Control and Data Acquisition and Automation (SCADA) 2021-2022 Improvements Project

Dear Grant Approval Authority at the Bureau of Reclamation:

Ducks Unlimited (DU) supports Klamath Irrigation District's (KID) proposed Supervisory Control and Data Acquisition and Automation (SCADA) 2021-2022 Improvements Project proposal, an important opportunity to improve an irrigation delivery system resulting in potential water savings through operational efficiencies.

KID is located within the Klamath Basin of the Southern Oregon - Northeast California (SONEC) region which recently has been identified by waterfowl researchers as one of the two most important geographic conservation priority areas for wetland dependent birds in the Intermountain West. KID is an important irrigation district within the Klamath Project as it provides service to eight additional irrigation districts. Therefore, operation efficiencies on KID will improve inter-district communications, improve water use efficiency through reduce spills and seepage, and potentially contribute to 39,000 acre-feet in annual water savings. This water savings when realized may provide additional water which may be made available to either Lower Klamath National Wildlife Refuge and/or Tule Lake National Wildlife Refuge. Both Refuges are incredibly important as migration and breeding locations for Pacific Flyway waterfowl populations, however, have suffered in their abilities to provide adequate habitat as water in Klamath Project has become scarce. Therefore, any efforts to improve water use efficiency throughout the project and potentially improve water availability to the refuges, may increase the available habitat to waterfowl and other waterbirds in the Klamath Basin.

In California and Oregon, DU has worked in collaboration with private landowners, other non-governmental organizations, state and federal agencies, and irrigations districts to help conserve wetlands through land protection, restoration, and enhancement projects. We look forward to continued collaborative efforts with KID and other organizations within the Klamath Basin to improve water use efficiencies and foster collaborative multi-beneficial projects.

Sincerely,

Mark E Biddlecomb

Digitally signed by Mark E Biddlecomb
DN: cn=Mark E Biddlecomb, o=Ducks Unlimited, ou, email=mbiddlecomb@ducks.org, c=US
Date: 2020.09.03 11:04:26 -07'00'

Mark Biddlecomb
Director of Operations

Intermountain West Joint Venture

INTERMOUNTAIN WEST
JOINT VENTURE
conserving habitat through partnerships

September 2, 2020

Bureau of Reclamation
Financial Assistance Support Section

Subject: Klamath Irrigation District (Klamath ID) Supervisory Control and Data Acquisition and Automation (SCADA) 2021-2022 Improvements.

Dear Grant Approval Authority at the Bureau of Reclamation,

The Intermountain West Joint Venture (IWJV) supports Klamath Irrigation District's WaterSMART Grant proposal for the installation of Supervisory Control and Data Acquisition and Automation (SCADA) systems. SCADA components will enhance inter-district communications, reduce spills, and decrease over-deliveries.

The Klamath Basin is one of our highest priority areas for wetland habitat conservation for Pacific Flyway waterfowl, shorebirds, and waterbirds. Waterfowl use of the Klamath Basin National Wildlife Refuges has declined by 50% since 2008, largely as a direct result of reduced water allocations. The IWJV is working with irrigation districts, farmers, and other local stakeholders to identify collaborative solutions that ensure the availability of wetland habitat on public and private lands as needed to sustain Pacific Flyway waterfowl population at goal levels established by the North American Waterfowl Management Plan.

The proposed irrigation modernization improvements will enhance water management capabilities. Projects that improve the stewardship of water in the Klamath Basin benefit waterfowl, irrigators and fisheries in the area. We urge the Bureau of Reclamation to give this project its utmost consideration.

Sincerely,

Dave Smith, Coordinator
Intermountain West Joint Venture

OFFICIAL RESOLUTION

The Klamath ID Board of Directors approved 2 resolutions for this project. The first in 2019 and again in 2020. (2020 Resolution Pending Director's Signatures)

BOARD OF KLAMATH IRRIGATION DISTRICT

KLAMATH COUNTY, OREGON

In the Matter of WaterSmart Grants) Resolution 2019-0007

WHEREAS, the Board of Directors of Klamath Irrigation District has reviewed and is in support of the Klamath Irrigation District 2019 Bureau of Reclamation WaterSmart Grant applications, for SCADA, Piping and Lining C-4a and F-4.

WHEREAS, Klamath Irrigation District will work with the Bureau of Reclamation to meet all established deadlines for entering into a cooperative agreement.

NOW THEREFORE the District Manager, Gene Souza, is authorized, empowered and directed to execute and deliver, in the name and on behalf of the district, the Grant Agreements if so awarded by the Bureau of Reclamation.

DONE and **DATED** this 10th day of October, 2019

BOARD OF KLAMATH IRRIGATION DISTRICT

Tyrel M. Kliewer, President

Jerry A. Enman, Vice-President

Grant W. Knoll, Director

Dave A. Hamel, Director

Ryan E. Hartman, Director

BOARD OF KLAMATH IRRIGATION DISTRICT

KLAMATH COUNTY, OREGON

In the Matter of WaterSmart Grants) **Resolution No. 2020-0005**

WHEREAS, the Board of Directors of Klamath Irrigation District has reviewed and is in support of the Klamath Irrigation district 2020 Bureau of Reclamation WaterSmart Grant applications for SCADA.

WHEREAS, Klamath Irrigation District will work with the Bureau of Reclamation to meet all established deadlines for entering into a cooperative agreement.

WHEREAS, at an election by mail held for the purpose of electing a person to the board of directors, the qualifications for a director are those set forth in ORS 545.043 and 545.207.

NOW, THEREFORE, the District Manager, Gene Souza, is authorized, empowered, and directed to execute and deliver, in the name and on behalf of the district, the Grant Agreements if so awarded by the Bureau of Reclamation.

DONE and DATED this 13th day of August, 2020.

BOARD OF KLAMATH IRRIGATION DISTRICT

Tyrel M. Kliewer, Chairman

David A. Hamel, Director

Jerry A. Enman, Vice Chairman

Ryan E. Hartman, Director

Grant W. Knoll, Director

ANNEX A: TID Daily Report WY2016-2017

DATE	STATION 48	ANDERSON-ROSE SPILL	J CANAL	TULE LAKE PRECIP	TULE LAKE SNOW	D PLANT PUMPING	TULE LAKE ELEV.
	(in CFS)	(in CFS)	(in CFS)			(in AF)	
9/1/2017	215	75	391	0.00	0.00	0	4,034.90
9/2/2017	179	30	373	0.00	0.00	0	4,034.95
9/3/2017	150	27	358	0.00	0.00	0	4,034.95
9/4/2017	133	5	370	0.00	0.00	0	4,034.95
9/5/2017	163	0	376	0.00	0.00	0	4,034.96
9/6/2017	200	0	376	0.00	0.00	0	4,034.96
9/7/2017	185	0	353	0.07	0.00	0	4,034.96
9/8/2017	119	0	331	0.00	0.00	0	4,034.97
9/9/2017	117	0	315	0.00	0.00	0	4,034.98
9/10/2017	73	0	265	0.00	0.00	0	4,034.98
9/11/2017	95	0	286	0.00	0.00	0	4,035.00
9/12/2017	50	0	293	T	0.00	0	4,035.00
9/13/2017	36	0	262	0.00	0.00	103	4,035.00
9/14/2017	20	0	235	0.00	0.00	261	4,035.00
9/15/2017	38	0	212	0.00	0.00	297	4,035.00
9/16/2017	31	0	187	0.00	0.00	318	4,035.00
9/17/2017	12	20	166	0.00	0.00	318	4,034.96
9/18/2017	0	17	157	0.05	0.00	318	4,034.94
9/19/2017	0	18	147	0.01	0.00	318	4,034.92
9/20/2017	0	15	141	0.04	0.00	318	4,034.90
9/21/2017	0	5	151	0.01	0.00	318	4,034.88
9/22/2017	0	0	147	0.00	0.00	318	4,034.86
9/23/2017	0	0	148	0.00	0.00	318	4,034.84
9/24/2017	8	0	166	0.00	0.00	318	4,034.82
9/25/2017	25	0	180				
9/26/2017	9	9	166				
9/27/2017	0	0	160				
9/28/2017	0	0	152				
9/29/2017							
9/30/2017							
Monthly Total	1,858	221	6,864	0.18	0.00	3,523	
WY Total	35,926	10,525	60,302	11.85	27.60	30,603	
Acre Feet	3685.3	438.4	13614.7				
WY AF Total	71259.2	**23337.9**	122259.0				

ANNEX B: Farmers Conservation Alliance Klamath ID Modernization Brief

Klamath Irrigation District
District Modernization Brief

Background

Klamath Irrigation District (Klamath ID or the District) is located in southern Oregon, south and east of Klamath Falls, just north of the California border. Klamath Irrigation District was officially formed in 1917.[49] However, the District's infrastructure dates back to 1906 when construction began on the A Canal.[50] Construction of the District's canals, laterals, and drainage system continued through 1917.[49] Klamath ID is a Bureau of Reclamation (Reclamation) District and is part of the Klamath Project, which provides water to 240,000 acres of cropland.[50] The District's water supply is from the Klamath River, Upper Klamath Lake, and Lake Ewauna.

In 1918, Klamath ID entered into a contract with Reclamation for repayment of the costs of certain project works.[49] In 1954, the District entered into another contract with Reclamation to assume operation and maintenance of the A, B, C, D, E, F, and G Canals; the C-G cutoff; and all the related distribution, drainage, and pumping plants.[49] Under this contract, Klamath ID is also required to serve water users both within and outside of its boundaries, including Klamath Basin Improvement District and individual Warren Act Contracts.[49] Since the District delivers water to eight other districts or companies, it does not keep records of the number of acres irrigated annually; however, approximately 74,996 acres are irrigated from the Klamath ID system.

Klamath ID has over 2,500 patrons and irrigates 53,638 acres of cropland through 200 miles of canals and laterals.[51] Although urbanization has occurred throughout the District, especially close to Klamath Falls, the District only delivers water for irrigation and stock water; no water is

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[49] Klamath Irrigation District. (2019). *District Website*. Retrieved from: http://www.klamathirrigation.com/page11.html

[50] Bureau of Reclamation. (2019). *Klamath Project*. Retrieved from: https://www.usbr.gov/projects/index.php?id=470

[51] Klamath Irrigation District *Water Management and Conservation Plan*. (2011).

delivered for domestic or municipal purposes.**Error! Bookmark not defined.** The District has o ne major diversion, from Upper Klamath Lake into the A Canal, with a capacity of 1,150 cfs. The diversion is screened through a vertical-plate, V-shaped fish screen before passing through a 3,300-foot-long tunnel beneath the City of Klamath Falls, then is discharged into the A Canal. The A Canal flows southeast for about 9 miles where it terminates and delivers water into the B Canal and the C Canal. The B Canal flows east about 4 miles where it terminates and delivers water into the E and F canals. The C Canal flows south about 1 mile to the C-G Cutoff, continues southwest about 2 miles to C-4 Lateral, and flows to the west. Below the C-G Cutoff, the G Canal flows southeast about 8 miles to discharge into the D Canal.**Error! Bookmark not d efined.** Approximately, 21,460 feet of the District's laterals in urban areas have been piped, but the vast majority of the system is open and unlined.

The District has seven reuse pumping stations (Miller Hill, Stukel, Adams, South Poe Valley, North Poe Valley, Melhase Ryan, and the #5 Pump) with a total of 16 pumps; ten major drains; and 2,000 turnouts. According to District staff, the South Poe Valley and Miller Hill stations are used most frequently, along with the Stukel station, which is used to correct water deliveries. The Miller Hill station's three pumps operate at 100 HP each and nearly always pump approximately 17 to 20 cfs between the Lost River Diversion Channel and the C-4 Canal. The A, B, C, D, and G Canals, and the Miller Hill Pumping Plant have SCADA.[52] Some measuring points use weirs and flumes, and others use differential pressure flow measurement meters. The District would like to install SCADA at the C and D drops and C Syphon Gate. The District has flow measurements for water discharging back to the Lost River and to Tulelake Irrigation District. Tulelake Irrigation District measures flows at the Anderson Rose Diversion Dam and Station 48 but does not typically share those measurements with Klamath Irrigation District staff.

The District maintains and operates one hydroelectric power facility located at the C Drop, though the facility is owned by Ted Sorenson. It has a vertical Kaplan turbine and a capacity of 1.1 MW. The power that is generated is sold to Pacific Power. The District receives royalties on power production, which are approximately $200,000 to $250,000 per year. Though, there is no drought contingency plan in the contract, so in a low water year the District could be subject to paying Pacific Power if the facility does not produce the agreed-upon amount of power. According to the District's water rights, the 700 cfs-capacity facility provides an average annual generation of 2,900 megawatt-hours (MWh). The turbine operates at a theoretical horsepower (HP) of 1,790.

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[52] Freeman, B., Hicks, J., & Burt, C. (2005). *Leveraging SCADA to Modernize Operations in the Klamath Irrigation Project*. SCADA and Related Technologies. Retrieved from: https://mountainscholar.org/bitstream/handle/10217/46525/121_Proceedings%202005%20USCID%20Vancouver%20Freeman.pdf?sequence=20&isAllowed=y

Approximately 40,000 acres within the District are irrigated with sprinklers (i.e., wheel lines, solid set, and, more frequently, pivots), and approximately 13,000 acres are flood irrigated. The primary crops grown in Klamath ID are alfalfa, pasture, potatoes, and cereal grains; however, row crops, orchards, strawberries, and landscape plants are also irrigated from the District's system.

Existing water loss data for the District indicate that between 1991 and 2000, approximately 20 percent of diverted water is lost in end spills, 14 percent is lost to lateral seepage, 1 percent is required for filling and draining the system, and the remaining 65 percent reaches patrons.[51] However, overall, the Klamath Project re-uses and recycles between 90 and 95 percent of the diverted water, according to a 1998 draft report entitled "Klamath Project Historical Water Use Analysis" by Davids Engineering.[51]

Goals and Objectives

- Modernization Goal: The District's main goal for modernization is to optimize its water resources by improving the flexibility and resiliency of its system.
- Key Modernization Objectives:
    - Improve water tracking from diversion to drain
        - Possible actions: water loss assessment; identify irrecoverable losses; mass balance study; improve measurement devices
            - The vast majority of the water loss in the District's system is reused by other Klamath Project water users; actions that impact recoverable losses could impact and reduce the overall Project efficiency.
    - Maximize efficiency and flexibility of water deliveries
        - Possible actions: reduce irrecoverable losses through piping; water transactions/marketing
    - Bring people together
        - Possible actions: build/strengthen partnerships to collaboratively manage water resources in the basin
    - Update failing infrastructure
        - There is a lots of failing infrastructure in the District. The A Canal between the diversion and the tunnel needs to be replaced, which is about ¼ mile.
    - Economic benefits: The District noted that it's tough to make things work financially for the District and the patrons, with power costs, market prices, water accessibility, etc.
        - Reduce power costs through piping
        - Reduce weed control through piping

Opportunities/Data Gaps

- Strengthen partnerships with local governments and other stakeholders
- Potential for low-head hydro in the District, with about 85 feet of drop across the existing system
- Potential for other power-generating activities, like solar
- The District has GIS data for its main canals and laterals but not for its smaller ones. The District is working on completing a GIS data set (which is 80-90% complete as of early May) that will include all the turnouts and the associated acreage.
- Updated water loss assessments, District- and project-wide, would inform the development of a System Improvement Plan and Modernization Strategy. Given the extensive reuse of water in the Klamath Project, an updated mass-balance study would also inform modernization efforts.
- Better information/data regarding stormwater inflow into the system from the City of Klamath Falls
- Mapping/GIS development of unmapped laterals and/or delivery points to District patrons, particularly in the southern part of the District
- Water rights mapping—need to get PDFs from District office
- Engineering designs—need to get PDF copies from District office

Challenges

- Water supply certainty is a challenge: Water deliveries are predicated on the current biological opinion, as well as the annual water availability. The BOR releases an Annual Operations Plan, which dictates that quantity of water available to Project water users. Hence, from year to year, there is no certainly, regarding Project water supply.
- There is a lot of competition between stakeholders for limited water supply and disagreement on how the limited water supply should be used.
- Because there is extensive water reuse within the Project, any piping or lining of canals and laterals requires careful review and analysis to not adversely affect downstream water supplies
- Effective coordination with local jurisdictions about stormwater management is a challenge.

Recent Successes/Projects

- C Siphon – replaced a failing flume, paid for by the District
- C-G Drop – replaced a structure that failed in 2016, concrete lining
- Stasney Check – replaced a failing structure

Pending Grants

- None known

Questions/Topics to Focus On

- Clarity on the District's major goals/objectives

Main Partnerships

- Through its contract with Reclamation, Klamath ID delivers water to:
  - Enterprise Irrigation District
  - Pine Grove Irrigation District
  - Van Brimmer Ditch Co.
  - Shasta View Irrigation District
  - Malin Irrigation District
  - Klamath Basin Improvement District
  - Sunnyside Irrigation District
  - Poe Valley Improvement District
  - Tulelake Irrigation District
  - individual Warren Act contractors
  - miscellaneous annual flat rate and temporary annual contracts
- The District works closely with the other Klamath Project water users. It is a member of the Klamath Water Users Association.

FCA Contact Information

- Lead Contact: Scott McCaulou; scott.mccaulou@fcasolutions.org; (503) 318-7116

ANNEX C: Sierra Controls Site Survey and Proposal Extract

Office

Priority: 1

Existing Master RTU equipment
Controller: RUG9
Radio: MDS4710 serial 462 MHz, 300 bps configuration
Power: AC Power
Backup Battery: Not verified.
Monitor Points: This site polls all data viewed on the existing Wonder Ware HMI application.
Control Points: Any points from the HMI must be transmitted through this PLC.

Status: The existing Master RTU Equipment is randomly located on a shelf in the main office.

Existing Master RTU Equipment

The new Master RTU will be used at the Office to interface with a graphic display and the SCADA control system. The Master Terminal Unit is coupled with the radio telemetry system to gather data from the remote stations. This RTU will support serial and Ethernet radio designs to support new and existing sites during the SCADA system modernization. This RTU will also allow for remote monitoring and control regardless of the operational status of the SCADA system.

The new Master RTU includes a local touchscreen that displays an interactive system overview where operators can view the complete SCADA system and control the system as configured during each phase of work.

A remote interface device will also be added to the master RTU. The device allows Sierra Controls to have remote accessibility into the system. This provides Sierra Controls with the additional tool of remote support and troubleshooting. Often times system failures can be resolved without travel to the site. This also allows SC to use its development software to provide most programming enhancements remotely.

This RTU is central to the SCADA system.

Example of New Master RTU

C-G Canal

Priority: 1

Controller: RUG3 RTU with onboard display
Radio: MDS4710 serial 462 MHz, 300 bps configuration
Power: Solar Power, AC power looks to be available close to G turnout.
Battery Exists.
Monitor Points: C Canal Level, C Instant Flow, Average Flow, G Canal Level, G Flow
Sensor: Sontek Flow Monitor
Control Points: None

Status: This site consists of AC and Solar power solutions possible. The G Canal Gate and the C Siphon Gate can be both be automated in the future. This site requires a new Gate Control RTU. This will be the second site to add gate automation and site monitoring.

G Canal Gate

Stukel Pumps

Priority: 1

Monitor RTU
Controller: Missing
Radio: MDS4710 serial 462 MHz, 300 bps configuration (to office)
Power: AC
Battery Backup
Monitor Points: HOA Position and Run status for 3 pumps.
Control Points: None

Status: The PLC is missing at this site, therefore not functional. A new Pump Control RTU is recommended for this site. Same hardware as the Gate Control RTUs. The new RTU will allow the opportunity to run the pumps in automatic control, remote control, and monitor site data.

Miller Hill Pump Station

Priority: 3

Monitor RTU
Controller: RUG3 RTU with onboard display
Radio: MDS4710 serial 462 MHz, 300 bps configuration (to office)
Power: Solar Power, AC power available at location in Pump House Building
Battery Backup
Monitor Points: South, Center, and North Flows, Pump 1 and 2 Speed References, Pump 1-3 calculated CFS output.
Control Points: None

Status: This site currently works. The PLC greatly limits the communication speed and will not support remote support or future site enhancements. This site can be supported with the new proposed SCADA system. A new Pump Control RTU is recommended for this site in the future.

New Sites

#1 Drain and #5 Drain Sites

Priority: 3

Monitor RTU
Controller: NA. Has local I/O module with Display
Radio: None
Power: Solar
Battery
Monitor Points: Flow
Control Points: None

Site Equipment

Status: Site works locally to monitor flow. Goal would be to upgrade solar and add radio to site. This would allow for the site to be integrated into the SCADA system. The district would support adding some 2" poles and uni-strut support for new enclosure, batteries, and solar panel. Goal would be to move existing box with monitoring equipment to new enclosure. Having the data from these units on SCADA could reduce the amount of site visits during the operating season.

C Spill, D Spill Sites

Priority: 3

Status: Currently no hardware to interface with. These sites can be monitored to provide a flow measurement based on the spill level. The flow data would be useful to help manage the control of the system in the future. A new solar canal monitor is recommended for each site.

C-Spill

D-Spill

Sierra Controls 2019 Budget Proposal (requires update for 2020 additions)

Priority	Site Description	Site Type	Project Low Range	Project High Range	Professional Services (PM, Design, Manual, As Builts)	Programming / Configuration (Radio, OIT, PLC, HMI, Alarm, Reporting)	Startup & Commissioning	RTU / Computer / Hardware Pricing	Software & (1) YR Support	Instrumentation	Hardware Installation (By District)	Site Total
1	HMI	SCADA	$ 70,000.00	$ 85,000.00	$ 2,500.00	$ 23,750.00	$ 9,500.00	$ 12,850.00	$ 25,055.00			$ 73,655
1	B Canal	Control	$ 28,500.00	$ 30,000.00	$ 4,800.00	$ 11,125.00	$ 4,455.00	$ 8,500.00				$ 28,880
1	C - G Canal	Control	$ 28,500.00	$ 30,000.00	$ 4,800.00	$ 11,125.00	$ 4,455.00	$ 8,500.00				$ 28,880
1	Stukel Pump	Control	$ 27,000.00	$ 28,000.00	$ 4,300.00	$ 10,750.00	$ 4,000.00	$ 8,000.00				$ 27,050
1	Mel Hayze Pond	Control	$ 27,000.00	$ 28,000.00	$ 4,300.00	$ 10,750.00	$ 4,000.00	$ 8,000.00				$ 27,050
1	Headworks (Fish Screen & Headgate)	Monitor / SCADA	$ 22,000.00	$ 24,000.00	$ 6,500.00	$ 9,255.00	$ 4,125.00	$ 3,250.00				$ 23,130
1	Contingency		$ 10,000.00	$ 12,500.00	$ 1,500.00	$ 3,500.00	$ 2,500.00	$ 2,500.00				$ 10,000
1	Communications Survey & Design		$ 10,000.00	$ 10,000.00	$ 10,000.00							$ 10,000
1	Project Management & Installation Support		$ 20,000.00	$ 25,000.00	$ 20,000.00							$ 20,000
2	Adams Pump	Control	$ 27,000.00	$ 28,000.00	$ 4,300.00	$ 10,750.00	$ 4,000.00	$ 8,000.00				$ 27,050
2	A Canal	Monitor	$ 16,000.00	$ 18,000.00	$ 3,400.00	$ 4,135.00	$ 2,145.00	$ 6,500.00				$ 16,180
2	D Canal	Monitor	$ 16,500.00	$ 18,000.00	$ 3,400.00	$ 4,135.00	$ 2,145.00	$ 7,000.00				$ 16,680
3	Miller Hill Pump	Control	$ 27,000.00	$ 28,000.00	$ 4,300.00	$ 10,750.00	$ 4,000.00	$ 8,000.00				$ 27,050
3	No 1 Drain	Monitor	$ 9,000.00	$ 9,500.00	$ 2,650.00	$ 1,250.00	$ 2,145.00	$ 3,000.00				$ 9,045
3	No 5 Drain	Monitor	$ 9,000.00	$ 9,500.00	$ 2,650.00	$ 1,250.00	$ 2,145.00	$ 3,000.00				$ 9,045
3	C Drop Hydro Gen Site		$ 5,000.00	$ 6,000.00	$ 1,000.00	$ 1,000.00	$ 2,145.00	$ 1,000.00				$ 5,145
3	Tulelake ID Headworks	Monitor	$ 6,000.00	$ 16,000.00	$ 3,400.00	$ 4,135.00	$ 2,145.00	$ 6,500.00				$ 16,180
3	D Spill	Monitor	$ 20,000.00	$ 25,000.00	$ 5,000.00	$ 4,135.00	$ 2,500.00	$ 8,500.00		$ 2,000.00		$ 22,135
3	C Spill	Monitor	$ 20,000.00	$ 25,000.00	$ 5,000.00	$ 4,135.00	$ 2,500.00	$ 8,500.00		$ 2,000.00		$ 22,135
		Totals:	**$ 398,500.00**	**$ 455,500.00**	**$ 93,800.00**	**$ 125,930**	**$ 58,905**	**$ 111,600**	**$ 25,055**	**$ 4,000**	**$ -**	**$ 419,290**

Priority	Total
1	$ 248,645.00
2	$ 59,910.00
3	$ 110,735.00
4	$ -
	$ 419,290.00