Langell Valley Irrigation District

Lorella Lateral Piping Project

WaterSMART Small-Scale Water Efficiency Project Grants for Fiscal Year 2021

Funding Opportunity Announcement No.

R21AS00300

By

Langell Valley Irrigation
District, Klamath Basin,
Oregon
In association with SHN,
Klamath Falls, Oregon

Haley Grohs, Business Manager
9787 East Langell Valley Rd,
Bonanza, Oregon 97623
Phone: Cell (541) 891-6291 Office (541) 545-6344
E-Mail: Haley.lvid@outlook.com

Table of Contents

Technical Proposal and Evaluation Criteria

Executive Summary

Date:	March 17, 2021
Applicant Name:	Langell Valley Irrigation District (LVID)
Applicant Category:	A
City, County, State:	Bonanza, Klamath County, Oregon
Contact:	Haley Grohs
Title:	Business Manager
Address:	9787 East Langell Valley Rd.
Office Phone:	(541) 545-6344
Cell Phone:	(541) 891-2691
E-mail:	Haley.LVID@outlook.com
Project Name:	Lorella Lateral Piping Project

This project is being submitted under the WaterSMART Small-Scale Water Efficiency Projects Grant funding opportunity announcement. Funding would be utilized for the conversion of approximately 1,200 feet of open canal to a buried pipe system. If funded, the completed project is anticipated to conserve approximately 482 acre-feet of water annually, based on 5 cfs equal loss over 3700 ft of lateral witnessed in the field. This equates to a savings of $62,266 per year based on the reimbursement rate of $400/ac paid to farmers in 2018 who chose to not irrigate their land, most of whom had an allocation of 3 ac-ft of water per year. Water conserved through this project would also allow the District to retain water in the reservoirs in order to provide greater water accessibility to clients during low water years.

Upon receiving confirmation of Reclamation funding, and completion of NEPA and NHPAcompliance, LVID anticipates they will complete the project within roughly two years. The following schedule assumes that both the NEPA and the NHPA process would require approximately six to twelve months for completion, and thus, construction would be delayed until after the following irrigation season in October 2022.

Project Schedule (dependent on NEPA/NHPA compliance)
March 2021- Submit grant application
September 2021-Anticipated Grant is awarded
September 2021 - Begin NEPA and cultural resources process
March 2022 - Anticipated finalization of NEPA and NHPA compliance
March 2022 - LVID requests final bids for pipe and materials
September 2022 - Purchase pipe and materials
October 2022 - March 2023 - (weather dependent) construction

The proposed project facilities are owned by the Bureau of Reclamation (BOR) are and situated in BOR Right-of-Way. LVID operates and maintains the irrigation infrastructure under an agreement with BOR.

Background Data

The Langell Valley Irrigation District (LVID) is located in Langell Valley in south-central Oregon, immediately north of the California border and is comprised of 16,815 irrigable acres. The Lost River divides Langell Valley and the District into two halves. The north half of the District is irrigated by waters collected and stored in Gerber Reservoir (Klamath County, Oregon), diverted at Miller Creek Diversion Dam, and delivered through the North Canal and its' lateral system. The south half of the District is irrigated by waters stored in Clear Lake Reservoir (Modoc County, California). diverted at Malone Diversion Dam and delivered through the West Canal and its' lateral system. The entire delivery system consists of 26 ½ miles of canals and 46 miles of laterals. The bulk of the system falls into the category of transferred works from the Bureau of Reclamation. Drains are either Reclamation owned or private. Reclamation drains are also transferred works. LVID was designed as a gravity system. A water driven hydraulic pump was the only pump in existence on the District for much of the first half of the 20th century. The District now has 7 electric lift pumps but continues to rely primarily on gravity for delive1y of water through the North and West Canal.

Improvements by the District since the original construction of the District are limited and noted below. Assessments have historically been very low, and the District has continued to function. Deterioration of existing infrastructure and the expense of repair and replacement costs are major concerns of the District.
The District installed lift pumps mid-way through the 20th century.
The District retrofitted Miller Creek Diversion Dam during the 1990's.
The District installed a ramp flume in a major lateral in 2001.

There are approximately 100 patrons served by the District. All water delivered by the District to its' patrons is for agricultural purposes. Irrigation methods include center pivot sprinklers, lateral movement sprinklers and gravity spread. The major crops grown within LVID include:

Pasture	7789 acres
Alfalfa	1460 acres
Barley	210 acres
Oats	780 acres
Other hay	4948 acres
Other	1628 acres

The current water demand delivered to patrons' point of diversion totals 55,000 acre-feet per annum. The projected demand is anticipated to remain unchanged for the foreseeable future. The primary water shortfall is the variable winter runoff for storage in Gerber and Clear Lake Reservoirs and the effects of climate change.

LVID's annual water allocation from BOR on a full water year is 71,000 acre-feet. The District's dam tenders/ditch riders know that a given release from storage, accounting for losses, results in a fairly accurate quantity of water delivered to the canal system. The discharge is regularly monitored at Gerber and Clear Lake Dams-and the gate openings are recorded inefficiencies in the delive1y system and evaporation, both between Gerber Reservoir and Clear Lake Reservoir and their respective diversion dams and then within the district in the North and West Canal, 16,000 acre-feet of water never reaches the field. Without considerable expense, the inefficiencies in the delivery system between the storage reservoirs and the diversion dams will never be eliminated. However, once the water enters the North and West Canals, efficiencies can potentially be dramatically improved.

The Upper Klamath Basin sits at 4,100 feet in elevation, with average annual moisture of 12 inches to 14 inches per year, the majority being winter snowpack. Klamath County has been experiencing major shortages in snowpack, however, with below annual snowfall recorded in many of the previous years. As such, water supply in the Klamath Project can become very limited in certain years, and it is extremely important to conserve as much water as possible. To meet both this conservation objective and LVID's

piping goals, this proposed project includes the piping of one section of Lorella Lateral, located within LVID.

Project Location

The proposed project includes the conversion of roughly 1,200 feet of a section of the Lorella Lateral into subterranean piping. The lateral is located within LVID in Klamath County, Oregon about nine miles southeast of the town of Bonanza, Oregon. Coordinates for the northern tip of the section are 42° 8'25.65"N and 121°16'14.94"W, and coordinates for the southern tip of the section are 42° 8'12.55"N and 121°16'3.24"W.

Project Description and Milestones

An irrigation district in the same valley with similar geology, Horsefly Irrigation District (HID), has discovered that, after piping approximately five miles of open canal, it has conserved roughly 30% of the water which is delivered through the system. The district has reduced their water demand through these piping projects from 35,000 acre-feet in 2006, to 25,000 acre-feet in 2018. As this currently proposed project is located in the same valley with similar soils, geology, and hydrologic characteristics, and the length of open canal to pipe conversion is similar, LVID predicts that similar water efficiency rates would result from this proposed project.

LVID is proposing to convert approximately 1,200 feet of the opened, unlined lateral to a piped system using 36-inch diameter High-Density Polyethylene (HDPE) pipe. This section of lateral experiences very high rates of seepage. When a flow of 5 cfs is required at the crossing of E Langell Valley Rd, it is necessary to release 10 cfs at the beginning of the lateral, 3,700 feet up stream. At a starting flow of 10 cfs, the system is losing 5 cfs which equates to 1,487 ac-ft over the course of the irrigation season. These loses are assumed to occur over a section of fractured basalt subgrade that allows for high rates of infiltration in the south section of the lateral, as seen in Appendix A. Converting the open conveyance to enclosed piping would eliminate the infiltration and evaporation that occurs over the length. If the losses are assumed to be uniform over the 3,700 feet length, then piping 1,200 feet would conserve 482 ac-ft of water over the course of the irrigation season. These factors as well as erosion, aquatic weed reduction and labor involved in maintenance of the ditch would be eliminated by converting this section to an underground pipe. LVID is also exploring the option of straightening the pipe alignment, as seen in Appendix A, in order to maximize the efficiency of the pipe installation.

If this proposal is awarded, LVID would procure the necessary supplies and materials for the pipe installation. LVID would provide the labor and equipment for the pipe installation.

To begin the piping project, equipment and materials would be transported from the District headquarters to the project sites as needed. Any existing turnouts, drop structures, or checks within the canal that would impede the placement of the pipe would be removed. LVID would utilize an excavator and D-4 Caterpillar to laser level the existing canal bed. The canal bed would be leveled to allow the pipe to lay properly at grade and allow for gravity flow through the piping system. It is anticipated that the canal bed will require an additional two feet of excavation to achieve the required ground cover. Once the ground is leveled, LVID employees would begin installing pipe in the ground. Cleanouts would allow for maintenance access and turnouts and worn headgates would be replaced, as necessary.

One control structure would be placed at the beginning of the pipeline, and a second structure would be installed at the end of the pipeline. Once the pipe and cleanout boxes are installed, the pipe would be backfilled with soil from the existing canal banks. Once backfilled, the new pipe would have a minimum cover of two feet and would be approximately four feet in the ground. In an effort to not distort the underlying pipe, compaction above the piping would be minimal. The disturbed areas on and neighboring the buried pipe would be revegetated with drought tolerant pasture grass.

LVID anticipates that the project, from purchasing materials to finalizing construction, could be completed within roughly 1 ½ years (weather permitting). An estimated project schedule, which assumes NEPA compliance to be completed six months after the grant agreement is signed, is in the executive summary section of this application.

Evaluation Criteria

Evaluation Criterion A: Project Benefits
Describe the expected benefits and outcomes of implementing the proposed project.

- *What are the benefits to the applicant's water supply delivery system?*

  The District anticipates that this project will conserve 482 acre-feet of water per year.

- *If other benefits are expected explain those as well. Consider the following:*
  - *Extent to which the proposed project improves overall water supply reliability.*

    As mentioned in the executive summary and background sections, the region has experienced water shortages in many of the previous years to which it is incumbent on irrigators to make their infrastructure as efficient as possible. LVID is focusing on the sections of its infrastructure that will provide the greatest water conservation. Water that is conserved by these improvements will allow for more water to be stored in the reservoir to provide flow to the Lost River system during dry years. Further, piping canals results in decreased pumping costs due to a lower water volume requirement up stream.

  - *The expected geographic scope benefits from the proposed project (e.g., local, sub-basin, basin).*

    Benefits would be primarily felt within the Lost River system, but, again, LVID's retained water would make beneficial contributions for all within the Lost River Basin.

  - *Extent to which the proposed project will increase collaboration and information sharing among water managers in the region.*

    This water conservation project is meant to increase the available surface supply through improved delivery systems. This increased supply will be truly beneficial to District water users and all who rely on Lost River flow. Also, this project includes a benefit to endangered species (Lost River and Short Nose Suckers) and other wildlife including waterfowl populations in nearby refuges and Gerber Reservoir.

  - *Any anticipated positive impacts/benefits to local sectors and economies (e.g., agriculture, environment, recreation, tourism).*

LVID anticipates several positive impacts as water quantity and water quality issues would be improved. As mentioned, local wildlife refuges (a recreation and tourist resource) would benefit with additional water provided from this project. Water conserved through this project would create greater drought resiliency in the Lost River system.

- *Extent to which the project will complement work done in coordination with NRCS in the area (e.g., with a direct connection to the district's water supply). Describe any on-farm efficiency work that is currently being completed or is anticipated to be completed in the future using NRCS assistance through EQIP or other programs.*

  The District, and irrigators therein, are experiencing an ongoing improvement in irrigation methods that includes installation of pivots, linears, and updated wheel lines. Most of these on-farm improvements have been in coordination with NRCS and the local Klamath Soil and Water Conservation District office. These on-farm improvements blend nicely with LVID's piping program as piping provides a consistent and improved supply of water to the water user. The water is cleaner than supplied by open canals and the discharge constant. This also allows LVID management to provide water to users in a more timely and efficient fashion.

Evaluation Criterion B: Planning Efforts Supporting the Project

Describe how your project is supported by an existing planning effort (water management plan, water conservation plan, System Optimization Review, or other planning effort).

- *Does the proposed project implement a goal or address a need or problem identified in the existing planning effort?*

  The Klamath River Basin Study stated that climate change has already impacted water resources and that the trend will continue in the future. Because of this, it is imperative that measures are identified that would reduce water supply and demand imbalances. The Study indicated that agricultural water conservation techniques, which reduce water demand, would assist in addressing this imbalance by increasing the drought resistance and sustainability of the Lost River system. This proposed piping project would support that goal. LVID is also in the process of sourcing funding for a system improvement plan that would allow the district to better address areas of the system in which to enact water conservation measures.

- *Explain how the proposed project has been determined as a priority in the existing planning effort as opposed to other potential projects/measures.*

  The Lorella lateral was chosen from among the many miles of irrigation infrastructure due to the improvement in water efficiency that piping this section would bring. No other improvements reviewed within the scope of the Small-Scale Water Efficiency Grant provided such a return on investment. The Klamath River Basin Study stated that climate change has already impacted water resources and that the trend will continue in the future. Because of this, it is imperative that measures are identified that would reduce water supply and demand imbalances. The Study indicated that agricultural water conservation techniques, which reduce water demand, would assist in addressing this imbalance by decreasing water consumption due to system inefficiencies. This proposed piping project would support that goal.

Evaluation Criterion C: Project Implementation

Describe the implementation plan for the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.

An estimated project schedule, which assumes NEPA compliance to be completed six months after the grant agreement is signed, is in the executive summary section of this application.

Describe any permits that will be required, along with the process for obtaining such permits.

Compliance with NEPA is the only required action known at this time.

Identify and describe any engineering or design work performed specifically in support of the proposed project.

Predesigning and engineering in the canal bed to accommodate the pipe. This is needed because of "overdig" and destruction by animals and weather in the 100 year period in which the facilities have existed.

Describe any new policies or administrative actions required to implement the project.

Outside of LVID Board directives, none are known.

Describe the timeline for completion of environmental and cultural resource compliance.

The project schedule assumes that both the NEPA and the NHPA process would require approximately six to twelve months for completion, and thus, construction would be delayed until after the following irrigation season in October 2022. This schedule was reviewed by Brandon (Kirk) Young at the Bureau of Reclamation (KBAO) and was deemed reasonable.

Evaluation Criterion D: Nexus to Reclamation

Is the proposed project connected to a Reclamation project or activity? If so, how? Please consider the following:

Yes, it is connected.

- *Does the applicant receive Reclamation project water?*

  Yes

- *Is the project on Reclamation project lands or involving Reclamation facilities?*

  The proposed Lorella lateral project does not interact with any Reclamation facilities or lands.

- *Is the project in the same basin as a Reclamation project or activity?*

  Yes, in the Klamath Basin as part of the Klamath Project.

- *Will the proposed work contribute water to a basin where a Reclamation project is located?*

Yes. The proposed project will conserve water within the eastern portion of the Klamath Project for Lost River users and for carryover water storage for drought years.

- *Will the project benefit any tribe(s)?*

  These system improvements will benefit the Lost River system and will not involve any tribes.

Project Budget

Funding Plan and Letters of Commitment

Describe how the non-Federal share of project costs will be obtained. Reclamation will use this information in making a determination of financial capability.

- *The amount of funding commitment.*

  LVID would commit $114,231 to this project. The greater portion of this amount is in-kind contributions of labor, management, and equipment. The total amount of the project is $189,231 with $75,000 requested under the WaterSMART opportunity.

- *The date the funds will be available to the applicant.*

  LVID anticipates of having its cost share available at the time of signing the financial assistance agreement.

- *Any time constraints on the availability of funds.*

  None known by LVID at this time.

- *Any other contingencies associated with the funding commitment.*

  None.

Please identify the sources of the non-Federal cost share contribution for the project, including:

- *Any monetary contributions by the applicant towards the cost-share requirement and source of funds (e.g., reserve account, tax revenue, and/or assessments).*

  LVID will primarily provide its cost share through in-kind contributions of labor, management, and equipment from which funding has been obtained through in-District irrigation assessments.

- *Any costs that will be contributed by the applicant.*

  Same as above. LVID will primarily provide its cost share through in-kind contributions of labor, management, and equipment from which funding has been obtained through in-District irrigation assessments.

- *Any third-party in-kind costs (i.e., goods and services provided by a third party).*

  LVID is not seeking funds from third-parties.

- *Any cash requested or received from other non-Federal entities.*

  LVID is not receiving funding nor has requested funding from any other non-Federal entities.

- *Any pending funding requests (i.e. grants or loans) that have not yet been approved and explain how the project will be affected if such funding is denied.*

  N/A

In addition, please identify whether the budget proposal includes any project costs that have been or may be incurred prior to award.

No expenditures prior to award are expected.

Budget Proposal

Total Project Cost Table

Funding Sources	Percent of Total Project Cost	Total Cost By Source
Recipient Funding	60%	$114,231
Other Recipient Funding		$0
Reclamation Funding	40%	$75,000
Other Federal Funding		$0
Totals	**100%**	**$189,231**

Budget Proposal – Table 1

Budget Item Description	Computation		Quantity Type	Total Cost
	$/Unit	Quantity		
Salaries and Wages				
Engineering	$120	10	Hour	$1,200
Administrative	$35	25	Hour	$875
Project Manager	$35	160	Hour	$5,600
Labor/Helper	$25	160	Hour	$4,000
Labor/Helper	$25	160	Hour	$4,000
Equipment				
Hyundai Robex 180lc	$75	130	Hour	$9,750
CAT D4 Dozer	$75	130	Hour	$9,750
Dump Truck	$75	100	Hour	$7,500
Low Boy - Haul Trailer	$105	12	Hour	$1,260
Supplies and Materials				

HDPE Control Structures	$5,000	2	Ea	$10,000
POD Box	$3,000	2	Ea	$6,000
Waterman Headgate	$1,200	2	Ea	$2,400
36" HDPE Pipe	$62	1209	Ft	$74,958
Seed	$1	400	LBs	$400
Other				
Reclamation environmental and cultural compliance costs	$15,000	1	LS	$15,000
Reporting	$5,000	1	LS	$5,000
Contingency	$15,769	10%	LS	$15,769
Total Direct Costs				**$173,462**
Indirect Costs				
De Minimis	10%	$15,769	MTDC	$15,769
Total Estimated Project Costs				**$189,231**

Budget Narrative

The project budget consists of five major components: 1) Salaries and Wages, 2) Equipment, 3) Supplies and Materials, 4) Other (Environmental Compliance/Reporting/Contingency), and 5) Indirect Costs. Based on previous similar projects, pricing quotes from local vendors, and the Army Corps of Engineers Operating Expense Schedule, LVID has budgeted for all related tasks, labor, and materials necessary for this project. An itemized breakdown of these costs is included in this report.

Salaries and Wages
The wages of the employees are not separated as indirect costs because of the direct nature of the project; their time is essential for material and labor coordination as well as other necessary functions of the project. No wage increases are anticipated at this time.

Salaries and Wages				
Engineering	$120	10	Hour	$1,200
Administrative	$35	25	Hour	$875
Project Manager	$35	160	Hour	$5,600
Labor/Helper	$25	160	Hour	$4,000
Labor/Helper	$25	160	Hour	$4,000

Fringe Benefits
Fringe benefits are included in the hourly wage of each employee.

Travel
No travel expenses are anticipated.

Equipment

The below listed equipment that is to be used during construction of this project is owned by LVID. The rates in the table are based the rates charged .

Equipment				
Hyundai Robex 180lc	$75	130	Hour	$9,750
CAT D4 Dozer	$75	130	Hour	$9,750
Dump Truck	$75	100	Hour	$7,500
Low Boy - Haul Trailer	$105	12	Hour	$1,260

Supplies and Materials

Costs associated with supplies and materials are based on similar projects.

Supplies and Materials				
HDPE Control Structures	$5,000	2	Ea	$10,000
POD Box	$3,000	2	Ea	$6,000
Waterman Headgate	$1,200	2	Ea	$2,400
36" HDPE Pipe	$62	1209	Ft	$74,958
Seed	$1	400	LBs	$400

Contractual

LVID is not anticipating the use of contractors for this project.

Environmental and Regulatory Compliance Costs

It is anticipated Reclamation will conduct the environmental (i.e., NEPA) compliance. However, based on prior experiences, the NHPA requirement may necessitate the hiring of a private cultural consultant where Reclamation will assume a review role. The costs listed below for the NHPA private consultant and the Reclamation NEPA/NHPA line items are based on HID's previously awarded WaterSMART projects as they are similar in scope to this proposed project and in coordination with Reclamation Klamath Basin Area Office staff.

A line item for reporting ($5,000.00) has been included to cover costs associated with the WaterSMART grant reporting requirement and other reporting obligations from the state or local level.

The contingency category has been included to support any unforeseen inflation involved in cost estimates for any of the budgeted line items. LVID does not intend to purchase any materials or supplies until NEPA and NHPA requirements have been met; however, given the timeframe that may be involved, the current estimates may change by the time the necessary compliances have been completed.

Other				
Reclamation environmental and cultural compliance costs	$15,000	1	LS	$15,000
Reporting	$5,000	1	LS	$5,000
Contingency	$15,769	10%	LS	$15,769

Indirect Costs
A line item for indirect costs has been included to cover any overhead and general costs. LVID has budgeted for the de minimis rate of 10% of the total direct costs minus the contingency line item (i.e., $157,693).

Indirect Costs				
De Minimis	10%	$15,769	MTDC	$15,769

Environmental and Cultural Resources Compliance

Please answer the questions from Section H.1. Environmental and Cultural Resource Considerations in this section.

- *Will the proposed project impact the surrounding environment (e.g., soil {dust], air, water {quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.*

  The proposed project is expected to have a minimal impact on the surrounding environment. The temporary disturbance of the soil caused by profiling or trenching existing canal will be minimal to the extent possible in preparation for pipe and well installation. It is the intent of LVID to keep all soil movement to a minimum and perform construction during the non-irrigation season to protect water resources. The District also intends to plant native grasses on the disturbed areas after construction.

- *Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?*

  LVID is not aware of any critical habitat or threatened or endangered species occurring in the project area that would be affected by the proposed project.

- *Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.*

No.

- *When was the water delivery system constructed?*

  Between 1918 and 1920.

- *Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.*

  It is the District's intent to replace open canals with buried pipe and replace all necessary control structures; these features were constructed in the early to mid-1900s.

- *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.*

  LVID is not aware of any historic sites within the project area.

- *Are there any known archeological sites in the proposed project area?*

  LVID is not aware of any archeological sites in the project area (see above response).

- *Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?*

  The proposed project is not expected to have an impact on low income or minority populations.

- *Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?*

  The project will not limit access to Indian sacred sites, nor will it impact tribal lands.

- *Will the proposed project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?*

  LVID will use best management practices during construction to prohibit the spread of noxious or invasive species. Additionally, after construction is complete, LVID will seed the project area with native grasses and utilize herbicides as appropriate to eliminate occurrence of invasive species.

Required Permits or Approvals

No permits or approvals, outside of NEPA compliance, will be necessary for this project.

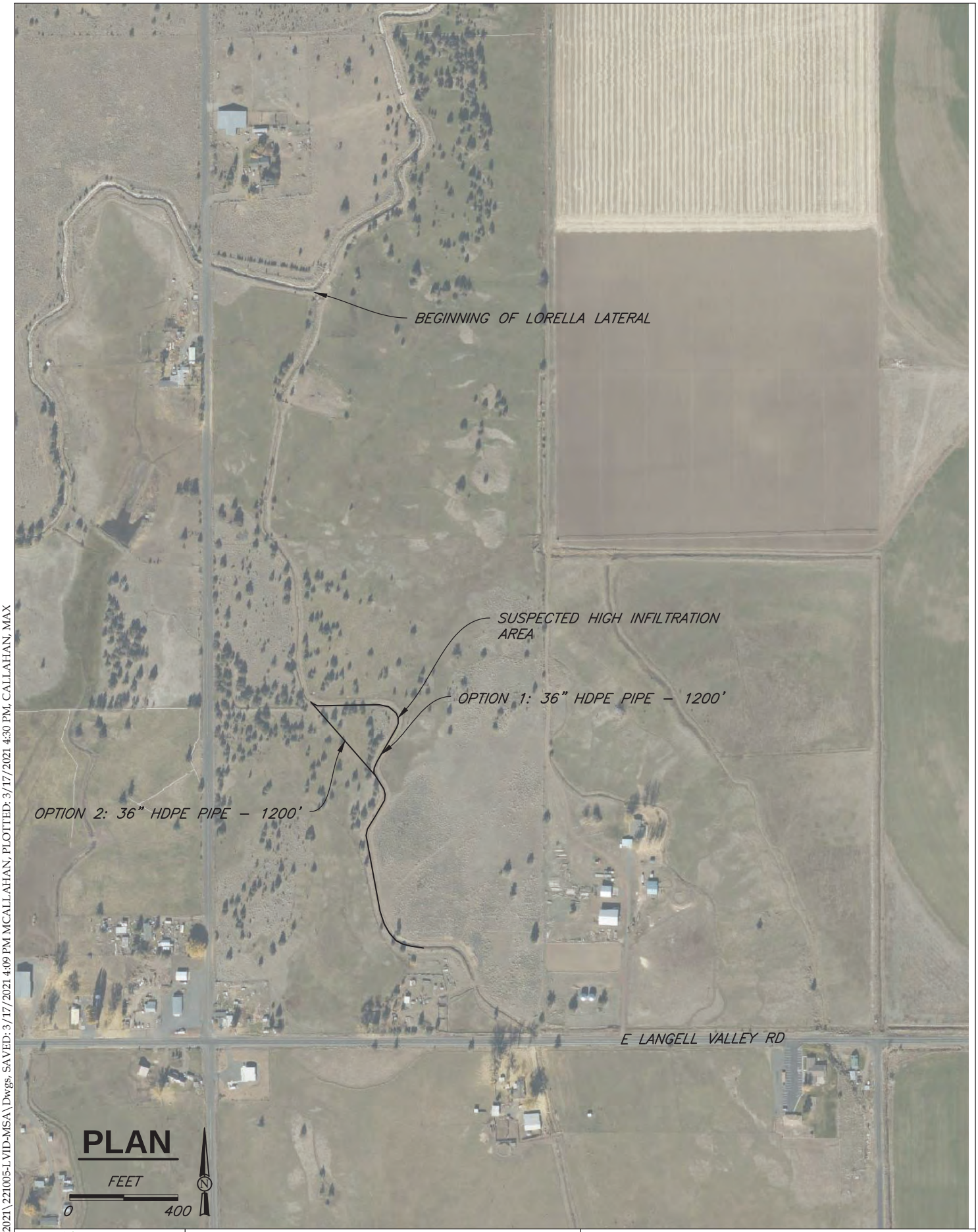
Official Resolution

LVID will submit a Board resolution that: 1. Identifies the official(s) with authority to enter into an agreement with Reclamation; 2. Identifies LVID's ability to provide cost share for the project; 3. Identifies LVID's willingness to work with Reclamation to meet established milestones for theproject.

The LVID Board will convene to draft, review, and sign a resolution. Per the funding announcement, LVID will present the resolution to Reclamation within 30 days after submitting this grant application.

APPENDIX A

LVID FY2021 WaterSMART Project Location

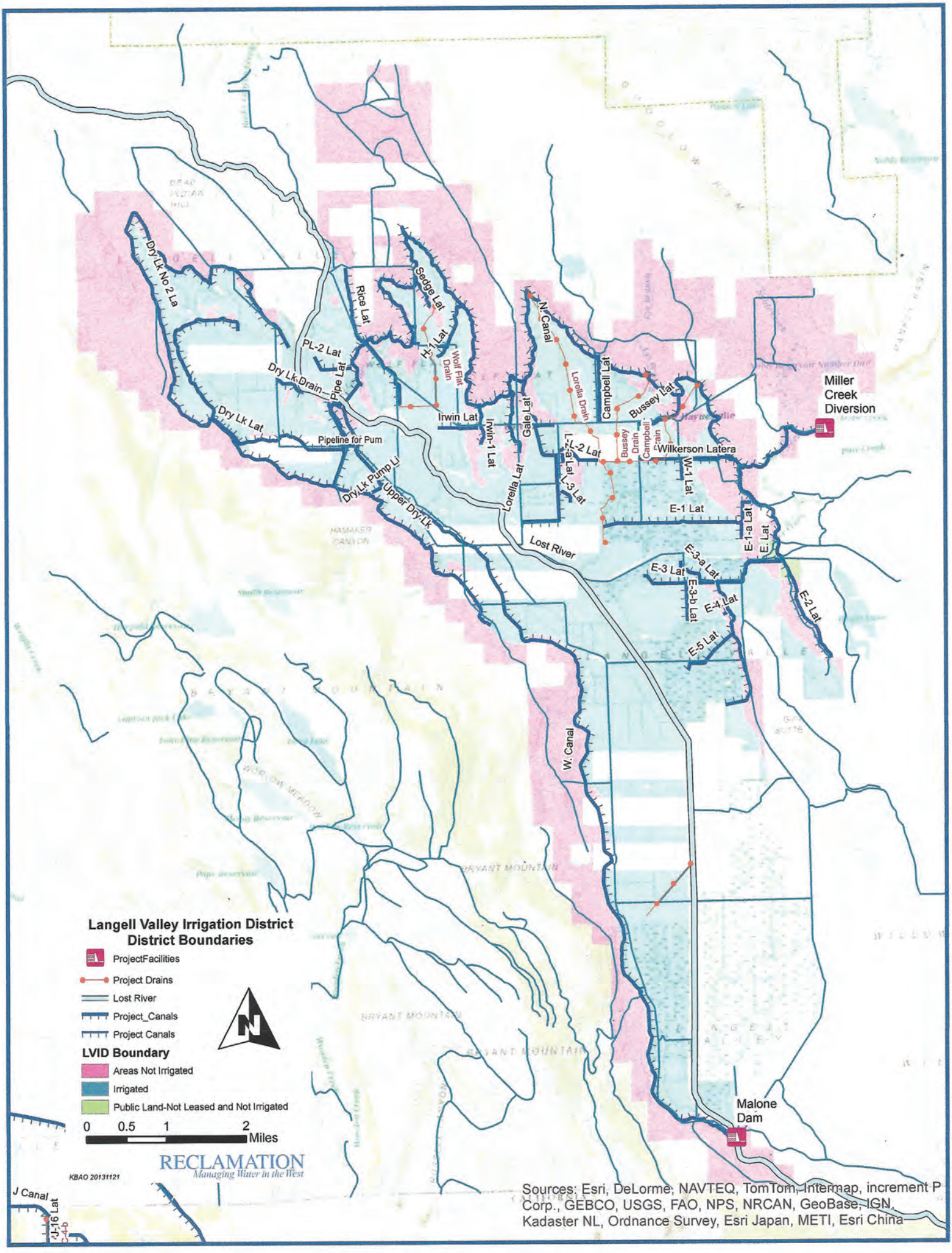


\\Kfalls\Projects\2021\221005-LVID-MSA\Dwgs, SAVED: 3/17/2021 4:09 PM MCALLAHAN, PLOTTED: 3/17/2021 4:30 PM, CALLAHAN, MAX

SHN	LANGELL VALLEY IRRIGATION DISTRICT LORELLA LATERAL - SWEG 9848 LANGELL VALLEY RD, BONANZA, OR	SHN-221005
	MARCH 2021 | \\Kfalls\Projects\2021\221005-LVID-MSA\Dwgs	Figure

APPENDIX B

LVID Area Map


Dry Lk No 2 La
Rice Lat
Sedge Lat
H-1 Lat
Wolf Flat Drain
PL-2 Lat
Dry Lk Drain
Pipe Lat
Dry Lk Lat
Pipeline for Pum
Irwin Lat
Irwin-1 Lat
Gale Lat
N. Canal
Lorella Drain
Campbell Lat
Bussey Lat
Miller Creek Diversion
Bussey Drain
Campbell Drain
Wilkerson Latera
L-2 Lat
L-2-a Lat
L-3 Lat
W-1 Lat
E-1 Lat
E-1-a Lat
E. Lat
Dry Lk Pump Li
Upper Dry Lk
Lorella Lat
Lost River
E-3-a Lat
E-3 Lat
E-3-b Lat
E-4 Lat
E-2 Lat
E-5 Lat
W. Canal
Malone Dam
J Canal
J-16 Lat
J-4-b
Langell Valley Irrigation District
District Boundaries
ProjectFacilities
Project Drains
Lost River
Project_Canals
Project Canals
LVID Boundary
Areas Not Irrigated
Irrigated
Public Land-Not Leased and Not Irrigated
0 0.5 1 2
Miles
RECLAMATION
Managing Water in the West
KBAO 20131121
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China

APPENDIX C

RECLAMATION

Managing Water in the West

Horsefly Irrigation District Yonna Canal WaterSMART Ponding Test

Summary of Findings Report

Mid-Pacific Region

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center

January 2016

Horsefly Irrigation District Yonna Canal WaterSMART Ponding Test

Summary of Findings Report

Mid-Pacific Region

Prepared by Merlynn D. Bender

Technical Service Center
Project Management
Mark Speare, Hydraulic Engineer

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center

January 2016

Acronyms and Abbreviations

AFY	acre-feet per year
cfs	cubic feet per second
HID	Horsefly Irrigation District
Reclamation	Bureau of Reclamation
SMART	Sustain and Manage America's Resources for Tomorrow
TSC	Technical Service Center
WEEG	WaterSMART Water and Energy Efficiency Grant

Contents

Figures

Background

The Horsefly Irrigation District (HID) applied for and received a Reclamation WaterSMART Water and Energy Efficiency Grant during 2014 (WEEG-14-082). Reclamation's Technical Service Center (TSC) staff identified this HID piping project as a good candidate for water savings verification. This project will replace one Yonna Canal section and two Dairy Canal sections with plastic pipe to reduce seepage. HID staff (Eric Mockridge and Nicholas Mockridge) provided equipment and performed the ponding test. TSC staff (Merlynn Bender) and Reclamation's Klamath Basin Area Office staff (Tyler Hammersmith) observed and facilitated the ponding test.

During April 9, 2015 through April 13, 2015, HID conducted a ponding test on Yonna Canal because the Dairy Canal pumps were not operable. Because those pumps were not operable, the reach for the ponding test was changed that morning to an open channel canal section just downstream of the Yonna Canal reach to be piped. The Yonna Canal reach to be piped was too steep for a ponding test. However, the reach downstream was flat enough for a ponding test. The purpose of the ponding test was to provide pre-project estimates of seepage losses that could be used to compare against the estimates given in HID's original proposal for the grant. The bottom of the earthen canal ditch used for the ponding test appeared to be hard-packed clay loam soil. Soil density was observed by driving a metal bar into the soil near the downstream temporary ponding test dam on Yonna Canal.

HID was provided a ponding test guidance document prior to the test.[1] After a beginning safety meeting, HID constructed the downstream dam with a tarp placed over the upstream culvert opening of a road crossing and then with excavated soil placed over and in front of the culvert opening using HID's backhoe (figure 1). Preparation for the ponding test occurred the same day as the beginning of the ponding test which began at 9 p.m. April 9. The backhoe was also used to cut an overflow key in the road crossing at the temporary downstream ponding test dam to prevent flooding fields. The backhoe and hand shovels were used to fill the downstream dam site culvert opening with soil to eliminate dam pond leakage. Three staff gauges were installed in Yonna Canal near the downstream dam, 0.3 miles upstream of the downstream dam, and about 0.3 miles upstream of the upstream end of the pond test section. The upstream gauge was used to show passage of the water draining off the steeper upstream reach and was not used for measurements after recordings for the ponding test period were initiated. Water was pumped slowly into Yonna Canal over a six hour period so as to not wash out the earthen dam while filling. Unfortunately, water seeped through the downstream closed-off dam culvert during filling. Repairing the

[1] Guidance document: "Measuring Seepage Losses from Canals Using the Ponding Test Method," by Eric Leigh and Guy Fipps. AgriLIFE EXTENSION, Texas A&M System. B-6218, 1-09 (January 2009).

downstream dam required the addition of a stiff plywood cover and additional soil over the culvert opening. The pond banks were allowed to saturate and the pond water surface to level off for three hours before beginning the ponding test. Gauge readings were initially taken every hour at each of the measuring stations just upstream of the downstream dam as the water surface elevation stabilized to a flat pool and calm pool condition at 9 p.m. on April 9. No wind or waves in the pond were observed and no precipitation occurred overnight.

Figure 1. Downstream dam on Yonna Canal for HID ponding test.

As shown by the report cover figure, the water surface elevation dropped 0.42 feet over a 12-hour period indicating considerable seepage from the canal which had been saturated for six hours before beginning the ponding test at 9 p.m. on April 9. Because no temporary upstream dam was constructed, slight drainage from the upper portion of Yonna Canal may have seeped into the ponded section during the early part of the ponding test period. Before ponding the reach and during the ponding test, canal bottom and top widths were measured using a tape line. These field measurements were performed at the test site to determine wetted perimeter and top width of the ponded section. Staff gauge measurements were initiated at each of the two pond test measurement locations three hours after it was determined that the inflow was complete and the downstream dam was water tight. The two measurement locations, at a distance of 0.3 miles apart, indicated a still calm pond condition without waves about two hours before starting the pond seepage drawdown measurements. The pond test consisted of recording the date,

time of day, and water level on the staff gauges as well as the distance of water level drop from a baseline maximum pool datum on stationary objects. Those stationary objects were a rust-colored culvert pipe (see report cover) over the pond near the downstream dam and a turnout headgate about 0.3 miles upstream of the downstream dam.

The drawdown rate of the pond test determined how long the measurements were taken as well as the extent of the pool length to use for seepage calculations. A pond reach length of one mile (excluding road-crossing culvert sections) allowed potentially 18 inches of water surface drop at the upstream end of the pond section chosen for seepage calculations over a three day period if needed. The ponding test was completed within 72 hours. Based on drawdown measurements from the rust-colored culvert pipe by TSC and HID, the ponded section lost forty percent of the initial ponded section water volume during the ponding test period of three days. The ponding test period extended 72 hours from 9 p.m. April 9 to 9 p.m. April 12.

Results

The initial observed seepage rate of 10 inches per day (0.83 feet/day or 0.83 cubic feet per foot of canal per day) was used for canal seepage calculations. It was assumed that the canals to-be-piped would run continuously for 180 days during the irrigation season. An assumed rectangular upper canal volume loss and an average canal width of 18 feet, based on field measurements, was used for seepage calculations resulting in a loss of 15 cubic feet per day per foot of canal to be piped. Multiplying the seepage loss rate by the total 1.26 mile length (6,653 feet) of canal to be piped in the three reaches resulted in 412 acre-feet per year (AFY) seepage loss based on the ponding test located just downstream of the to-be-piped reach of the Yonna Canal. HID estimated 720 AFY total seepage loss for the three canal reaches to-be-piped. The applicants estimate was based on the difference between the amount pumped and amount diverted. HID estimated that 30 percent of the water diverted is lost.

The unlined canal section tested during the ponding test is a flat reach with ten road-crossing culverts that dam as well as restrict the flow. Fine sediments observed in the canal bottom (figure 1) drop out of the water column and partially seal the canal bottom upstream of the road-crossing culverts potentially reducing the amount of canal seepage. Each road-crossing culvert constricts flow and dams water thereby reducing velocities causing fine sediments to settle to the canal bottom upstream of the culverts. Fine sediments were observed by TSC staff before and during the ponding test while walking the dry canal and wading the saturated canal. The apparent sediment sealing is suspected to have partially sealed the canal in the ponding test reach, thereby reducing the amount of seepage

observed in the ponding test relative to the more typical canal sections. With no temporary upstream dam, slight upstream drainage from rainfall, bank drainage, and groundwater seepage may have entered the ponding test section after the beginning of the ponding test which would decrease the ponding test seepage rate calculated. After saturating the unlined canal for six hours, the HID Yonna Canal ponding test for one mile of unlined channel was considered successful.

Conclusions

The Yonna Canal ponding test indicated seepage water loss from the unlined earthen canal was 57 percent of that estimated by the applicant. However without an upstream dam on the ponded section, the actual amount of seepage may be more due to previous precipitation or pump drainage entering the ponded section after the start of the ponding test. The ponded section is located in a flat wetland area which is expected to experience less seepage than a more typical reach with better drainage pathways to the groundwater table. There may be more seepage on the Dairy Canal and Yonna Canal reaches to be piped where there are less road crossings with culverts and more rodent burrows. The many variables affecting net seepage into the hard-packed soils where the ponding test occurred reduces the certainty of testing and subsequent interpretation of data. A post-project test is typically not required for a piping project which should not leak.

Although the ponding test of the earthen Yonna Canal in flat terrain downstream of the reaches to be piped provided useful information in regards to seepage reduction, additional information would be required to potentially better estimate pre-project seepage in other reaches. Overall, the grant applicant's water saving estimate appears to be reasonable based on the information provided in the grant application and based on the Yonna Canal ponding test observations; however without additional data, the larger seepage rate estimated by the applicant on the three canal sections to be piped was not verified on the flatter Yonna Canal ponding test reach located downstream of the steeper reach to be piped.

C:\1wordDP\WaterSmart2015wp\MeasurementDreportsWEEG2014\Horsefly082\PondTestResults\Horsefly Ponding Test Final Report2015c17.docx