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Memorandum

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| **Subject** | **Phase 1 Assessment of Irrigation Water Conservation Opportunities for Water Quality Improvement** |
| **Project Name** | Klamath Hydroelectric Project: Interim Measure 11 Assistance |
| **Attention** | Demian Ebert (PacifiCorp) |
| **From** | Jason Smesrud, Dana Larson, Ken Carlson (Jacobs) |
| **Date** | September 30, 2019 |
| **Copies to** | Interim Measures Implementation Committee |

## 1. Introduction

The Klamath Hydroelectric Settlement Agreement (KHSA) includes Interim Measure 11 (Interim Water Quality Improvements, IM11), which is intended to address water quality improvements in the Klamath River. Once the Dam Removal Entity (now the Klamath River Renewal Corporation) accepts the Federal Energy Regulatory Commission (FERC) surrender order, PacifiCorp will provide funding of up to $5.4 million for implementation of projects identified in the Priority List of Projects. The KHSA states that "The emphasis of this measure shall be nutrient reduction projects in the watershed to provide water quality improvements in the mainstem Klamath River, while also addressing water quality, algal and public health issues in Project reservoirs and dissolved oxygen in J.C. Boyle Reservoir."

The projects to be implemented under the Priority List of Projects process per IM11 will be selected from among four categories:

- Natural Wetlands Restoration
- Diffuse Source (Decentralized) Treatment Wetlands
- Riparian Fencing and Grazing Management
- Agricultural Irrigation Efficiency and Water Management

More information about the development of the Priority List of Projects is available under the Technical Reports link here: https://www.pacificorp.com/energy/hydro/klamath-river/khsa-implementation.html.

Projects in the Agricultural Irrigation Efficiency and Water Management category will be used to manage irrigation and associated return flows along streams and canals that flow into Upper Klamath Lake or the Klamath River to reduce sediment loads, sediment-bound nutrients, and irrigation tailwater discharges to streams in the Upper Klamath Basin. Types of Irrigation Efficiency and Water Management projects

could include: the reduction of sediment and nutrients from irrigation return flow by using wetlands, ponds, and pump-back systems; upgrading irrigation systems to increase the efficiency of irrigated water applications to reduce runoff and irrigation-induced erosion; purchasing or leasing of water rights for instream return; and lining or piping delivery systems to reduce water loss and sediment delivery to rivers and streams. These irrigation efficiency and water management efforts would contribute to improved water quality in adjacent canals and streams by reducing or preventing excessive sediment and nutrient-enriched runoff into local water sources. Measures that conserve water and provide an in-stream water quantity benefit also directly benefit water quality. All of the measures outlined above present possible benefits to irrigators including potential reductions in energy use/cost, reductions in labor cost, and the ability to maintain production with reduced water diversion/pumping helping to improve resiliency to future water shortages.

Locations for specific Irrigation Efficiency and Water Management projects include the Klamath Basin area upstream of Keno Dam; including the Sprague, Williamson, Wood, and Lost River drainages.

## 2. Purpose and Scope

PacifiCorp (with assistance from Jacobs) initiated contacts with key stakeholders working in the target geographic area of the Klamath Basin during May and June of 2019. The focus of this effort was to compile additional information about potential Agricultural Irrigation Efficiency and Water Management projects in the Basin that could be supported under IM11. PacifiCorp was specifically interested in:

- Stakeholder needs to allow identification of priority water quality and quantity management projects related to irrigation
- Irrigation efficiency projects already identified by stakeholders that may be candidates for IM11 funding
- The extent to which the water quality benefits have been defined/quantified for candidate projects
- Other funding sources currently being leveraged for these projects that may have synergistic possibilities with IM11 funding

Ultimately, this information was compiled to help inform and focus future IM11 efforts in support of Agricultural Irrigation Efficiency and Water Management projects in the Basin.

The scope of this effort was limited to identifying and contacting stakeholders, documenting the information gathered, and reporting back to the Interim Measures Implementation Committee (IMIC) on the results of this effort along with an assessment of data gaps and possible future efforts in support of this IM11 project category.

## 3. Stakeholders Contacted

Local representatives from each of the following organizations were contacted under this work:

- U.S. Bureau of Reclamation (Reclamation)
- Klamath Water Users Association (KWUA)
- Klamath Irrigation District (KID)
- Natural Resources Conservation Service (NRCS)

- Oregon Department of Agriculture (ODA)
- Oregon Department of Environmental Quality (DEQ)
- California North Coast Regional Water Quality Control Board (NCRWQCB)
- Oregon Water Resources Department (OWRD)
- Trout Unlimited (TU)
- Farmers Conservation Alliance (FCA)

Several other organizations and individuals that were identified that offer additional insights for this effort; however, the time and budgets allocated constrained formal contacts in this phase of work to the above list.

## 4. Interview Process and Meeting Notes

The first step in the process was identifying and prioritizing stakeholders to be contacted. A project fact sheet with IM11 background information and a list of potential questions (Attachment A) was then prepared and distributed to the stakeholders. Interviews with each stakeholder or organization were then conducted by phone and meeting notes were prepared to document interview results (Attachment B). Key reference documents mentioned in interviews were also compiled for future use (see Section 6.10).

## 5. Klamath Basin Background and Context

It is important to recognize the regional differences in irrigation water users and irrigation practices in the Klamath Basin and the water quality priority areas for effective planning and evaluation of irrigation water conservation opportunities in the Klamath Basin. The Klamath River Basin is divided into 12 subbasins that cover widely varied geographies (Figure 1).

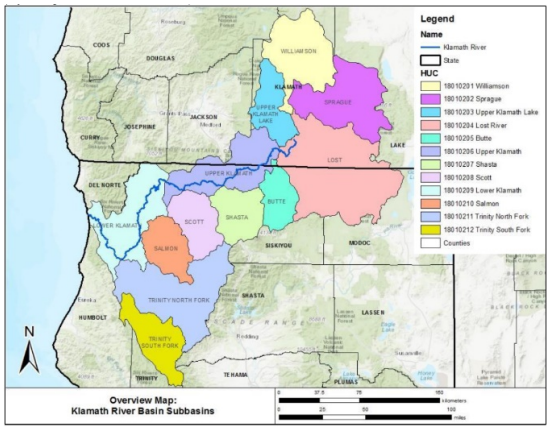


**Figure 1.** Klamath River Basin Subbasin Map (DEQ 2019b).

### 5.1 Geographic Differences

The Lost Subbasin comprises lands that drain to the Lost River and the Klamath River downstream of Upper Klamath Lake (UKL). While the Lost Subbasin spans the Oregon/California state line, the focus of IM11 is in portions of the basin within Oregon. The Klamath Irrigation Project, operated by the Reclamation and a number of local irrigation districts, is located in the Lost Subbasin. The majority of irrigation diversions and deliveries in the Lost Subbasin are operated by irrigation districts in cooperation with Reclamation. While water management at the field scale (from field head gate to field tailwater return flows) is operated by individual landowners, the delivery of water from the water source to field head gates is the responsibility of irrigation districts. As a result, key stakeholders in developing Irrigation Efficiency and Water Management projects in the Lost Subbasin include the irrigation districts and Reclamation.

As defined in this document, the Upper Basin consists of lands draining into UKL from the Sprague, Williamson, and Upper Klamath Lake subbasins. The Wood River is part of the Upper Klamath Lake Subbasin. In the Upper Basin, the vast majority of irrigation diversions and deliveries are operated by individual landowners. Aside from the Modoc Point Irrigation District (MPID) on the northeastern shoreline of UKL and a few small irrigation ditch associations/companies, the majority of irrigators operate their own irrigation delivery systems from source through fields. As a result, projects in the Upper Basin generally require working directly with landowners as opposed to water delivery organizations. Key stakeholders with a history of working directly with landowners on irrigation projects in the Upper Basin include NRCS, ODA, TU, Klamath Soil and Water Conservation Districts (KSWCD), and the Klamath Watershed Partnership (KWP).

### 5.2 Nutrient TMDL Priorities for Agricultural Sources

There are two primary Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) documents that specify target nutrient reductions from agricultural sources in the Upper Klamath Basin (DEQ 2002, 2019a). Key conclusions from these documents that are relevant to the assessment of priority areas include:

- The Upper Klamath Lake TMDL (DEQ 2002) specifies a total phosphorus (TP) load reduction of 40 percent to UKL to meet water quality objectives.
- The primary agricultural TP sources to UKL are agricultural drain pumps discharging directly to UKL, and flows entering UKL from Seven Mile Creek, Wood River, Williamson River, and Sprague River.
- The highest unit land area agricultural TP sources above UKL are agricultural drain pumps discharging directly into UKL, followed by flows from Seven Mile Creek and the Wood River downstream of Weed Road.
- The Lost River Diversion (LRD) and Klamath Straits Drain (KSD) are the primary agricultural TP sources to the Klamath River downstream of UKL.
- The Upper Klamath and Lost River Subbasins Nutrient TMDL (DEQ 2019a) specifies a TP load reduction of 89 percent from the LRD and KSD to meet water quality objectives in the Upper Klamath River.

This information helps to identify key areas of focus for agricultural nutrient reduction priorities.

## 6. Summary of Interview Information by Topic

This section summarizes information discussed during stakeholder interview and is organized by topic area. Additional details from specific stakeholder discussions can be found in Attachment B.

### 6.1 Summary of Past Work in the Basin – On-Farm

NRCS spent approximately $50 million in 2001 and years following in the Klamath Basin in response to the 2001 water crisis and severe reductions in irrigation water allocations. Although activities were conducted Basin wide, the focus was on the Klamath Project lands in the Lost Subbasin. An additional $14 million was allocated to NRCS in 2014 with a focus in the Sprague Subbasin and on-farm irrigation water efficiency projects. Projects included flood to sprinkler conversion, wheel/hand line to pivot conversions, and some flood irrigation enhancement projects. While cost data is available for different types of irrigation water conservation measures from these efforts, there was no assessment of water

quality or quantity benefits from these projects. In their interview, the NRCS thought data to connect water quality benefits with different types of conservation measures would be beneficial.

Some of the lessons learned from implementing past projects may be useful in planning future project investments. NRCS noted that some flood to sprinkler projects substantially reduced water supplies to downstream irrigators that had historically depended upon tailwater from upgradient water users for their irrigation supplies. One solution to this issue is to take a systems approach and ensure that the routing of water sources and tailwater are well understood and addressed in early project scoping. Water conservation projects on fields that have tailwater discharges directly to natural channels are most likely to have direct water quality benefits and are least likely to result in impacts to downstream water users, but could impact instream resources if water supply is reduced substantially.

NRCS also noted that the widespread flood irrigation in the Sprague Subbasin mimics natural floodplain processes helping to support groundwater interactions and baseflows.

### 6.2 Summary of Past Work in the Basin – Districts

The only irrigation district interviewed directly was KID. Both KID and Reclamation staff, however, discussed work completed by Horsefly Irrigation District (HID) and Tulelake Irrigation District (TID) in recent years.

HID has implemented a number of canal-to-pipe conversion projects to reduce conveyance losses. It was estimated that reductions in combined canal losses to seepage (recoverable loss to groundwater) and evaporation (nonrecoverable loss) were in the range of 30 percent. HID was not contacted to confirm this estimate or to obtain additional details; however, project cost and water loss reduction estimates should be available.

TID has implemented several modernization projects focused on automation/SCADA in recent years. KID plans to visit TID and learn from their experiences, since this is a focus of KID in targeting better monitoring and control of inflows and outflows/operational spills.

### 6.3 Current Drainwater Management Planning for Agricultural Operations Around UKL

The ODA started working with agricultural landowners around UKL in early 2018. Approximately 1 year of water quality and drain flow monitoring data has now been compiled from agricultural operations around UKL. ODA hopes to continue water quality monitoring but their funds to support these efforts ran out after the first 1-year period and additional funding is dependent upon additional state funding decisions.

ODA is working with several other agencies including NRCS, TU, KSWCD, and KWP to work with landowners in developing conservation plans and obtaining funding. At the time of the interview with ODA, ten landowners had conservation plans in some stage of development resulting from this work. Conservation plans include irrigation efficiency, sediment reduction, tailwater recovery, livestock exclusion, and solar livestock watering systems. Additional funding is needed for continued monitoring, further engineering, and project implementation.

### 6.4 Projects Currently in Project Definition to Early Implementation Phases – On-Farm

There are several on-farm projects involving irrigation water conservation components for water quality benefit that are in definition to early implementation phases. If IM11 funding becomes available within

the timelines for these projects, there may be potential to support some of these projects. Alternatively, if IM11 funding lags implementation readiness for these projects, the description of these projects may help in providing further context to the types of projects that might benefit from IM11 funding.

Some of the projects discussed with stakeholders are briefly summarized below:

- The Walker and Caledonia farms border the southwestern shore of UKL and have drainwater discharges to UKL. Projects envisioned with these landowners would improve reuse and retention of drainwater and reduce direct discharge to UKL. The project partners are currently looking for engineering and implementation funding.
- There is a point of diversion transfer being considered for irrigation water rights that draw upon Barkley Springs. Current irrigation diversions at Barkley Springs (near Hagelstein County Park on the eastern shoreline of UKL) substantially reduces the cool high-quality water habitat created by the springs and their connectivity to UKL in summer months. This project would replace the existing diversion with a groundwater well for irrigation water supply. The project would improve important habitat for juvenile suckers and improve water quality by allowing cool spring water to flow unimpeded to UKL.
- Several other potential projects have been identified by ODA for lands bordering and with direct drainwater discharges to UKL. These projects include those mentioned in Section 6.3, involving UKL boarding landowners with conservation plans in some stage of development including irrigation efficiency, sediment reduction, tailwater recovery, livestock exclusion, and solar livestock watering systems.
- The Regional Conservation Partnership Program (RCPP) funding from NRCS is still available for projects in the Upper Basin through September of 2020, when this funding expires. The $7.6M funding allocated through NRCS has been partially spent thus far and funding is still available for additional projects. The geographic area includes Wood and Sprague subbasins and west side of UKL; projects on the south side of UKL are not eligible. The primary conservation measures being targeted are riparian fencing, off-channel livestock watering, irrigation energy efficiency, and piping of irrigation ditches.

### 6.5 Projects Currently in Project Definition to Early Implementation Phases – Districts

The Klamath Straights Drain Recirculation Project was the one irrigation-district-scale water conservation project that was identified in stakeholder discussions that is in the definition to early implementation phase and has direct water quality benefits. This project involves recirculation of up to 60 cubic feet per second (cfs) of drainwater captured at end of the KSD through Pumping Plant FF back into the Ady Canal through 42-inch pipeline for reuse as irrigation water supply.

The water quality benefits for this project were estimated in a 2014 USGS study (Sullivan et al 2014). Benefits were projected to vary throughout the year depending on seasonal changes in Klamath River (the study used the Ady Canal as a surrogate for the Klamath River because it is representative of the Klamath River upstream of the KSD flowing into the diversion) and KSD water quality (flowing out of the diversion after irrigation use). Nitrogen (N) and TP concentrations from the KSD are typically higher than inflows to the Ady Canal and overall, the project would reduce N and TP loads to the Klamath River. However, there are times of the year in which water entering the Ady Canal from UKL has higher N and TP loads than the N and TP loads discharging from the KSD to the Klamath River. During these periods of time, the KSD recirculation system may be shut down, because it could have a negative effect on

downstream water quality. Although the recirculation project is expected to benefit water quality in the Klamath River, this project alone will not result in total compliance with the nutrient TMDL for the KSD.

This project is currently approaching the 100 percent design level. The budget to implement the project (construction cost estimate of $600,000) is contingent upon congressional budget approval.

### 6.6 Project in Early Planning Phases

Two irrigation districts, KID and MPID, are in the early stages of identifying potential water and energy saving project opportunities. The FCA is working with both districts, and initial goal setting activities have been completed. For KID, FCA expects an 18- to 24-month period for plan development. Per KID staff, a focus will be on improved flow measurement and automation and better control of canal operational spills. For MPID, FCA expects a 12- to 16-month period for plan development. Previous efficiency and modernization assessments for MPID targeted canal piping, tailwater/drainwater capture and reuse, and on-farm flood irrigation enhancements.

### 6.7 Potential Project Funding Sources

There are several federal and state funding sources that are applicable to irrigation water conservation projects within the IM11 target area. The primary funding programs identified by stakeholders include the following:

**Federal**

- Reclamation WaterSmart grants (Water and Energy Efficiency) & (Cooperative Watershed Management Program)
- NRCS PL566 (Watershed Protection and Flood Prevention)
- NRCS Environmental Quality Incentives Program (EQIP)
- NRCS Regional Conservation Partnership Program (RCPP)

**State**

- Oregon Watershed Enhancement Board (OWEB) grants (multiple categories)
- OWRD grants (Water Conservation, Reuse, and Storage)

### 6.8 Potential Project Funding Issues

In discussions of funding program limitations with stakeholders, the following issues were discussed as funding needs and/or issues.

- Cost-share requirements: There is interest in combining funding sources and flexibility is desired in cost-share source requirements.
- Geographic and technical scope: Some high impact potential projects are outside the geographic area for current RCPP funding. It is important to make future funding programs sufficiently flexible to account for unidentified projects in priority areas.
- Pre-implementation project funding: Funding sources need to provide for activities needed to further develop projects prior to them being implementation/construction ready include water quality monitoring, permitting (federal, state, local), and engineering.

## 6.9 Issues Around Protection of Conserved Water

Although the primary goal of promoting irrigation water conservation through IM11 is to improve water quality in UKL and the Klamath River, increasing in-stream river flows through conservation can support this goal. Water conservation can be accomplished through operational changes in irrigation operations thereby preserving more water in-stream. Additionally, water right transactions/modifications can help to ensure that water "conserved" in this manner is protected for in-stream uses and not used to irrigate additional lands.

For Klamath Project irrigation districts, Reclamation makes water allocation decisions based on Biological Opinions and dictates water allocations year by year. With substantial water supply restrictions imposed in past years, irrigation districts feel like they have little flexibility or control over their supplies.

For upper basin irrigators, the Klamath Tribes have called on their senior water rights and cut off junior water right holders in recent years. This has resulted in the complete curtailment of irrigation water withdrawals from the Sprague, Williamson, and Wood rivers in some years. Temporary administrative rules (effective for the 2019 and 2020 irrigation seasons) allow continued groundwater use for wells greater than 500-feet away from surface water in systems in subbasins where Klamath Tribes have exercised their senior water right. However, these rules are temporary, and a long-term solution has not yet been reached. Consequently, upper basin irrigators are also in a position of great uncertainty over the future status of water availability.

Given the uncertainty in the ability of irrigators to exercise their existing water rights, there is uncertainty in the value that might be obtained from water right transactions (e.g. in-stream leases) that might be contemplated in association with irrigation water conservation projects. Placing requirements on IM11 funding that require water right modifications (such as those to allocate saved water to in-stream flows) may also impede cooperation and participation of some stakeholders who do not want to give-up water.

Although there may be challenges around protection of conserved water from a water rights regulatory perspective, there are valid concerns about the potential for some types of irrigation water conservation projects to result in an increase in water use/consumption. In particular, irrigation conservation projects that allow for irrigation of a larger area should be avoided. An example would be a project that converts a flood irrigation system that effectively irrigates 50 percent of a field to a sprinkler system that fully irrigates 100 percent of a field. Because the water is applied more efficiently to the field, such a project could result in increased water consumption and possibly lower in-stream flows through a reduction of tailwater. This type of unintended consequence and other similar situations should be explored and considered in developing the rules around ranking and selection of irrigation water conservation projects under the IM11 funding.

## 6.10 Reference Documents Obtained

During stakeholder interviews, any written studies on planned irrigation water conservation projects and documentation of water quality benefits were requested. The following documents were obtained from stakeholders as part of the process:

- *"Klamath Project Historical Water Use Analysis,"* Davids Engineering, Inc., Report prepared for U.S. Bureau of Reclamation, Review Draft, October 1998.

- *"Klamath Project Water Quality and Use – Initial Demonstration Assessment, Upper Klamath Basin, Oregon*," U.S. Department of the Interior, Bureau of Reclamation, June 2016.
- *"Evaluation of the Recirculation of the Klamath Straits Drain through the Ady Canal,"* David Evans and Associates, Technical Memorandum prepared for the U.S. Bureau of Reclamation, December 5, 2003.
- "*Water-Quality Modeling of Klamath Straits Drain Recirculation, a Klamath River Wetland, and 2011 Conditions for the Link River to Keno Dam Reach of the Klamath River, Oregon*," Sullivan, A. B., I. E. Sogutlugil, M. L. Deas, and S. A. Rounds. Report prepared by the U.S. Department of the Interior, U.S. Geological Survey in cooperation with the U.S. Bureau of Reclamation. Open-File Report 2014–1185.
- *"Modoc Point Irrigation District Efficiency and Modernization Assessment,"* Adkins Consulting Engineering, Report prepared for the Modoc Point Irrigation District, August 2018.


## 7. Summary of Phase 1 Assessment Findings

A brief summary of the Phase 1 assessment findings is presented in the following subsections.

### 7.1 Technical Considerations in Project Evaluation and Prioritization

There are several technical considerations that should be acknowledged in developing the criteria for irrigation water conservation project evaluation and prioritization under IM11. These include considerations for the typical irrigation practices in the area and lessons learned from past irrigation water conservation projects.

A key consideration is that sequential recovery and reuse of irrigation return flows is common and should be considered in project planning. Davids (1998) reported the overall water use efficiency within the Klamath Project as 93 percent even though some individual subareas had efficiencies as low as 40 percent. This is high level of efficiency is a result of the sequential recovery and reuse of tailwater that leaves one field or irrigation unit and is subsequently captured and reused in a downstream field. Identifying key tailwater and drainwater outflows and operational spills directly to natural channels and working back upstream from those locations would likely result in the greatest water quality impact and reduce potential water supply conflicts.

For irrigation efficiency projects, irrigation water management is as important as physical improvements in improving irrigation efficiency and reducing return flows. This creates an opportunity as the management components of projects (e.g., irrigation water management plans and simple monitoring and controls) can often be lower cost than the infrastructure components. It is also an important consideration in planning for follow-through on IM11 funded projects in that long-term operations after the projects have been implemented can have significant impacts on the real benefits achieved from the projects.

Finally, there have been several cases in the past where well-intentioned irrigation efficiency projects resulted in negative side-effects to downstream water availability and instream flows. These include projects that eliminated tailwater supplies that downstream users relied upon and projects that enlarged irrigation areas resulting in greater water consumption and lower water availability for downstream users. Controls should be implemented on IM11 funds to protect against these unintended consequences, . These controls could include proponent quantification of pre-project and post-project tailwater volumes available for reuse, consumptive use calculations, or other measures.

## 7.2 Potential High Benefit Projects in Need of Near-Term Funding

There were several projects discussed with stakeholders that have been defined to a sufficient level and are currently in need of implementation funding. These include the following projects:

- Klamath Straights Drain Recirculation Project: Addresses nutrient, sediment, and heat loads from one of the main Klamath Irrigation Project outflow points
- Walker and Caledonia Farms Drainwater Reuse: Reduces nutrient, sediment, and heat loads from direct discharge to UKL
- Barkley Springs Point of Diversion Transfer: Improves important habitat for juvenile suckers and improves water quality in UKL by allowing cool spring water to flow directly to UKL
- Other potential projects bordering UKL identified by ODA including irrigation efficiency, sediment reduction, tailwater recovery, livestock exclusion, and solar livestock watering systems.

## 7.3 Data Gaps and Needs

Data gaps and needs that were identified through discussions with stakeholders are briefly summarized below:

**Data Gaps**

- There are limited compiled data to characterize potential water quality benefits of specific irrigation efficiency and irrigation water conservation actions to assist in project prioritization.
- There is limited compiled data on project costs and benefit:cost ratios (B:C) of specific efficiency and conservation actions to help focus funding where it has the greatest impact on improving water quality.

**Needs**

- There is a need to identify synergistic funding opportunities that consider project timing, funding limitations, matching fund requirements or constraints, and to maximize the impact of the combined funding sources. This is a need that could be addressed by the Priority List of Projects Steering Committee and the fiscal agent, in finalizing the IM11 funding program.
- There is a need to discuss and consider the value of incorporating water quality monitoring and cost reporting as part of IM11 funding and determine how these potential requirements could be implemented. Stakeholders have identified this as a need to support quantification of the actual benefits realized by projects and such efforts could result in data that is valuable for future funding allocation. This is a need that could be addressed by the Priority List of Projects Steering Committee and the fiscal agent, in finalizing the IM11 funding program.
- There is a need to further define the types of projects where IM11 funds are expected to have the greatest benefits and to identify and protect against potential unintended consequences resulting from IM11 support for Agricultural Irrigation Efficiency and Water Management projects. This need would benefit from further technical evaluation. For example, qualitatively, an irrigation efficiency project immediately adjacent to the discharge water body would likely have the greatest positive water quality effect with the fewest tailwater reuse or groundwater recharge issues, but this is a generalization. Analysis of the water quality and cost data the does

exist would allow a better quantitative selection matrix or identification of categories or types of projects that could have the most effect on water quality.

## 8. Potential Phase 2 Assessment Activities

The Phase 1 assessment was limited in scope to contacting stakeholders working in the Klamath Basin on irrigation efficiency projects and to gather information that would help inform and focus future IM11 efforts in support of Agricultural Irrigation Efficiency and Water Management projects. Based on the information gathered and the data gaps and needs identified above, there are two efforts proposed for consideration as potential Phase 2 assessment activities.

The first effort would involve compiling water quality and project cost data to estimate B:C ratios by irrigation efficiency project categories. The goal of this effort would be to narrow the IM11 Agricultural Irrigation Efficiency and Water Management project focus on highest benefit activities given the available funding.

The second effort would be to develop guidance for identifying IM11 Agricultural Irrigation Efficiency and Water Management project evaluation and prioritization. The goal would be to develop specific project requirements or IM11 funding proposal requirements that would assist in the identification and selection of projects that have high water quality benefit and that avoid unintended consequences that could reduce those project benefits.

## 9. References

Adkins Consulting Engineering. 2018. Modoc Point Irrigation District Efficiency and Modernization Assessment. Report prepared for the Modoc Point Irrigation District by Adkins, August.

Davids Engineering, Inc. 1998. Klamath Project Historical Water Use Analysis. Report prepared for U.S. Bureau of Reclamation, Review Draft, October.

David Evans and Associates (DEA). 2003. Evaluation of the Recirculation of the Klamath Straits Drain through the Ady Canal. Technical Memorandum prepared for the U.S. Bureau of Reclamation by David Evans and Associates, December 5.

Oregon Department of Environmental Quality (DEQ). 2002. Upper Klamath Lake Drainage Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP). Oregon Department of Environmental Quality. Draft, May.

Oregon Department of Environmental Quality (DEQ). 2019a. Upper Klamath and Lost River Subbasins Nutrient TMDL and Water Quality Management Plan. Oregon Department of Environmental Quality. Draft, January.

Oregon Department of Environmental Quality (DEQ). 2019b. Upper Klamath and Lost Subbasins Temperature TMDL and Water Quality Management Plan. Oregon Department of Environmental Quality. Draft, May.

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Sullivan, A. B., I. E. Sogutlugil, M. L. Deas, and S. A. Rounds. 2014. Water-Quality Modeling of Klamath Straits Drain Recirculation, a Klamath River Wetland, and 2011 Conditions for the Link River to Keno Dam Reach of the Klamath River, Oregon. Report prepared by the U.S. Department of the Interior, U.S. Geological Survey in cooperation with the U.S. Bureau of Reclamation. Open-File Report 2014–1185.

# Attachment A
# Interim Measure 11 Fact Sheet and List of Questions

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# FACT SHEET

## Interim Measure 11: Interim Water Quality Improvements Agricultural Irrigation Efficiency and Water Management Category in Priority List of Projects

### Background

The Klamath Hydroelectric Settlement Agreement (KHSA) includes Interim Measure 11 (Interim Water Quality Improvements, IM11), which is intended to address water quality improvements in the Klamath River. Once the Dam Removal Entity (the Klamath River Renewal Corporation) accepts the FERC surrender order, PacifiCorp will provide funding of up to $5.4 million for implementation of projects.

### Goal of Interim Measure 11

The KHSA states that "The emphasis of this measure shall be nutrient reduction projects in the watershed to provide water quality improvements in the mainstem Klamath River, while also addressing water quality, algal and public health issues in Project reservoirs and dissolved oxygen in J.C. Boyle Reservoir."

### Priority List of Projects: Categories

The projects to be implemented under the Priority List of Projects process per IM11 will be selected from among four categories:

- Natural Wetlands Restoration
- Diffuse Source (Decentralized) Treatment Wetlands
- Riparian Fencing and Grazing Management
- **Agricultural Irrigation Efficiency and Water Management**

More information about the Priority List of Projects is available in the Phase 2 report located here: http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Klamath_River/2018-2-26-PLP-P2-Final-Rpt-Rev4-12-18.pdf

### Purpose of Agricultural Irrigation Efficiency and Water Management Projects

Irrigation Efficiency and Water Management projects will be used to manage irrigation and associated return flows along streams and canals that flow into Upper Klamath Lake or the Klamath River to reduce sediment loads, sediment-bound nutrients, and irrigation tailwater discharges to streams in the Upper Klamath Basin. Types of Irrigation Efficiency and Water Management projects could include: the reduction of sediment and nutrients from irrigation return flow by using wetlands, ponds, and pump-back systems; upgrading irrigation systems to increase the efficiency of irrigated water applications to reduce runoff and irrigation-induced erosion; purchasing or leasing of water rights for instream return; and lining or piping delivery systems to reduce water loss and sediment delivery to rivers and streams. These irrigation efficiency and water management efforts would contribute to improved water quality in adjacent canals and streams by reducing or preventing excessive sediment and nutrient-enriched runoff into local water sources. Measures that conserve water and provide an in-stream water quantity benefit also directly benefit water quality. All of the measures outlined above present possible benefits to

irrigators including potential reductions in energy use/cost, reductions in labor cost, and the ability to maintain production with reduced water diversion/pumping helping to improve resiliency to future water shortages.

## Target Geographic Area

Locations for specific Irrigation Efficiency and Water Management projects include upper Klamath Basin area upstream of Keno Dam; including the Sprague, Williamson, Wood, and Lost River drainages.

## Goals for initial Stakeholder Engagement on Agricultural Irrigation Efficiency and Water Management

PacifiCorp (with assistance from Jacobs) is contacting stakeholders working in the target geographic area of the Klamath Basin to compile available information and evaluate:

- Stakeholder needs to allow identification of priority water quality and quantity management projects related to irrigation
- Irrigation efficiency projects already identified by stakeholders that may be candidates for IM11 funding
- The extent to which the water quality benefits have been defined/quantified for candidate projects
- Other funding sources currently being leveraged for these projects that may have synergistic possibilities with IM11 funding

Information gathered during this effort will be compiled to help inform the usefulness and direction of a more comprehensive Irrigation Water Efficiency Evaluation.

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# LIST OF QUESTIONS

## Interim Measure 11: Interim Water Quality Improvements Agricultural Irrigation Efficiency and Water Management Category in Priority List of Projects

- Has your organization conducted any studies or evaluations of irrigation efficiency and water management in your service areas or any of the upper Klamath Basin target areas (as described above)?
    - Can you briefly describe the scope and outcomes of any such studies or evaluations?
    - Are water quality effects or benefits addressed in these studies or evaluations?
    - What documentation is available for any such studies or evaluations (and can that information be shared)?
    - If no such studies have been done, what sort of information would be the most useful to your organization?
- Has your organization identified any specific irrigation efficiency and water management projects (of the types that correspond to the IM 11 category as described above)?
    - To what extent have the costs and benefits of the projects been defined?
    - To what extent have water quality effects or benefits of the projects been defined?
    - What documentation is available for these projects (and can that information be shared)?
- Have funding sources been identified for implementing these projects?
    - Are identified funds sufficient? Are there any funding gaps?
    - Are there any associated activities that would help increase access to other funding sources?
- In your opinion, what types of irrigation efficiency projects within the target geographic area will provide the greatest water quality benefit per dollar invested?
- If available, would you pursue funding assistance (e.g., grants, cost-share, low interest loans) to improve your irrigation infrastructure or irrigation water management?
- If you were able to satisfy your existing water needs with less water, would you consider allocating a portion of the conserved water to environmental needs? If so, what conditions would you need to apply to the transfer?

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# Attachment B
# Meeting Notes from Stakeholder Interviews

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# Meeting Minutes

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|---|---|
| **Subject** | **Klamath IM11: Irrigation Efficiency Evaluation Scoping Calls** |
| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Dana Larson |
| **Location** | Call-in |
| **Date/Time** | 5-14-19, 9 am |
| **Participants** | Clayton Creager (North Coast Regional Water Quality Control Board), Dana Larson (Jacobs), Ken Carlson (Jacobs), Jason Smesrud (Jacobs) |
| **Copies to** | Demian Ebert |

## Notes

The purpose of this conference call was for Jacobs to get feedback from Clayton Creager of the North Coast Regional Water Quality Control Board (NCRWQCB) on the draft Fact Sheet and List of Questions developed by Jacobs to guide upcoming interviews for this year's Interim Measure (IM) 11 study of irrigation water conservation opportunities. The meeting started with a safety moment focusing on PacifiCorp's Stand Down earlier this week. We moved on to discuss the Fact Sheet and get Clayton's comments. He expressed approval for it being concise and its purpose of prepping people to focus the phone discussions. He suggested a statement be added to clarify that irrigation efficiency projects can offer benefits to both Water Quality (WQ) and water quantity/availability. He indicated we should be mindful of the key water issues in the Klamath Basin in terms of competing water uses, water shortages, and impact to irrigators. We should clarify how these projects can offer more stable operations from improvements in process.

Clayton gave a summary of the "Coalition of the Willing" - essentially the KBRA parties and more. The Restoration Agreement included an important water settlement piece between the tribes, irrigators and to some degree the Klamath Basin national wildlife refuges (NWRs). The KBRA provided a planning baseline such that if supply or irrigation dropped due to environmental needs, insurance kicked in. There were land based benefits to the Klamath Tribes for giving up their water rights, but the agreement did not address the upper basin irrigators and split the community. Congressional approval of The agreement failed in committee and expired. The last two years, the Klamath Tribes called their water right such that irrigators lost use of the called water (mostly those irrigators in the upper basin outside of Reclamation Klamath Project).

Alan Mikkelsen, Deputy Secretary of the Interior for the West (in D.C.) wants the community to solve the issues. A new group, exclusive of the state and federal agencies, including local counties, NGOs, tribes, and Irrigation Districts (IDs) are meeting and will invite the regulators back to the table in June or July. This group is the "Coalition of the Willing". They will use the KBRA as a source for decision topics, though

likely with different outcomes. There is a preference for no federal action being required and an agreement that is silent on dam removal. This group may be up to 150 people.

Regarding the Fact Sheet, Clayton suggested we should add the positive benefit to Irrigator's and add a few questions he outlines just a bit later.

For background, Clayton explained that Klamath ID is already under contract with Farmers Conservation Alliance (FCA) to evaluate district scale efficiency opportunities. They are targeting a different source of funding for those projects.

Going up to a higher level – Clayton explained his concern that baseline conditions in the basin be identified and met on the ground to even consider Irrigation Efficiency projects in certain areas. Physical constraints such as gradient (which can potentially offset power cost), the existing distribution system type and condition, etc. should be considered or determined. He clarified the Upper Klamath Basin (UKB) is quite different form the lower portion – the Reclamation irrigation project area. In terms of baseline appropriateness of Irrigation Efficiency (IE) projects. He asked – what would broadscale implementation of IE look like across the basin?

Jason clarified the difference in conditions in the UKB. In the UKB, irrigation water is managed primarily individual irrigators with their own water rights and diversions (surface water and groundwater). In the Reclamation irrigation project area, the irrigation districts manage water deliveries to on-farm irrigators using district canal and drain systems.

In terms of financing, Clayton indicated that favorable rate loans and grants are common (if the irrigator has some of their own money involved they have more skin in the game) but that a condition should be placed on the transaction to ensure some of the water "saved" goes back to environmental flows. He reiterated we need to see how IE fits on the current landscape, if/where it is feasible.

He suggested two additional questions to put to stakeholders/water users:

1) If available, would you pursue funding assistance (e.g., grants, low interest loans) to improve your irrigation infrastructure?

2) If you were able to satisfy your existing water needs with less water would you consider allocating a portion of the conserved water to environmental needs? What conditions would you need to apply to the transfer?

Jason indicated that improved on-farm irrigation efficiency often times improves WQ but does not actually decrease consumptive use.

Clayton indicated that in the North Coast region (including the Klamath basin) there are intermittent streams that dry up to over summering pools for juvenile salmon. They are or have identified critical low flows and recognize flow as a WQ issue. For example, the Shasta subbasin has a TDML that drops to less than 10% of flow in summer. This subbasin is not adjudicated so water conserved by implemented IE projects got snapped up downstream because there was no 1707 agreement in place to allocate some of the saved flow to environmental use. A 1707 is a requirement in CA only for funding by the NCRWQCB. Part of the contingency funding is for 1707 discussions - Clayton feels we should check with potential IE project partners to implement such a commitment.

Flows to Upper Klamath Lake and the Klamath River are a key WQ concern. When irrigators are not flooding and can transfer water back to the river, there is the concern that there might be a reduction in charging of other aquifers and wetlands that could have an environmental impact. He wonders what the impact will be (site specific) from decreasing flood irrigation?

Clayton suggested that IM11 put constraints on the types of projects to avoid water conservation leading to increased irrigation water use by ag.

He mentioned Mary Grainey and Kyle Gorman at Oregon Water Resources Department (OWRD) be included in discussions on this category of IM 11 PLPs. Sounds like they have been working on flexible agreements for in-stream transfer of conserved water in the Deschutes basin that run in 5-year cycles to eliminate the concerns about property value reduction.

Regarding Stakeholders, Clayton suggests some potential additions to the list of stakeholders to interview including:

OWRD - Mary Grainey and Kyle Gorman (as noted above)

Tule Lake ID - Brad (last name?)

FCA - this entity would be a good starting point because they have already done some complementary work for some of the IDs in the area

Modoc ID Board - Mason Terry. He is a professor at Oregon Institute of Technology (OIT) and has looked at modernization needs for the Klamath Basin (he was on the summit panels)

U.S. Fish and Wildlife Service (USFWS) - Greg Austin (refuges); Mike ? (Partners Program); Josh Rassmussen (research Scientist)

Klamath Watershed Action Team - Cristy Alderberger

Oregon Department of Fish and Wildlife (ODFW) – Bengi Ramirez (role? Manager); and Bill Tenniswood (chief Scientist)

Trout Unlimited (TU) – Kristen Lambert – may be someone who doesn't see piping as a panacea for IE.

Oregon Department of Agriculture (ODA) – Beth P. has lots of information on spring field pumping, and WQ based irrigation improvements working with landowners for TMDL compliance.

Jason mentioned that the focus of IE activities for most IDs in the region is often piping /modernization of systems but the focus may differ depending for IDs vs on-farm users or those irrigation users outside of the IDs. One question to answer is where to focus?

Clayton commented that the character of the upper and lower basins differ and asked how infrastructure is managed. In the lower basin, the KWUA, Reclamation, and the IDs are the right groups to talk to about this. In the upper basin, NRCS, OWRD, and the NGOs are more involved in irrigation water management activities. Jason clarified that there is no Reclamation presence above UKL, mostly just individual irrigators and some small ditch associations. NRCS has the most contact with individual irrigators above UKL.

Focusing on the goals of IM11 – reps are needed that work with individual users as well as coordinated IDs. There is a need to focus not just on conveyance but to get information on the range of projects considered and then prioritize those with a Water Quality of Water Quantity benefit (that improves WQ). Clayton believes that a goal is to use IM11 PLP funds as gateway funding for potential additional cost support from other funding sources.

Clayton's follow up email included the following specific additional interview questions:

- If available, would you pursue funding assistance (e.g., grants, low interest loans) to improve your irrigation infrastructure?

- If you were able to satisfy your existing water needs with less water would you consider allocating a portion of the conserved water to environmental needs? What conditions would you need to apply to the transfer?

He also clarified that a formal Overview Section could be added to the Fact sheet (I understand this is where the potential benefits to irrigators could be made clear).

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| **Subject** | **Klamath IM11: Irrigation Efficiency Evaluation Scoping Calls** |
| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 5-21-19, 2 pm |
| **Participants** | Rick Carlson (Reclamation), Kirk Young (Reclamation), Jason Smesrud (Jacobs), Dana Larson (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp), Ken Carlson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the U.S. Bureau of Reclamation, Klamath Basin Area Office staff on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. A summary of key items of discussion is included below:

- There are several projects that Reclamation has either studied or are currently progressing towards implementation that have potential water quality benefits. Rick mentioned several reports that provide additional documentation (and he subsequently sent us via email) including:
    - *"Klamath Project Water Quality and Use – Initial Demonstration Assessment, Upper Klamath Basin, Oregon",* U.S. Department of the Interior, Bureau of Reclamation, June 2016: This report documents an assessment of multiple water quality project opportunities on irrigated lands in the Klamath Project. Categories of projects and specific projects were screened and prioritized and included measures such as drainwater capture and recirculation, distributed wetland treatment of tailwater and drainwater, small scale temporary storage, and supply or loading exchange programs.
    - *"Evaluation of the Recirculation of the Klamath Straits Drain through the Ady Canal",* David Evans and Associates, Technical Memorandum (TM) prepared for the U.S. Bureau of Reclamation, December 5, 2003. This TM outlines a preliminary evaluation of the project that is currently nearing final design (described further below).
    - "*Water-Quality Modeling of Klamath Straits Drain Recirculation, a Klamath River Wetland, and 2011 Conditions for the Link River to Keno Dam Reach of the Klamath River, Oregon"* Sullivan, A.B., I.E. Sogutlugil, M.L. Deas, and S.A. Rounds. Report prepared by the U.S. Department of the Interior, U.S. Geological Survey in cooperation with the U.S.

Bureau of Reclamation. Open-File Report 2014–1185. This report includes a water quality evaluation of the proposed Klamath Straights Drain recirculation project that is currently nearing final design (described further below) and a 675-acre off-channel wetland located between the Lost River Diversion Channel and the Klamath Straights Drain.

- The Klamath Straights Drain (KSD) recirculation project is currently defined to a 90% design level but is awaiting budget authorization to proceed. The capital construction cost estimate is $600K. The project includes recirculation of up to about 60 cfs of drain water captured at the end of the KSD at Pumping Plant FF, discharging through a 42-inch pipeline, back into the Ady Canal for reuse as irrigation water supply. Water quality benefits are documented in the USGS study above.

- Rick mentioned some wetland sites being evaluated currently but some are across the state line in CA. Given that Oregon Watershed Enhancement Board was just selected as the fiscal agent for the IM11 funding, all target projects will need to be in Oregon.

- Kirk provided an overview of the WaterSMART grant program and its application in the Klamath Basin.

    - The grants are open to organizations with water or power delivery authority.

    - There are three main grant programs:

        - Water and Energy Efficiency Grant (WEEG). The WEEG is the most popular one as it supports water conservation projects and can provide funding for 50% (with a $1.5M maximum) of a project's total cost. Projects funded under the WEEG include canal lining and piping projects, canal automation projects, and projects to modernize delivery systems such as improved canal control structures.

        - Cooperative Watershed Management Program (CWMP) Phase 2 Grant. The CWMP Phase 2 Grant is open to established watershed groups (a side note - CWMP Phase 1 objectives include the development of watershed groups) for implementing projects that address water supply or water quality issues. The CWMP Phase 2 can provide funding for 50% ($300K maximum) of a project's total cost. On-farm tailwater reuse and recirculation projects that have a water quality and quantity benefit are not eligible under the WEEP but can be included under the CWMP.

        - Drought Contingency Planning Grants

    - Kirk provided via email copies of the requests for grant proposals for the WEEG and the CWMP Phase 2 Grants.

    - We discussed applicable geographic areas and confirmed that irrigators in off-project lands (e.g. upper basin areas served off the Williamson, Wood, and Sprague Rivers) could also apply for an be eligible for WaterSMART grant funding consideration.

    - Rick noted that there are opportunities to leverage the IM11 funding along with WaterSMART funding to help support high benefit projects. Would need to investigate further to determine the cost-share and funding source rules for both programs to determine specific funding opportunities and limitations.

- Kirk summarized irrigation efficiency activities being completed by irrigation districts (ID) and organizations in the basin.

- The Klamath Watershed Partnership has been working with the Horsefly ID and Langell Valley ID to determine what local needs are for water management improvements and to identify and prioritize project opportunities. Kirk suggested reaching out to Bill Lehman and Leigh Ann Vradenburg of the KWP. They have a web-page at https://www.klamathpartnership.org/ and the office number is 541-850-1717. They may be of assistance as they were developing an implementation plan for restoration projects in the Langell Valley area.

- The Horsefly ID has completed several canal piping projects now and is estimating a savings of 30 percent combined from reduced canal seepage (recoverable return flow to groundwater) and canal evaporation (non-recoverable loss).

- Three districts in the basin have applied for WaterSMART WEEGs this year with two districts targeting canal piping projects and one district targeting a SCADA project

- Kirk listed the irrigation districts by region that might have relevant information to this study:

  - West side – Klamath ID, Enterprise ID, Tulelake ID

  - East side – Horsefly ID, Langell Valley ID

  - South – Shasta Butte ID, Malin ID, Sunnyside ID

- Asked about any additional information on specific water quality benefits of irrigation efficiency projects, Rick noted that irrigators understand the need for water quality improvements and support those efforts but are more focused on the water and energy savings of efficiency projects so have more information on those benefits.

- Jason asked if Rick had a copy of the 1998 Davids Engineering (Davis, CA) report for Reclamation titled, “Klamath Project Historical Water Use Analysis.” This is a widely cited report that concluded “the effective efficiency for the overall Project is 93 percent, making the Klamath Project one of the most efficient in the country.” Rick was going to try and locate a copy that could be shared.

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| **Subject** | **Klamath IM11: Irrigation Efficiency Evaluation Scoping Calls** |
| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 5-29-19, 8 am |
| **Participants** | Gene Souza (KID), Jason Smesrud (Jacobs), Demian Ebert (PacifiCorp) |
| **Copies to** | Dana Larson (Jacobs), Ken Carlson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Klamath Irrigation District (KID) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- The recent revision of the Klamath TMDL has identified nutrient load limits for discharges from the Klamath Straights Drain (KSD) and KID is working with the Klamath Water Users Association (KWUA) to identify strategies for TMDL compliance

- Paul Simmons, the former legal counsel for the KWUA, has been appointed to the executive director post. It would be good to talk with KWUA who will offer a good perspective on opportunities to improve the science around water quality interactions with irrigation operations and communications needs.

- KID has a number of irrigation efficiency related projects they are currently investigating including:

    - Improving fish screen and trash rake operations at the A-Canal headworks for better control of diversions into the A-Canal

    - Installing Sontek sensors for flow monitoring in the main canal

    - Improving on the currently limited manual flow measurement of operational spills. There is an existing OIT student project that has put sensors on the #1 and #5 drains that spill back to the Lost River, but a more comprehensive and automated system is needed.

    - Developing a water management plan to improve water distribution and conveyance efficiency and reducing unplanned operational spills

  - Implementing an electronic water ordering system

- KID started an initial assessment project with the Farmers Conservation Alliance (FCA) in April 2019 and recently received a proposal from FCA to perform more detailed planning work. Gene said that FCA has also worked with Modoc Point ID and would be good to talk with as part of these interviews.

- KID's priority need is developing a better understanding of where all its water is going through improved measurement and automation/communications

  - KID routinely needs to coordinate with TID on operational spills from KID to TID to cut back on water that is spilled to TID

  - Automation and remote data access through a SCADA system would help to improve this understanding and communications between districts

- Another priority focus of KID is the need to modernize and decrease flooding risk from the A-Canal to downtown Klamath Falls

- KID is in the preliminary stages of defining their project and funding needs. In 2019, they are starting with some smaller budget allocations ($15K) to KID staff education and training

- When asked about the state of other districts water measurement and monitoring, Gene said:

  - Tulelake ID (TID) recently completed a modernization project and KID will be talking with TID to capture lessons learned

  - Enterprise ID has limited automation

  - Klamath Drainage District has automation on key points throughout the Klamath Straights Drain operated by USBR

  - Shasta View ID has sensors on the main diversion and return points only

- When asked about targeted funding sources to support KID project implementation, Gene said:

  - He hopes to get projects included in a WaterSMART grant proposal next year (2020)

  - FCA is helping KID identify other funding sources

  - PacifiCorp has been identified as one potential project partner/funder

- One of the big unknowns for KID is "What is the future of the Klamath Project?" Some political appointees have talked about a downsizing of the project which is a very politically charged proposal

- Prior to 2001, irrigators in the Klamath basin managed the storage of their water right in Upper Klamath Lake (UKL) and the diversions off UKL for their permitted uses. Since 2001, the federal government has taken authority and control over all water allocation and use decisions allowing the irrigation districts authority to use water solely for irrigation purposes. It is now completely outside the individual districts control to allocate water for uses other than irrigation. In response to the question about willingness to allocate conserved water for in-stream use, Gene said that decision is now entirely up to the feds.

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| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 5-29-19, 10 am |
| **Participants** | Mike Hiatt (DEQ), Jason Smesrud (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp), Dana Larson (Jacobs), Ken Carlson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Oregon Department of Environmental Quality (DEQ) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- Upper Klamath and Lost River Subbasins TMDL was originally issued in 2012
    - This TMDL was challenged and required reconsideration/revision
    - Mike worked through the reconsideration process to update the TMDL addressing stakeholder comments
    - The updated nutrient TMDL was issued in Jan 2019 and has been approved by EPA
    - The updated temperature TMDL is out for public review now and will be issued by the end of Sep 2019
    - DEQ is currently under request for judicial reviews on the nutrient TMDL for applicability to irrigation related discharges
    - DEQ expects continued appeals on the TMDLs but will continue moving forward with implementation
- DEQ has sent letters out to all Designated Management Agencies (DMAs) under the TMDL with a requirement to have draft TMDL implementation plans completed within 18 months
- DEQ is helping the irrigation district DMAs by developing an umbrella document to cover loads from all irrigation district sources

  - The support is a combined OR DEQ / CA RWQCB effort
  - DEQ is providing an outline of the plan to the DMAs with all plan requirements
  - The Districts will need to develop their own solutions and provide the content to develop the plan
  - The primary irrigation related load reduction required under the TMDL are discharge from the Klamath Straights Drain and the Lost River Diversion Channel (when flows are directed from the Lost River to the Klamath River)
  - A stewardship advisory committee has been formed which consists of USBR, USFWS, KWUA, Langell Valley ID, Horsefly ID, ODA, ODFW, OR DEQ, and CA RWQCB – The first meeting is scheduled for the end of July 2019

- A separate TMDL for the Upper Klamath Lake (UKL) Drainage: Sprague, Upper Klamath Lake and Williamson Subbasins was approved by EPA in 2002
  - This TMDL is largely affected by non-point source contributions
  - DEQ received a TMDL implementation plan from Klamath County and other DMAs have their own plans including ODA, BLM, and ODF

- Some of the hottest spots for concentrated nutrient loads are in the Upper Sprague and Wood River Basins
  - The UKL Drainage TMDL concludes that a 40% reduction in phosphorus (P) loading is required to bring the UKL into an equilibrium condition over time
  - The West Canal draining the Wood River drainage comprises 13% of the incoming P load with only 2% of the incoming flow as proportions of total inflows to UKL – TU is looking at a project to divert the West Canal drainage into a series of wetlands
  - The Center Canal in the Wood River drainage is another significant nutrient source
  - 50,000 to 60,000 head of cattle are trucked into the Wood River valley each year for summer pasture introducing a significant nutrient load that can enter the lake through inefficient irrigation management practices - the upper Sprague River valley has similar large summer cattle operations
  - Key issues for nutrient loads include:
    - Large numbers of cattle
    - Naturally high P content soils
    - Grazing of streambanks (direct nutrient contribution and indirect erosion contributions)
    - Irrigation water runoff from flood irrigated fields to water courses in the summer
    - Runoff of flood waters from fields during the winter
    - Erosion of natural channel banks

- In 2016, DEQ brought a number of agencies together to discuss the opportunity for irrigation efficiency projects in the Klamath Basin including USBR, NRCS, TU, and FCA. There was limited follow up at the time but FCA has since contracted with Modoc Point ID and KID to initiate irrigation efficiency studies

- Mike said that in initial discussions with Clayton Creager on the IM11 irrigation efficiency funding, Mike and Clayton were thinking that funding FCA to do efficiency studies on a number of districts in the basin could be a good use of funds if it helped them to identify other sources of money to actually implement projects

- We discussed differences between work with coordinated districts in the lower basin and work with individual landowner/irrigators in the upper basin and the differences in types of projects and project needs

- In response to the question about data needs to support the steering committee decisions on where to spend the IM11 funds, Mike said he would like to see data on the nutrient/sediment load reduction benefits from proposed projects (i.e. the benefit per $ invested) – this information is currently lacking

- Liam Schenk from the USGS recently completed a project in the Sprague drainage identifying sources of sediment and concluded that in-stream channel erosion can be a large source of sediment and nutrients – it would be good to contact Liam for more information on sediment/nutrient source identification

- Potential funding sources include USBR WaterSMART, OWEB, NRCS, DEQ 319 grants (generally pretty small), and DEQ CWSRF low interest loans

- Another opportunity in the future is nutrient trading to allow new industrial and municipal loads in exchange for reducing NPS loads

    - The Klamath Tracking and Accounting Program (KTAP) was a project spearheaded by the Willamette Partnership in 2016

    - KTAP generated a protocol for estimating and tracking nutrient contribution reductions from various conservation measures

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| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 5-30-19, 10 am |
| **Participants** | Beth Pietrzak (ODA), Jason Smesrud (Jacobs), Ken Carlson (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp), Dana Larson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Oregon Department of Agriculture (ODA) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- Beth is located in Ashland and covers SW Oregon including the Klamath Basin for ODA's agricultural water quality program
- In March 2018, ODA was asked to work with landowners around Upper Klamath Lake (UKL) to address nutrient loads coming from direct pumping of irrigation tailwater and drainage water to the UKL
    - DEQ identified these sources as contributing 12% of the total P loading into UKL
    - The target operations border the lake on the West, East, and South sides of the UKL – Modoc Point ID is not part of the target area and has a separate planning process underway
    - ODA started with water quality monitoring to better characterize the flows and loads coming from these operations around UKL
        - 1 year of data has now been compiled
        - Nutrients and flow are being recorded – flow is a combination of flow meter records and estimated flows from power usage on tailwater/drainage pumps
        - ODA has requested an additional $100K from the OR legislature to continue the water quality and flow monitoring but funding is not yet approved

- The nutrient loads vary with some sources being better and some being worse than expected

o ODA is working with landowners to develop plans for water quality improvements and water use efficiency

- Landowners have been very cooperative in this process
- NRCS, TU, SWCD, and KWP are all project partners working with landowners in the area
- They have not been able to apply NRCS funding to these projects due to them falling outside of NRCS priority areas – currently talking with Senator Merkley's office to get this changed
- OWEB grant applications have been submitted to continue technical assistance (plan development and design/engineering of conservation measures)
    - $75K cap per project for OWEB technical assistance
- 10 landowners now have plans in some stage of development
- Plans contain projects such as irrigation efficiency, sediment reduction, and tailwater recover systems as well as livestock exclusion fencing and solar livestock water systems
- Need further engineering to design irrigation and drainage system improvements, tailwater recovery systems, and settling basins within the plans
- Targeting complete reuse of tailwater and drainwater on site

o Two specific example projects were described

- 5,000-acre potato and grain farm
    - Represents some of the highest nutrient loads monitored by ODA in discharges to UKL
    - Summer tailwater was previously pumped to UKL
    - Last summer, tailwater was redirected into a wetland area on the farm – water quality monitoring shows significant improvement
    - The water quality improvement plan has several components that need additional funding to implement
- 500-acre grass seed farm in the Algoma area
    - The primary irrigation diversion is from Barkley Springs which is important habitat for suckers – in the summertime, irrigation diversions dry out the spring
    - Landowner is open to abandoning the surface water diversion in exchange for a new groundwater well and irrigation improvements

- OWRD (Kyle Gorman) is involved in helping with the water right issues

- Other focus areas for ODA include the Upper Sprague
    - ODA has designated a strategic implementation area (SIA) in the Upper Sprague near the confluence of the North and South Fork near Bly, OR
    - This area was chosen based upon monitoring of channel conditions and opportunity for improvements
    - SWCD, KWP, TU, NRCS, and ODA are all partners
    - There will be an August 1 open house for the new SIA
    - ODA is targeting 1 to 4 years for implementation of improvements within the SIA
    - Future SIAs are targeted lower down on the mainstem Sprague
- Water quality data to characterize loads from irrigation operations and potential benefits of conservation actions
    - ODA collects water quality data but does not produce reports on the data
    - ODA could work with landowners to provide water quality data that would support estimates of water quality benefits to support grant funding applications
    - The best sources of water quality data in the basin are:
        - USGS
        - Jake Kann – independent contractor for the Klamath Tribes that has worked in the basin for 30 years
        - DEQ
- Agencies that can accept and administer funding to implement projects include SWCD, NRCS, TU, KWP (not ODA)
- Primary ODA needs to help implement targeted projects
    - Engineering designs for planned projects
    - Funding to construct/implement projects

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|---|---|
| **Subject** | **Klamath IM11: Irrigation Efficiency Evaluation Scoping Calls** |
| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 5-31-19, 1 pm |
| **Participants** | David Komorowski (NRCS), Kevin Conroy (NRCS), Jason Smesrud (Jacobs), Ken Carlson (Jacobs), Demian Ebert (PacifiCorp) |
| **Copies to** | Dana Larson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the USDA Natural Resources Conservation Service (NRCS) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- David Komorowski is the District Conservationist for the Klamath Falls Service Center
- Kevin Conroy has worked in the basin for 30 years, was the former Klamath Basin Team Leader, and is now the Acting State Conservationist
- NRCS received $50 million for irrigation improvements in the Klamath Basin in 2001/2002 that was largely spent up through 2006/2007
    - Funding was through EQIP (Environmental Quality Incentives Program) for projects direct to ag producers
    - Projects included conversions from flood to sprinkler irrigation, upgrades from wheel lines and hand lines to pivots, and some flood irrigation piping/improvement projects
    - Most projects were in the Klamath Project area
    - Limited work also in the Sprague valley and in Modoc Point ID
- Important lessons learned from implementing irrigation water conservation projects included:
    - In the Modoc Point ID, the conversions from flood to sprinkler substantially reduced water supply to downstream users that were relying upon tailwater from upgradient flood

irrigation operations – Projects need to consider the downstream impact of their actions - The group discussed some of the previous studies of the Klamath Basin that concluded overall project efficiency is about 93% with water being reused multiple times before being released to downstream outflows

- In the Sprague, flood irrigation helps to mimic natural processes that have been otherwise altered, providing late season base return flows to the river

- In 2014, NRCS received an additional $14 million to spend in the upper Sprague R basin

- PL566 (Watershed Protection and Flood Prevention Act) is a funding source NRCS has been using to support larger basin scale projects and larger capital construction projects such as piping improvements with irrigation districts

- RCPP (Regional Conservation Partnership Program) has been used in the Klamath Basin most recently for a project coordinated between NRCS and Trout Unlimited "Water Quality and Quantity in the Klamath Basin Project"

  - FY 2016 award for FY 2016 through FY 2019 – recently obtained a 1-year extension for FY 2020 to complete by September 2020

  - $7.6 million funding has been partially spent – recent cancellations of some larger projects has freed up sizeable funds for use on other projects

  - The RCPP pools together various program funds such as EQIP, WRP, CSP, etc

  - The primary conservation measures include riparian fencing, off-channel livestock watering, irrigation energy efficiency, and piping of irrigation ditches

  - RCPP requires a 50% match with outside funding sources

  - The geographic area covered under the RCPP includes the Wood R and Sprague R basins, and the west side of Upper Klamath Lake (UKL) – the south side of UKL where some of the ODA projects are located is not covered

- Future RCPP funding is still under consideration in DC and state/project funding levels are uncertain

  - Possibly $1-2 million annually for OR under state RCPP funding

  - Individual project applications for RCPP funding can be made separately

    - Applications are due in the fall (Sep/Oct), awarding occurs in Jan/Feb, and funds become available for successful projects around March timeframe

  - Potential to couple other funding sources to satisfy the 50% match requirement

- Most NRCS funding programs are for direct ag producers (e.g. EQIP, WRP, CSP) however PL566 can be used with irrigation districts and other entities – PL566 also has a higher funding limit to support larger infrastructure projects

- Demian asked what the greatest need from irrigators was when they approach NRCS for project funding

- Kevin/Dave explained that practical irrigation water management (IWM) plans that recognize the irrigators water supply/demand limitations and their labor limitations is usually one of the biggest data gaps and needs.

- Jason explained the project CH2M did for NRCS in the Sprague and that a simple electric timer on the well pump and an IWM plan were the least expensive parts of the project but likely had the greatest benefit

- NRCS has required IWM to be implemented as part of any project to improve irrigation efficiency however, enforcement/follow-up has been limited

- Some component of IWM would be good to tie together with any physical irrigation improvements

- Dave and Kevin were not aware of any documentation on the water quantity/quality benefits of NRCS investments in the basin or the cost effectiveness of conservation investments to achieve stated goals in the basin – they thought this type of study/documentation would be useful

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| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 6-5-2019, 3 pm |
| **Participants** | Paul Simmons (KWUA), Mark Johnson (KWUA), Jason Smesrud (Jacobs), Dana Larson (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp), Ken Carlson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Klamath Water Users Association (KWUA) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- Paul is the new Executive Director and Mark is the Deputy Director
- KWUA is a non-profit organization representing 15 irrigation districts covering 175,000 acres of irrigated lands
- Some of their member agencies are getting Farmers Conservation Alliance in development water/energy conservation assessments
- Paul asked about the timing of the funding relating to the KHSA transfer order and we responded that there is no new information on concrete timing
- KWUA has a member meeting coming up this Friday and can reach out for further input on our questions from the Fact Sheet
- Paul mentioned the Running Y Ranch project that Beth Pietrzak/ODA told us about as a ready to go project that has significant water quality benefits
- TMDLs
    - The Klamath Straights Drain (KSD) and the Lost River Diversion Channel are the two primary points identified in the TMDL as the responsibility of irrigation operations
    - The targeted reductions in nutrient loads at these two points are significant

    - The irrigated lands in the project are actually a nutrient sink for the high nutrient loads that come into the project from diversions of water discharging from the Upper Klamath Lake

- We discussed data availability for water quality benefits of irrigation efficiency projects

    - Paul mentioned a “walking wetlands” project on the federal refuge land where rotating fallowing and returning ag lands to wetland status is being used for habitat but has water quality benefits

    - Mark asked about the KSD recirculation project we mentioned being described by Reclamation – Jason described what he knows about the project and said he could email a copy of the USGS report on water quality benefits

    - Paul asked about the ongoing $560K/year funding from IM11 targeted for project operation and maintenance and was wondering if part of those funds could be used for water quality monitoring and documentation of the benefits of the projects implemented with the $5.4 implementation budget – good idea since follow-up monitoring seems to be a data gap

- KWUA could be helpful to PacifiCorp in getting the word on this funding out to its member agencies as the funding program moves forward

- Paul already forwarded on the email and Fact Sheet we sent him to Klamath County and to Senator Jeff Merkley’s office as KWUA works with them on project funding

- Paul and Mark asked about the timing for getting answers back to the questions on the Fact Sheet. Jason and Dana described that we are targeting getting all information back in June to summarize what we’ve learned in early July. Paul and Mark said they would discuss with their members and would get back to us.

**Action Items**

- Jason to email a copy of the USGS report that evaluates the potential water quality benefits of the KSD recirculation project to Paul and Mark - Done

- Paul and Mark to discuss questions on the Fact Sheet with their members and back to us by Friday, June 21

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| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 6-6-2019, 11 am |
| **Participants** | Mary Grainey (OWRD), Kyle Gorman (OWRD), Jason Smesrud (Jacobs), Dana Larson (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp), Ken Carlson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Oregon Water Resources Department (OWRD) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- OWRDs main role in the basin is to regulate water users by priority date based on calls for water by senior water right holders
- The Tribes call on water in the upper basin is significant and has resulted in regulating off many irrigators
- OWRD recently adopted new administrative rules that are in effect through March 2021 (2019 and 2020 irrigation seasons) that allow groundwater wells further than 500-ft from streams and rivers to continue pumping even when the Tribe makes a call on their water rights
- Since there are not permanent agreements in place over continued irrigation water regulation in the upper basin, some irrigators may be reluctant to invest money in improvements for a system that could be regulated off and not used
- Irrigation water conservation and water quality projects that OWRD is aware of in the basin include:
    - MPID – starting to work with FCA to identify potential projects including some canal piping projects and projects to better manage winter snowmelt runoff that drains through irrigated lands and ends up in the drainage system discharging to UKL
    - Irrigated lands south of Hagelstein Park - Barkley Spring is important sucker fry and rearing habitat – project is looking to transfer surface water right to a groundwater right to

eliminate the draw of cool high-quality water away from the spring and channel to UKL – Kyle thought the diversion was fairly significant at 10 to 15 cfs

- Walker Farms and Caledonia Farms near the Running Y
  - Tailwater (TW) is being directed through wetlands now
  - Howard Bay has very poor water quality and previous TW discharges were directed into Howard Bay – with the proposed project, the discharge would be relocated
  - ODOT is currently relocating a culvert that will help with the future proposed project replumbing

- OWRD is not aware of any existing WQ assessments related to irrigation efficiency projects
- OWRD invested in new stream flow and diversion flow monitoring in the upper basin about 5 years ago
  - There are several new stream gauges in the upper basin that are available real-time on-line – Kyle will forward a web link to the data
  - The North Fork Ditch on the Sprague now has a flow monitoring station
  - MPID now has a flow meter on their new pumped diversion which has been operational for 10+ years now
- Important data needs include more information on sucker biology/life stages/critical habitat & water quality needs
- Two of the most significant direct nutrient inflows to UKL are through Seven Mile Creek and the Wood River
- Danny Watson (Klamath Watermaster) may know more about specific water conservation ideas being considered in the Wood River valley

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| **Project Name** | Klamath IM11 |
| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 6-17-19, 1 pm |
| **Participants** | Julie O'Shea (FCA), Margi Hoffman (FCA), Scott McCaulou (FCA), Jason Smesrud (Jacobs), Dana Larson (Jacobs), Ken Carlson (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Farmers Conservation Alliance (FCA) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- Julie is the executive director, Margi works in project development and funding/permitting support, and Scott is the project manager for the System Improvement Planning projects in the Klamath Basin
- FCA has two primary focus areas:
    - Fish screening technology
    - Supporting irrigation districts with infrastructure modernization – planning, permitting, funding
- FCA is currently working with 24 different irrigation districts in OR
- FCA is just starting work in the Klamath and is in the very early project stages with Klamath Irrigation District (KID) and Modoc Point Irrigation District (MPID)
    - FCA recently completed the initial goal setting project phases with KID and MPID – improved irrigation efficiency is a priority
    - FCA is just starting the data collection phase of the projects
    - The next step of project identification and prioritization has not yet begun

- FCA initial assessment of KID
    - Large complicated district with multiple interconnections to other districts in the Klamath Project
    - Developing the system improvements plan will take 18 to 24 months, or longer if other Klamath Project districts are looped into the work
    - FCA trying to get other Klamath Project districts engaged
- FCA initial assessment of MPID
    - Much simpler independent district - Not part of the Klamath Project
    - Developing the system improvements plan should take 12 to 16 months
- Initial thoughts on technical opportunities in irrigation efficiency with water quality benefits
    - Tailwater management – reduction and reuse
    - Distributed treatment wetlands on return flows
- FCA relayed the anecdotes expressed by the Klamath Project irrigators that water leaves the project area cleaner than it enters the area thus acting as a nutrient sink instead of a source
- When asked about the data collection phase FCA is starting with KID and MPID, Scott said their data collection is focused on water quantity and improving the understanding of how water is being routed through the districts and where the water losses or inefficiencies exist
    - There are not existing plans for including water quality in the data collection phase
    - Scott mentioned the water quality data that exists from DEQ used in support of TMDL development as the best available information on water quality
- FCA is just starting the projects in the Klamath so has not identified funding yet but would look to the traditional sources used to support these activities in other areas of OR including:
    - USBR – WaterSmart
    - NRCS – PL566, EQIP, RCPP
    - State – OWEB, OWRD
- FCA asked about the cost-share requirements of IM11 funding – Ken said that it hadn't been finalized but explained some of the discussions to date – unclear whether the PacifiCorp funds after being transferred to OWEB will be considered as state or private funds
- Julie explained the funding needs for irrigation efficiency projects in general and advocated for having IM11 funds available to support all stages of project development
    - System Improvement Assessment – early stages of project definition/prioritization, costing, and identification of project benefits
    - Pre-construction Needs – federal/state/local permitting (NEPA, cultural, biological, land use, water rights) and engineering

    - Implementation Capital - $ to fund construction

- Julie suggested that IM11 funds be open to use for collecting water quality data that would help to better define the water benefits of irrigation efficiency projects

- Julie advocated for structuring the requirements for IM11 funding to be flexible and not onerous in timing, match funding requirements, and project phasing or scope of projects to fund

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| **Project Number** | D3214800 |
| **Prepared by** | Jason Smesrud |
| **Location** | Call-in |
| **Date/Time** | 6-6-2019, 1 pm |
| **Participants** | Chrysten Lambert (Trout Unlimited), Nell Scott (Trout Unlimited), Jason Smesrud (Jacobs), Dana Larson (Jacobs) |
| **Copies to** | Demian Ebert (PacifiCorp), Ken Carlson (Jacobs) |

## Notes

The purpose of this conference call was for Jacobs to get feedback from the Trout Unlimited (TU) on potential irrigation efficiency project opportunities in the Klamath Basin that could be supported under Interim Measure (IM) 11. Key items of discussion are summarized below.

- Nell Scott is the local Klamath Basin project coordinator
- TU's geographic focus in the basin is in the Wood R, Williamson R, and Sprague R basins, and the land bordering Upper Klamath Lake (UKL)
- TU's activities are focused on fish habitat improvements with measures including in-stream/channel modifications, fish passage improvements, fish screening of diversions, in-stream flow enhancements (water right leasing), riparian enhancements including riparian fencing and off-channel livestock watering, and general measures to improve in-stream water quantity and quality
- TU gets engaged with irrigation efficiency projects when there is a clear and direct in-stream habitat and/or water quality benefit. This includes:
    - Irrigation diversion modifications to better control the rate and timing of off-channel water diversions to within water right limits and irrigation needs – benefits are reduced diversions out of stream and reduced tailwater generation and return to stream with the associated sediment and nutrient loads
    - Irrigation piping projects to provide better control over water distribution and deliveries than with open ditch systems – benefits include less ditch erosion and sediment/nutrient transport and reduced interaction between cattle/manure and water returning to streams

  - TU has found that these projects mostly represent opportunities for water quality benefits, more so than water savings since crop consumptive use is usually unchanged

  - TU cautioned against “irrigation water conservation” projects that improve distribution uniformity on irrigated lands and expand the area effectively irrigated thus resulting in increased consumptive use and less return flow and in-stream flow – Projects on steeply sloped lands where irrigation distribution uniformity is currently very low can often result in enlargement of existing water use/consumption with measures that improve distribution uniformity

- NRCS’s RCPP was focused on bringing in partners that could work with NRCS together to identify and develop projects for application of NRCS financial assistance

  - TU wrote the RCPP funding application and has been working with NRCS and other local non-profit partners to implement the program

  - TU does the initial outreach to landowners to develop projects and then connects them to NRCS to administer/fund the projects

  - Focus projects is in the upper Klamath Basin mostly above UKL and on projects including riparian enhancements, fencing (streamside and rotational grazing cross-fencing), vegetation planting’s, grazing management, off-stream stock watering, and irrigation piping

  - A large irrigation piping project with a number of landowners served off the North Fork Ditch on the Sprague recently fell through due to some land ownership issues

  - There are 9 or 10 active applications/contracts in place – almost all focused on riparian protection

- The highest nutrient loads per unit area come out of the Wood R Valley and the fringe lands bordering UKL

  - TU had conversations with a number of irrigators in the Wood R valley last year about potential tailwater reuse projects. Some of the challenges to moving those projects forward included:

    - Lack of coordination between adjacent landowners that all operate their own separate irrigation systems

    - Pumping tailwater increases operational costs (pumping energy) and doesn’t return direct benefits to the ranching operation

    - Many operations now have junior supplemental groundwater rights and have developed wells that have sufficient capacity to meet their entire irrigation need limiting the additional benefit of TW reuse

- The Upper Klamath Basin Comprehensive Agreement (UKBCA) which was a settlement between the Tribes and the Upper Basin Irrigators identifying actions to increase flows into UKL by 30,000 AFY fell apart with the expiration of the Klamath Basin Restoration Agreement (KBRA).

  - Much of the focus of the UKBCA was on selective irrigated lands retirement, pasture fallowing and split season forbearance to increase flows into UKL.

  - Technical work to support the estimates of benefits from these projects included:

        - Early work by Richard Cuenca/OSU in the Wood River Valley quantifying consumptive use/ET on irrigated and non-irrigated pasture

        - Remote sensing study by Rick Allen/U of Idaho on the Wood River Valley and estimated baseline consumptive use/ET across the valley

- Water quality data is harder to come by than water quantity data, especially in terms of benefits gained from potential conservation measures

    - DEQ's TMDL is a source of WQ data

    - There was a MS Thesis by Damion Ciotti "Water quality of runoff from flood irrigated pasture in the Klamath Basin, Oregon" that documented water and nutrient inflows and outflows from a typical flood irrigated field in the Wood R Valley https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/t722hd40t?locale=pt-BR

    - WQ data being collected by ODA is in progress and is designed to help answer questions about effects of conservation measures

- Water quality data being collected by ODA

    - ODA is the lead

    - TU is supporting ODA

    - It's a work in progress but the goal is to help answer the following two questions:

        - What is the baseline condition before conservation practice implementation?

        - What projects should be funded based on the potential WQ benefits?

    - The goal is to have these questions answered around the end of 2019 to early 2020

- Several distributed treatment wetland (DTW) projects are being implemented and monitored in the Wood R valley focused on treating runoff from pasturelands.

- TU working with ODA on the project being developed around the Running Y with Walker Farms and Caledonia Farms

    - Currently working on monitoring inflows/outflows and developing a better water balance for the basis of evaluating potential projects

    - There are existing wetlands that could be integrated into the tailwater (TW) recirculation stream to help polish and remove sediment and nutrients prior to discharge back to UKL

    - There are improvements to the TW recirculation system within the farm that could be implemented to increase reuse of TW and decrease the discharge of TW back to UKL

    - The farm is concerned with salt buildup over time if complete TW reuse and recirculation continued for too long. Considering some schedule of alternating reuse and discharge to provide salt leaching as necessary

- Additional data needs to support project prioritization

- Better/finer scale water quality monitoring data to better characterize and identify the sources of sediments and nutrients in the upper basin