



TUALATIN VALLEY
WATER DISTRICT

**TVWD Advanced Metering Infrastructure Project
Grant Application**
NOFO #R23AS00008 (15.507)

**Tualatin Valley Water District
1850 SW 170th Avenue
Beaverton, OR 97003**

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U.S. Department of the Interior - Bureau of Reclamation
WaterSMART: Water and Energy Efficiency Grants for Fiscal Year 2023

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I. Technical Proposal & Evaluation Criteria (limited to 50 pages)

The technical proposal and evaluation criteria (50 pages maximum) includes: (1) the Executive Summary, (2) Background Data, (3) Technical Project Description, (4) Project Description, and (5) Evaluation Criteria.

A. Executive Summary

The executive summary should include: the date, applicant name, city, county, and state. Please indicate whether you are a "Category A" applicant or a "Category B" applicant.

July 28, 2022

Steve Carper - Conservation Technician & AMI Project Manager

Tualatin Valley Water District

Beaverton, Oregon (Washington County)

Category "A" Applicant

1. Project Summary

A one-paragraph project summary that provides the location of the project, a brief description of the work that will be carried out, any partners involved, expected benefits, and how those benefits relate to the water management issues you plan to address.

Located in Washington County, Oregon, the Tualatin Valley Water District (TVWD/District) is moving forward with a district-wide \$21,549,340 Advanced Metering Infrastructure (AMI) Project as part of its long-term goal of water supply reliability and efficient water management. As such, if awarded a grant, it is estimated that all 217,700 TVWD customers will be served by the \$5,000,000 in Federal funds requested. AMI is an integrated system of smart meters, communication networks, and data management systems that enables two-way communication between utilities and customers. TVWD hired an experienced AMI consultant to facilitate the upgrade of 100% of its existing 60,497 water meters with AMI functionality. The smart meters and the system's accompanying network provide several important functions that are currently not possible or have to be performed manually. For example, over *half* of the District's meters must still be read manually every other month by technicians driving service vehicles. Leaks, can thus, go undetected for up to 60 days or longer before being detected. Whereas, AMI can identify and isolate leaks remotely and nearly automatically, saving both water and our customers' money. The replacement of existing registers with automated, high resolution digital units is also an integral component to modernizing TVWD's customer service, providing real-time access for both TVWD staff and water customers via a future on-line data portal. The upgrade to a fully automated AMI system leads to wide-ranging meter efficiency improvements and accuracy resulting in district-wide water savings of 873.33 acre-feet per year (AFY) and energy savings of 530,443 kilowatt hours (kWh) per year. Reducing manual meter reading and the use of field service vehicles will save 5,425 gallons of gasoline per year and reduce carbon emissions by 102 metric tons of CO₂ per year. While there are no partners on this project, there is widespread support for it from the Regional Water Providers Consortium, Clean Water Services, and the local Joint Water Commission.

2. Estimated Completion Date

The Project will be completed in multiple phases commencing with a \$200,000 detailed design and planning phase that began in July 2022. The planning phase has an estimated completion date of January 2023, and will be paid for using existing TVWD general funds. TVWD is not seeking Federal funding for this portion of the project. Rather, the construction portion of this project, which is the phase TVWD is seeking Federal funding for, is not estimated to begin until July 2023. The project implementation phase will take approximately 36 months (3-years) to complete. Estimated completion date is July 2026.

3. Whether Project Located in Federal Facility

The project is not in a federal facility.

B. Project Location

TVWD is located in Washington County, Oregon, approximately four miles northwest of the City of Beaverton and 9.5 miles west of the City of Portland. The AMI Project will include meters throughout TVWD's entire district territory. The project latitude is 45°30'N and longitude is -122°51'W.

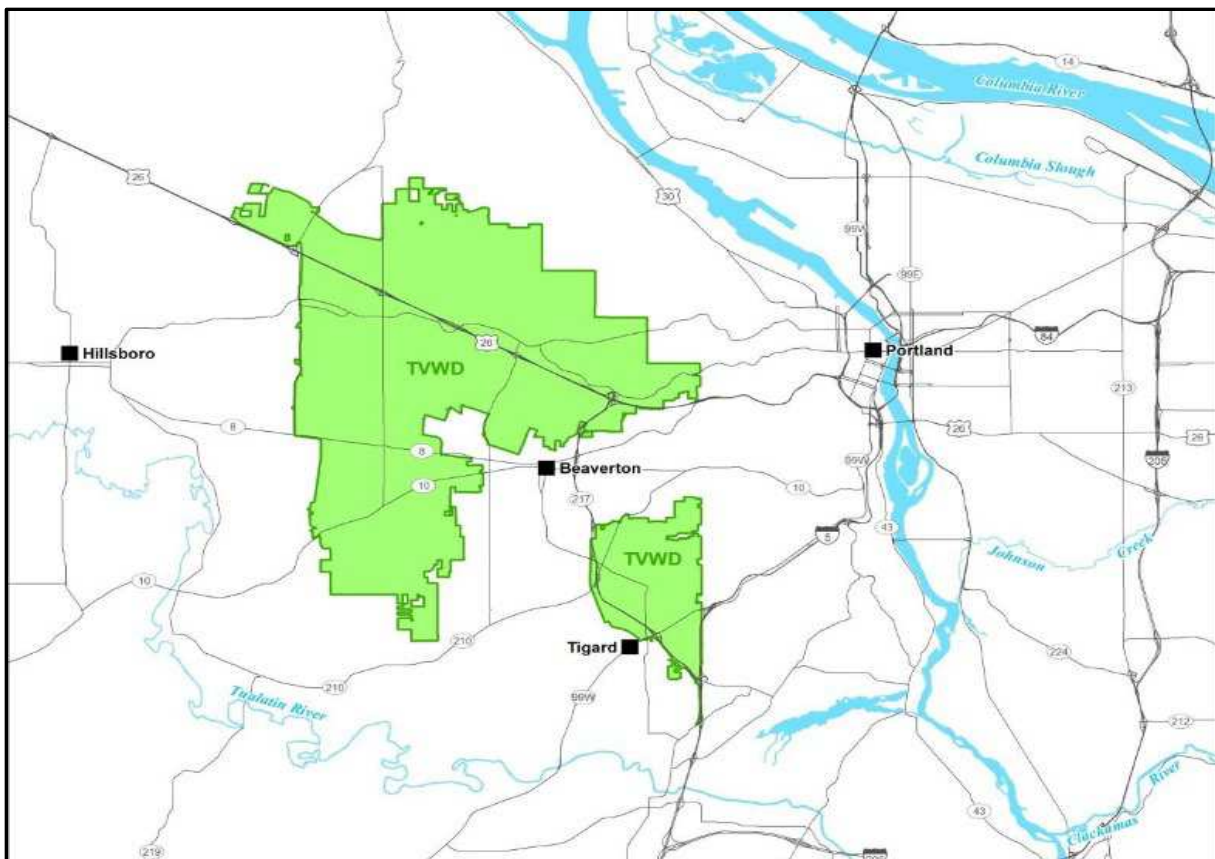


Figure 1 - TVWD District-Wide AMI Installation Map

TVWD customers are in a unique situation because the District has multiple water sources. Shifting the amount of water received from each source allows TVWD to minimize service interruptions and manage water storage and fiscal resources more efficiently and reliably, especially during an emergency or natural disaster. TVWD receives about 72% of its water from the [Portland Water Bureau](#), which is primarily sourced from the Bull Run Watershed. Water is piped to a 50-million-gallon storage reservoir on Powell Butte, located on the east side of Portland. The Portland Water Bureau also uses the [Columbia South Shore Wellfield](#) to augment the Bull Run supply. Drawn from 25 wells and four aquifers, it is capable of producing close to 100 million gallons of water per day (MGD).



Figure 2 - TVWD's Water Source Map

About 28% of TVWD water comes from the [Joint Water Commission \(JWC\)](#), which is jointly owned by TVWD and the neighboring Oregon cities of Hillsboro, Beaverton and Forest Grove. The JWC source is comprised of water from Hagg Lake (BOR-owned Scoggins Reservoir) and the Barney Reservoir released into the upper portion of the Tualatin River. When flows are available, water from the Tualatin River is used. It is then withdrawn and filtered through the [JWC water treatment plant](#).

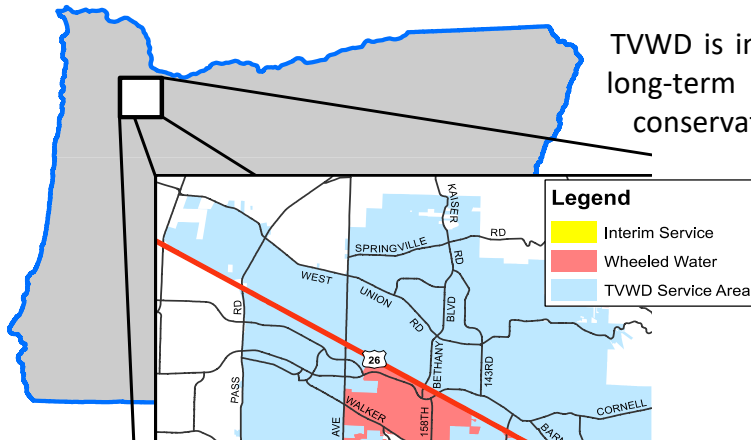
During the winter, when water supplies are plentiful, TVWD stores treated drinking water underground in the aquifer surrounding the Grabhorn Aquifer Storage and Recovery (ASR) well. During the summer, the stored water is pumped from the well to augment other sources to help meet peak summer water demands. This ASR can supply TVWD customers with three million gallons a day for approximately 90-100 days. The Grabhorn ASR well can store more than 350 MG of treated water. During the 2020 fiscal year, TVWD injected about 74 million gallons of water into the ASR and withdrew about 18 million gallons from the ASR.

C. Technical Project Description

Provide a more comprehensive description of the technical aspects of your project, including the work to be accomplished and the approach to complete the work. This section is an opportunity to address any aspect of the project that reviewers may need additional information to understand.

1. Work to be Accomplished

TVWD supplies water to two main service areas - Wolf Creek and the Metzger area. As of 2020, approximately 196,700 customers are in the Wolf Creek service area and 21,000 customers are in the Metzger service area, for a total population served of approximately 217,700 customers.



TVWD is implementing the AMI Project as part of its long-term goal of water supply reliability, water conservation, and efficient water management in the Tualatin Valley Basin.

Within TVWD's 44 square mile service area, it is estimated that all 217,700 customers will benefit from this project. The AMI Project includes the upgrade of approximately 60,497 manual and mobile-read water meters to an automated fixed-base network system. The new meters will collect and store meter readings within hourly intervals (at most) and 15-minute increments at peak resolution. The intent is to have 100% of the meters automated over a 36-month deployment.

The AMI Project will allow TVWD the ability to provide the following benefits:

- Allows TVWD to better track and quantify unaccounted water loss and better identify where distribution system losses originate.



Figure 3 - Tualatin Valley Water District Service Area

- Provides TVWD with the ability to accurately meter the lowest usage flows, ensuring customers are accurately billed for all the water they use.
- Enables customers to view their water consumption online, making it easier to track usage.
- Additional demand data will enable TVWD to optimize its pump stations, water reservoirs, and water treatment plants' operational and energy efficiency.
- Alerts are triggered by unusual or continuous usage patterns, which can be indicative of leaks, before there is extensive water loss or property damage.

- Allows for equitable use of the system by optimizing water rates based on actual water use, justifying rate changes for high users.
- Eliminates vehicle miles and staff time for manually reading service meters individually.
- Optimization of treatment and pumping by partner agency Clean Water Services which provides sewer, stormwater and surface water management services to TVWD customers.

2. Materials & Equipment

The AMI Project materials are straightforward. TVWD will automate 100% of its water meters out of a total of 60,497 water meters. Of the 60,497 total water meters, 26,074 will be completely replaced with an automated fixed-base network system. 34,423 meters will require replacing the register of an existing meter with an automated digital register. End points, meter boxes and lids will be replaced or upgraded where necessary. Six data collection gateways will need to be purchased. Data analytics software and training will be provided as part of the subcontractor installation agreement. As each route is completed, real time access for both staff and water customers will gradually be enabled via data access portal.

3. Approach to Complete the Work

In preparation for this project, in early 2019, TVWD hired a consultant to complete a **Focused Meter Reading Business Case Analysis (BCA)**, which will be referred to throughout this application. Key objectives of the analysis were to 1) Provide an overview of modern meter reading practices and related technologies, 2) Discuss the meter types offered by leading vendors, 3) Discuss available software solutions at a cursory level, and 4) Determine the feasibility of several automated meter options for the District. From this thorough review, the TVWD Board of Commissioners decided to go forward with the district-wide installation of an Advanced Meter Infrastructure system. The analysis also focused on presenting options and opinions of preliminary costs for five different alternatives. In preparation for the BCA, workshops were conducted with TVWD staff and preliminary propagation studies were solicited to obtain relevant background information. Workshops were held to review technology options and discuss both monetary and non-monetary factors associated with new meter reading technologies and meter data management capabilities. The preliminary propagation studies were conducted with participation from three leading AMI vendors, each with a slightly different network topology and infrastructure. The intent of the preliminary studies was to gain a high-level understanding of various meter reading systems, related costs, and expected performance.

Following this analysis, an official resolution of support from the TVWD Board of Commissioners (Board) was adopted on October 20, 2021, giving TVWD legal authority to enter into any agreements for the AMI Project. In July 2022, a contract was awarded to Diameter Services Inc. who will manage all aspects of the AMI Project as the District's AMI consultant (including procurement, vendor selection, installation, integration and testing of the AMI systems) with oversight from TVWD. This allows for a project management approach that is designed to place the "heavy lift" with Diameter resources while engaging the District primarily through efficiently facilitated workshops to ensure District stakeholder voices are accounted for.

Phase 1 - Project Planning/Detailed Design: Prior to the AMI Project beginning in July 2023, a \$200,000 detailed design and planning phase will be completed by TVWD and Diameter Services, by January 2023, and will be paid for using existing TVWD general funds. The District is NOT seeking any Federal funding for this portion of the project.

TVWD and Diameter will set-up a Core Project Team of department leads and subcontractors to serve as a cross functional group, which will also contain a Steering Committee/Executive Team that reports into the TVWD Board. Diameter and the TVWD’s Project Manager, Steve Carper, will then establish dates for as many meetings and project workshops as possible over the duration of the project. Preconstruction activities include the preparations of cost estimates and specifications for contract advertisement, review of estimates, propagation studies, and customer outreach. Propagation studies performed prior to the start of construction will determine the strategic placement of data collectors and installation to maximize effectiveness.

Diameter will also initiate an information request consisting of a comprehensive survey at the outset of the project to collect data and information about the District’s current water meter population, organizational structure, meter reading equipment, current business practices related to meter reading, billing and maintenance, and existing software (CIS, GIS, work order management, and level of integration), which supports cross functional participation, project understanding, and ensures departmental interests are met. Soon after, Diameter’s subcontractor, Minority Construction Group (MCG), will lead the field inspections of the meters and pits throughout the service area to determine meters that require work and the work specifics (i.e., meter or register replacement, register re-programming, pit/lid compatibility for AMI endpoints). Field inspections will also provide reliable work type assumptions that feed TVWD’s financial model and ultimately procurement documents. MCG will perform approximately 320 hours of inspections focusing on the accounts that will have the biggest impact on the project budget using a smart phone application that allows for field representatives to collect data, take pictures, and gather GPS coordinates.

Prior to equipment for the AMI Project is chosen, Diameter will conduct a series of workshops with TVWD AMI Project members to properly analyze the best choice for equipment and materials for the project and engage in needs assessments for proper AMI implementation. The following table provides a list of workshop discussion topics and goals:

Workshop Topic	
1. Assessment of Water Meters	7. Recommendation of Meter Choice
2. Overview of AMI Systems	8. Procurement Strategy
3. Analysis of Information Systems/Business Process Changes	9. Implementation Schedule
4. Stakeholder Engagement	10. Final Report – Culminating Phase 1
5. Project Scoping/Planning/Project Support	11. Risk Management
6. Cost Estimates & Budget	

Figure 4 - Planned AMI Project Workshop Topics

The AMI Project will then be broken down into four additional phases. It is these remaining phases of the project that TVWD seeks Federal funding – Phase 2) Procurement, Phase 3) Startup, Phase 4) Proof of Concept/Installation and Deployment, and Phase 5) Close Out.



Figure 5 - Planned Phases of the AMI Project

TVWD staff will provide administrative oversight for the project and shall be responsible for management of grant activities, such as reviewing and executing the grant agreement, attending (and preparing for) requested meetings with the BOR, maintaining grant and project files, preparing and processing requests for reimbursements, preparing updates for the TVWD Board of Commissioners, ensuring grant agreement compliance, completing and submitting quarterly and final reports, coordinating any audit request and/or examination of records by BOR and maintaining all records after the project is closed out. The below table captures the required grant activities, a task description of those activities, and the deliverables for compliance.

Overarching Tasks	Task Description	Deliverables
Project Management	Activities include coordination of all Project activities including budget, schedule, materials, procurement, communication, safety, site supervision, grant administration, and the preparation of invoices and maintenance of financial records.	Preparation of invoices, schedules, as required.
Reporting	Reporting of the financial status and project progress will be conducted at a minimum on a quarterly basis. Significant development reports and a final project report will be prepared, along with any other reporting requirements specified in the Grant Agreement (GA).	Submission of quarterly, annual and final reports.
Environmental Documentation	The AMI Project will simply replace or retrofit existing water meters, replace boxes and lids where necessary and will install data collection gateways on TVWD-owned property. Thus, TVWD does not anticipate NEPA being required for this project due to the categorical exclusion found in Bureau of Reclamation Part 516 Chapter 14, 14.5D.	Completed and approved environmental documentation, if required.

Permitting	No special permits or approvals will be required for the AMI Project, as all work will be performed on existing TVWD-owned facilities. Project-related approvals, including an over-the-counter electrical permit for the data collection gateways and approval by partnering municipalities for work on and near sidewalks, will be executed by the installers.	Appropriate permitting and approvals will be obtained.
Installation	This project involves a licensed installer replacing 26,074 new water meters and registers and another 34,423 new registers to be installed on existing water meters, and zero to six data collection gateways with antennae and replacement meter boxes and lids where required.	Progress reports as required by GA.
Grant Management	TVWD staff will negotiate, execute and manage the GA with BOR. Reporting will be performed on a semiannual basis, including submittal of Financial Reports and Program Performance reports, as well as Financial Reimbursement Requests using the online ASAP system through the System for Award Management (SAM). Performance Reports will document the status of the Project's performance measures, including water and energy savings, water management improvements, and carbon emission reductions.	Progress reports as required by GA.

Table 1 - Required Grant Activities

Working in consultation with the District’s Project Manager, Diameter will lead the management of the AMI, installation and water meter contractor(s). Directing the contractor also includes task management, which requires specific instructions to the installation vendor so the meter installation can be completed successfully.

Phase 2 – Procurement: As part of the agreement with Diameter Services, it will hire a meter installation subcontractor to change out the residential and commercial meters within the service area and will work with TVWD’s Project Manager, Customer Service, and Information Technology departments to develop and test software system integrations and train utility end users prior to activation. TVWD will initiate a public outreach and education effort to notify customers of installation activities and a new web-based data portal that features tools to help customers better manage their own water usage.

It’s important to note that TVWD has already decided that procurement of AMI meters should provide either complimentary customer facing consumption related functionality with the District’s current customer web-based portal, or alternatively, TVWD could procure a new fully functional customer-friendly portal. The added functionality relates to billing information, internet payment, conservation algorithms that provide customer with water consumption behavior tips, District marketing and program sign up capabilities.

Phase 3 – Startup: At this point, the procurement of equipment and supplies is completed, and the contractor/vendors have been selected. The AMI Project now transitions to Program Management. It is expected that the installation vendor will have a quality inspection program and provide feedback to the project management team on performance. Diameter will work with the AMI vendor and the water meter vendor to develop a User Acceptance Test Plan (UAT) that documents and provides the framework of all the different tests that will be conducted before installation begins. Two UATs will be conducted. The Initial User Acceptance Test (IUAT) will be conducted at the end of the start-up phase, prior to the proof-of-concept (POC) phase. The Use

Cases will test the integration with TVWD’s customer service information system and the setup of water meter multipliers to make sure water bills remain accurate. The Final User Acceptance Test (FUAT) will be conducted at the end of the POC, prior to the full implementation starting. The Use Cases will test all aspects of the system ensuring the system is delivering all identified AMI business drivers and meeting the goals of the project, as outlined in Phase 1.

Diameter will support the integration of the customer portal with the District’s billing system and any existing single sign-on authentication process the already exists. During Phase 3, the training agendas are developed, District resources for training are identified, and training expectations are communicated to all project team members. Diameter’s communication master plan developed in the design phase will be updated to reflect the details of the selected installation contractor and finalized to map out the start-up, POC, installation and deployment, which includes another round of facilitated discussions between stakeholders.

Phase 4 – Proof-of-Concept/Installation and Deployment: Following the successful execution of the startup phase, the project transitions into the POC and installation/deployment period (full implementation). The POC provides a critical milestone that confirms the proposed solution as implemented is going to meet the TVWD’s requirements and deliver on identified AMI business drivers. This includes at a minimum: 1) Meters are functioning, 2) That meter readers and data collectors are collecting information, and 3) That the data collectors are then properly transmitting the information to the customer billing portal and the customer interface portal. The IUAT will confirm the water billing process will work and therefore the installation contractor can start the POC. The FUAT will confirm the proposed solution is able to deliver the AMI business drivers ranked as Important or Critical.

Activities related to the network deployment will begin in the startup phase and carry into both the POC and installation/deployment phases. Diameter will review the AMI vendor’s propagation study and work with the vendor and TVWD’s facility personnel to establish the protocols for review and site approvals where data collection equipment will be installed.

Phase 5 – Close Out: Effective management of the close out activities is an important phase in the overall project as it ensures proper closure and hand off as the system transitions from the implementation to the on-going ownership, operation, and maintenance by the District. Diameter will ensure receipt and review of AMI system manuals and ensure TVWD staff have the training required by work function.

D. Evaluation Criteria - Quantifiable Water Savings

Up to 28 points may be awarded for this criterion. This criterion prioritizes projects that will conserve water and improve water use efficiency, supporting the goals of E.O. 14008. Points will be allocated based on the quantifiable water savings expected as a result of the project. Points will be allocated to give greater consideration to projects that are expected to result in more significant water savings.

In evaluating quantifiable water savings, it is important to understand the District’s overall system. TVWD’s distribution system is made up of 23 covered reservoirs with a combined

capacity of 67.35 million gallons. Some reservoirs are below ground with park and recreation tennis courts, ball and soccer fields built on top. The major pumping stations and the reservoirs have full telemetry control systems. TVWD maintains 798 miles of pipe ranging in size from 2-inch to 60-inch diameters, with a gravity line capacity at 42.3 MGD, and 12 pumping stations that transmit water from a gravity flow water main to higher elevations within TVWD. Another 10 MGD is available from the Joint Water Commission (JWC), an amount well above the average and peak daily flow. There is an emergency standby pumping capacity of 20 MGD that can be used to back up the gravity flow main.

Additionally, TVWD is expanding its aquifer storage and recovery program, and as a last resort, is prepared to use groundwater rights in emergency situations. The distribution system includes a total of 60,497 meters that measure between 5/8-inch to 10 inches in size with approximately 55% of the existing meters being more than 15 years old. TVWD has implemented Automated Meter Reading (AMR, aka “mobile” or “drive-by” reading) on approximately 33% of its existing meters using the Badger Read Center CE drive-by meter read system, which will need to be upgraded with new technology to be AMI compatible.

It is also important to understand the District’s baseline use of water for comparison. For the 2021 fiscal year, TVWD’s total usage was 25,318 acres-feet (AF), with an average daily demand, net changes to the TVWD’s reservoir and ASR storage, of 22.61 MGD. For this same period TVWD’s population was 217,700, and the average usage per person per day was 104 gallons. TVWD has approximately 60,497 service connections.

1. Estimated Water Savings

State the estimated amount of water to be conserved (acre-feet per year) as a direct result of this project.

The TVWD AMI Project is expected to result in a large amount of water, energy and greenhouse gas savings. TVWD estimates implementation of its AMI Project will reduce the apparent annual water use by 873 acre-feet (AF) per year. This water savings will also result in savings of approximately 530,443 kilowatts per hour (kWh) per year on the potable and waste water systems, 5,425 gallons of gasoline and 102 metric tons of carbon dioxide (Co2) equivalent emissions.

2. Describe Current Losses

Please explain where the water that will be conserved is currently going and how it is being used.

Where are current losses going? Unmetered water losses are likely seeping back into the ground or making their way into a storm drain, sewer drain or the aquifer, with the majority of metered losses likely returning to the sewer and treatment system. Based on historic production analysis, TVWD estimates that approximately 70% of metered water is used “indoors” and therefore is returned to the sewer system. Accordingly, 30% of metered water is used “outdoors” and for industrial cooling processes. Therefore, it does not return to the sewer and treatment system.

How are current losses being used? A high portion of the water identified as “apparent losses” are currently going to *users of the water system*. Meaning, apparent losses of registered usage are due to errors in meter accuracy or under-registration. TVWD performs an annual water audit that incorporates the following data: total demand (volume of water purchased that enters the distribution system), total volume of water consumed by customers through metered service connections, wheeled water (i.e., “Portland Water Bureau overlap;” which is water moved through TVWD’s water distribution system for PWB customers), and estimated non-revenue authorized uses (i.e., unmetered water uses, such as hydrant use or pipeline flushing).

Audit Year	System Water Loss
2018	4.72%
2019	4.37%
2020	3.27%
3-yr. Average	4.12%

Table 2 - TVWD Water Audit Average Losses

Water audits in 2007 and 2008 revealed that the calculated water loss for the entire service area was 3% and 4.5%, respectively. However, from 2009 through 2013, water loss ranged from -2.0% to -15.1%, which TVWD attributes to the malfunctioning main Wolf Creek supply meter on the Washington County Supply Line (WCSL) and to the Florence Lane meter, which is the primary meter for the Metzger service area. The Wolf Creek supply meter and the Florence Lane meter are owned by the PWB. Consequently, TVWD is only able to investigate meter errors and then recommend PWB complete any necessary maintenance. PWB has made efforts to recalibrate the Wolf Creek intertie meter with limited success, with TVWD’s assistance. Accordingly, based on water audits prior to the meter errors, TVWD estimates that its unaccounted-for water was less than 10% over the past five years.

The water meters which record flows entering the system from the PWB source were replaced in recent years leading to better accuracy when evaluating water loss. It is of note that these are estimations with several variables including water use for fires, pipeline flushing, and construction. Beginning in 2018, water loss values were also spatially analyzed using utility billing data in combination with Geographical Information System (GIS) data to obtain a more accurate depiction of water loss within the Metzger system. TVWD audits water loss on an annual basis.

Year	Wolf Creek	Metzger	System Total ¹
2003	5.6%	7.5%	5.3%
2004	8.4%	19.2%	9.0%
2005	5.5%	-3.2%	4.2%
2006	3.7%	16.6%	4.5%
2007	1.9%	16.1%	3.0%
2008	4.0%	14.7%	4.5%
2009	-3.4%	15.1%	-2.0%
2010	-4.7%	18.9%	-2.5%
2011	-6.6%	17.7%	-4.2%
2012	-7.7%	17.0%	-5.4%
2013	-15.7%	-3.2%	-15.1%
2014	-2.3%	16.3%	-3.2%
2015	Unavailable	Unavailable	7.0%
2016	0.9%	13.3%	2.2%
2017	1.0%	12.2%	2.4%
2018 ²	4.75%	4.46%	4.72%

Notes:
(1) System total is the scaled overall loss within the system including both Wolf Creek and Metzger.
(2) 2018 values obtained were for the fiscal year ending on June 30, 2018.

Table 3 - TVWD Historical Water Losses (2003-2018)

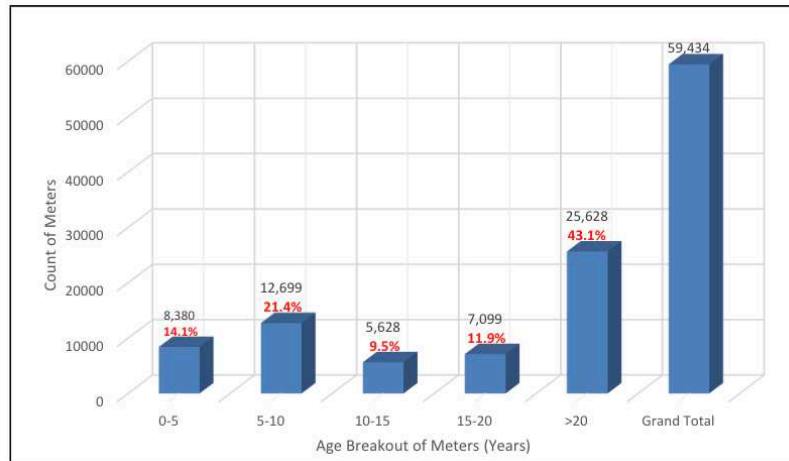
Given the recent replacement of the PWB supply meters and implementation of GIS analysis to improve audit results, estimated water savings calculations for Improved Non-SFR Customer-Side and Distribution Leak Identification use the 2018-2020, 3-year average system water loss of **4.12%** as the multiplier for “% Leaks” (See Table 3).

Are there any known uses or benefits to the losses? There are no known benefits or uses to the apparent losses.

3. Documentation of Estimated Water Savings

Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations.

Because aging meters tend to under-register with time, recovery of apparent losses is an essential consideration to improve overall distribution system efficiency and equity across the entire customer base. While increased registration (and associated revenues) may persist for many years, any across the board change in rates based on expected consumption (“test year consumption”) that includes the increased registration, essentially adjusts it away.¹ TVWD’s AMI Project will be able to reduce some of the estimated 972.9 AF in apparent water losses, but the project is expected to show even more savings from the metered water demand mostly from improved leak detection and repair as this phase of the AMI Project is expected to install 26,074 new meters which represents 43.1% of the entire meter population of 60,497.



Approximately 55% of the meters within the system are greater than 15 years old, with over 43% being older than 20 years (See Figure-6, above). Estimated water savings calculations are based on total number of meters as of October 19, 2021. Approximately 86% of the meters within the system are Badger Recordall nutating disc-type meters. Approximately 34% of the meters within the system are being read using the Badger Read Center AMR drive-by system, which require trained technicians driving service vehicles to individually read these meters, adding up to significant internal cost and avoidable Co2 emissions. These meters are equipped with a Badger Orion CE endpoint that will no longer be compatible in the future using an AMI system. Over 96% of the meters are 5/8” to 1-inch small meters.

¹ Schlenger, Don; Advanced Metering Infrastructure, 2019.

4. Municipal Metering

Applicant must provide a detailed description of the method used to estimate savings, including references to documented savings from similar previously implemented projects.

How has the estimated average annual water savings that will result from the project been determined? TVWD’s estimated average annual water savings will be measured by improved customer and distribution leak identification and through improved accuracy of the meters. Water savings are achieved by implementing more rapid identification and correction of water leaks. Currently, residential meters are read every two (2) months, allowing leaks to go undetected and water to be wasted for 60 days or more before being noticed. The new AMI meters will provide readings every hour, if not in shorter intervals. This will enable the AMI analytics software and TVWD staff to identify leaks in real-time, such as higher than normal minimum night flow (MNF) values. The software will flag potential leaks and the volume of the potential water loss and staff will work with the customer to inform them of the amount of potential water losses. Educating customers on their actual water usage will also reduce potable water usage. In addition to improved meter data accuracy and frequency of data collection, AMI enabled pressure monitoring functionality will also supplement TVWD’s existing distribution system leak identification and repair process.

Estimated average annual water savings for Improved Single-Family Residential (SFR) and Non-Single-Family Residential (Non-SFR) Customer-Side and Distribution Leak Identification resulting from the project have been calculated using the following data sets and assumptions:

- **Consumption** values for estimated savings are averaged totals for fiscal years 2018-2020.
- **SFR “% of Leaks”** is based on findings presented in the *Residential End Uses of Water, Version 2: Executive Report; 2016* Water Research Foundation;² which calculates that leaks account for an average of 17.8 gallons per household per day. That leakage rate equates to **9.8%** of TVWD’s 3-year average SFR metered volume for 2018-2020.
- **% Of Meters Installed** is 100% as the entire meter population will be converted to full AMI functionality regardless of whether the meters are replaced or retrofitted.
- **Non-SFR Customer-Side and Distribution Leak Identification** uses the 2018-2020, 3-year average system water loss of **4.12%** presented in Table-3 as the multiplier for **“% Leaks”**.
- **35% Effectiveness** is a conservative multiplier to account for leakage that is difficult to isolate or repair and for customers that will not adopt water conservation behaviors.

Improved Single Family Residential (SFR) Customer-Side and Distribution Leak Identification:

$$\begin{aligned} \text{Annual Water Savings} &= \text{SFR Consumption} \times \% \text{ of Leaks} \times \% \text{ of Meters Installed} \times \% \text{ Effectiveness} \\ \text{Annual Water Savings} &= 11,442 \text{ AF} \times 9.8\% \times 100\% \times 35\% = \quad \quad \quad \mathbf{392.46 \text{ AFY}} \end{aligned}$$

Improved Non-SFR Customer-Side and Distribution Leak Identification:

$$\begin{aligned} \text{Annual Water Savings} &= \text{Non-SFR Consump.} \times \% \text{ of Leaks} \times \% \text{ of Meters Installed} \times \% \text{ Effectiveness} \\ \text{Annual Water Savings} &= 12,173 \text{ AF} \times 4.12\% \times 100\% \times 35\% = \quad \quad \quad \mathbf{175.53 \text{ AFY}} \end{aligned}$$

² Water Research Foundation; Residential End Uses of Water, Version 2: Executive Report, 2016.

TVWD also relied on the Water Research Foundation (WRF) study on small meters that included testing over 500-disc type meters obtained from a variety of water utilities. The resulting test results are presented in Figure-7 below and include regression equations for meter accuracy degradation based on both age and consumption through the meters. In the absence of a comprehensive data set based on TVWD specific meters, preliminary estimates for replacing meters were developed based on the regression equations developed in the WRF study. It is evident by inspection of Figure-7 that low flow accuracy falls off considerably with throughput over time. The results presented in Figure-7 indicate that there is significant opportunity for reducing apparent losses through a combination of replacing aging meters, more appropriate meter typing, and improving the meter settings (i.e., re-designing existing manifold installations when warranted by testing).

By relying on the WRF meter performance data, the estimated loss of accuracy based on age and throughput for each individual meter can be calculated. Using regression coefficients from the WRF data along with TVWD water rates for each account, an estimate of potential increases in meter accuracy and revenue was created. Table-4, found on the next page, presents an analysis of age-based potential accuracy and revenue increase for replacing 5/8” meters (89% of TVWD’s meter population) that are 15-years old and older.

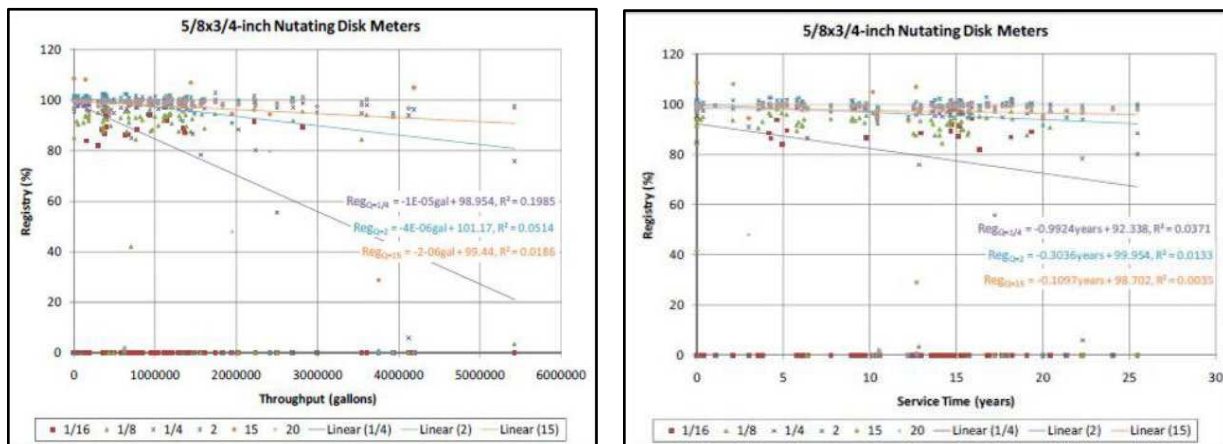


Figure 7 - Water Research Foundation Small Meter Accuracy Degradation

Table-4 presents an average accuracy percentage increase of 5.96% for replacing 5/8” meters greater than 15 years old. *It should be noted that TVWD has assumed a conservative meter accuracy improvement or “% Inaccuracy” of 3% for the purpose of water savings estimates as the District does not presume to take credit for all apparent, non-revenue water losses.* TVWD will replace 43.1% of the total meter population.

Meter size	Meter Age Range	Quantity of Meters	Percent of Total Meters	Avg Monthly Throughput (CCF)	Avg Age	Avg Yearly Throughput (CCF)	Avg. Accuracy Percent Inc*	Revenue Increase
5/8"	15-20	6,561	12.47%	14.65	17.20	175.80	4.22%	\$263,926
5/8"	>20	24,272	46.12%	15.04	28.68	180.48	7.71%	\$1,829,749
Total		52624	58.59%				5.96%	\$2,093,675

Table 4 - WFR Study Average Accuracy Percent Increases

Improved Accuracy of Meters

Annual Water Savings = Consumption x % Inaccuracy x % of Meters Installed Annual

$$\text{Water Savings} = 23,615 \text{ AF} \times 3.0\% \times 43.1\% = 305.34 \text{ AFY}$$

Total Amount of Water Saved/Conserved (AFY):

Improved SFR Customer-Side and Dist. Leak Identification: 392.46 AFY

Improved Non-SFR Customer-Side and Dist. Leak Identification: 175.53 AFY

Total Amount Saved: 567.99 AFY

Improved Accuracy of Meters: 305.34 AFY

TOTAL AMOUNT SAVED: 873.33 AFY

How have current system losses and/or the potential for reductions in water use by individual users been determined? TVWD's **2018 Water Master Plan Update (WMPU)** describes system losses to determine water demand and development within TVWD. Water usage in the 10-year period from 2003 to 2018 was analyzed using yearly totals of water delivered to TVWD, water billed to customers and active services. Current distribution system losses were determined by TVWD comparing the total water purchased and produced to the water billed to customers and calculated an average of 4.12% water loss over the past three (3) years, resulting in approximately 973 AFY in water losses. Some potential reasons for water loss include water used in operation and maintenance, pipe leaks, reservoir leaks, fire department use, meter error and unmetered water usage.

What studies have been completed in the region or in the applicant's service area that are relevant to water use patterns and the potential for reducing such use? As noted above, the **Focused Meter Reading Business Case Analysis (BCA)** provided three AWWA water audits that analyzed the water system inputs and outputs, including the amount of imported water, changes in storage, and values for various authorized consumption quantities. This audit program was developed by the AWWA Water Loss Committee and includes related information developed in cooperation with the International Water Authority (IWA).

The AWWA Free Water Audit Software has become the industry standard for conducting an annual water audit, including water balance and key performance indicators for utilities across North America. In preparing the updated AWWA water audits, the following adjustments were made to conform more closely with industry standard practices:

- Meter accuracy was adjusted from 1% under-registration (Scenario 1) to 5% in a sensitivity analysis (Scenario 2) to evaluate the impact to corresponding real and apparent losses.

- Various assumptions categorize activities such as hydrant flushing and other losses by making corresponding adjustments to the “Authorized Consumption” input parameters
- Default values were used for some items (i.e., data handling errors, unauthorized consumption).
- Changes in storage were ignored considering that storage levels fluctuate throughout the meter reading period in question and the overall impact is relatively negligible.
- Water discharged to the aquifer was considered exported water.
- The change in Aquifer Storage and Recovery storage was not included in the audit as it is outside the purview of the distribution system water losses under consideration.
- The average customer meter inaccuracy was set at 2% for Scenario 1 and 4% for Scenario 2.

One of the most revealing indicators from the water audit is the \$1.47 to \$2.70 million estimated value of apparent losses using the assumption of an overall customer meter accuracy loss of 2% and 4% respectively, while relying on the lowest tier for retail water rates (\$5.42/CCF). It is apparent that this value increases significantly as estimates for overall master meter and customer meter accuracy losses increase. Given the overall age of the TVWD meter population, the analysis indicates that an *average customer meter error approaching 4% is reasonable*. This in turn would tend to emphasize the economic justification for meter replacements. The values assumed for customer meter accuracy, in turn, determine the relative amount of real losses and corresponding infrastructure leakage index (ILI).

The ILI is calculated based on the ratio of estimated Unavoidable Annual Real Losses (UARL) to the Current Annual Real Losses (CARL): $ILI = UARL/CARL$

The UARL is a theoretical value that relies on a combination of miles of mains, system pressure and number of service connections. An ILI less than 1.0 is rare and is often an indicator that the real losses are being underestimated. Scenario 2 above assumes a master meter error of 5% and an average customer meter error of 4%. The result is an ILI of approximately 1.0. When considering the relatively low score for the system input volume data grade, it is likely that the total water supplied to the system is underestimated. It is also likely that the overall accuracy and corresponding value of apparent losses is considerably higher based on the age of many of the TVWD meters. Given the relatively high cost of water at TVWD, an emphasis should be placed on improving meter accuracy to recover appropriate revenues from each customer and help ensure an equitable distribution of costs among customers.

Does this project involve the installation of distribution system meters? Not applicable. No AMI distribution main meters will be installed.

What types (manufacturer and model) of devices will be installed and what quantity of each? AMI devices have been researched, but not purchased at this time. After field inspections provide reliable work type assumptions for TVWD’s financial model and procurement documents, and prior to equipment for the AMI Project is chosen, Diameter will conduct a series of workshops with TVWD AMI Project members to properly analyze the best choice for equipment and materials for the project and engage in needs assessments for proper AMI implementation.

TVWD is presently finalizing a contract with Diameter Services Inc. for project representation and facilitation, specifically for AMI system vendor selection and implementation project management services.

How will actual water savings be verified upon completion of the project? Actual water savings will be verified upon completion of the AMI Project using utility data management software to conduct a water balance of the completed project. Additionally, all usage data for all meters equipped with AMI will be compared to historical values to determine water savings due to increased water use efficiency and improved meter accuracy. Immediately upon startup, the software analytics will begin to identify issues including leak, backflow, zero consumption and high/low alarms. After a short baseline period, the software analytics will identify other issues including abnormal usage patterns and higher than normal minimum night flow (MNF) values. TVWD will maintain a log of these issues as they arise and the resolution for each event.

All leaks and water loss identified through this process were quantified, resulting in TVWD’s 2020, three-year average leakage percentage at 4.12%. TVWD plans to begin installing meters in 2023. The first full year of data for some new meters will be 2024. TVWD will compare pre- and post-project years to document actual water savings. The detailed methodology for verifying actual water savings is outlined in the **Performance Measures** section of this application. Based on the preceding estimate of water to be saved, TVWD estimates in the years following completion unaccounted for losses will be maintained at less than 4.12%. Therefore, the performance measure will be to document the water savings of reducing unaccounted for water at 4.12% or lower following project completion.

Table 5 - TVWD Water Loss Value in Dollars

Key Performance Indicator	California (325 Utilities) Median Value	TVWD FY 2019 System Value	
		Scenario 1 (Note 1)	Scenario 2 (Note 2)
Water Losses per Service Connection per Day (gal)	36.5	18.79	34.67
Apparent Losses per Service Connection per Day (gal)	8.3	9.11	16.74
Real Losses per Service Connection per Day (gal)	26.6	9.68	17.93
Infrastructure Leakage Index (ILI)	1.5	0.56	1.03
Estimated Annual Value of Real Losses	N/A	\$337,786	\$625,395
Estimated Annual Value of Apparent Losses	N/A	\$1,472,520	\$2,704,414

Notes:

- 1) Based on TVWD average master meter error of 1% and average customer meter error of 2%
- 2) Based on TVWD average master meter error of 5% and average customer meter error of 4%

E. Sub-Criterion No. B.2.: Increasing Energy Efficiency in Water Mgmt. (10 pts)

Up to 10 points may be awarded for projects that address energy demands and reduce greenhouse gas emissions by retrofitting equipment to increase energy efficiency and/or through water conservation improvements that result in reduced pumping or diversions.

Describe any energy efficiencies that are expected to result from implementation of the water conservation or water efficiency project (e.g., reduced pumping). The AMI Project will reduce real system losses and increase water use efficiency and conservation through the availability of near real-time data on water usage and daily water needs. The AMI Project will expand upon TVWD's efforts to promote water use efficiency by accomplishing the following: 1) More rapid identification and correction of water leaks (currently meters are read every two months allowing leaks to go undetected and water to be wasted for two months before being noticed), 2) More accurate meter readings compared to aging meters (55% of TVWD's meters are greater than 15 years of age and are likely erroneously registering lower water use than actual water use), and 3) Reduced potable water usage based on customer education through the AMI Project's data on water usage.

The upgrade to a fully automated AMI system also leads to wide-ranging efficiency improvements resulting in water savings of 873 AFY; 530,443 kWh per year in energy savings; 5425 gallons of gasoline per year in meter reading and maintenance vehicle consumption; and carbon emissions reductions on the order of 102 metric tons of Co₂ equivalent per year. Electrical energy savings will be driven by reductions in pumping requirements for water and wastewater conveyance and water treatment.

What is the estimated amount in kilowatt hours per year? TVWD's 2015 WMPU evaluated the relationship between water use and energy use based on energy bills and water billing data from 2005-2015. For that period the average annual energy use, district-wide was approximately 3,300 mega-watt hours. The average annual system demand for 2018-2020 was 23,614.56 AF which results in an average energy requirement of 139.74 kWh per AF per year. Based on the project's estimated savings of 873 AF per year, the resulting energy savings for potable water distribution is 122,042 kWh per year.

Clean Water Services (CWS) is a water resources management utility serving more than 600,000 residents and businesses in urban Washington County, Oregon, which includes customers of TVWD. CWS staff has informed TVWD that the annual rate of energy use directly related to the volume of water treated is 2,050 kWh/MG. Therefore, based on the estimate that approximately 70% unaccounted for water is returned to the sewer/treatment system, water use savings of 199 MGY would result in energy use reductions of 408,401 kWh/year for wastewater conveyance and treatment. The combined total estimated energy savings from drinking water and wastewater conveyance pumping and water treatment reduction is 530,443 kWh/yr.

How will the energy efficiency improvement combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions? A reduction in consumption by 873.33 AFY due to increased water use efficiency and decreased water losses could result in energy savings of approximately 530,443 kWh per year on the potable water and wastewater systems, and 102 metric tons per year of greenhouse gas emissions reductions.

How would the proposed project impact the current pumping requirement and energy usage? Pumping makes up the vast majority of energy costs for TVWD. Any water savings achieved will have a direct correlation to reduced pumping and associated energy usage as detailed in the previous sections.

Does the energy savings estimate originate from the point of diversion or is the estimate based upon an alternate site of origin? Energy savings estimates are based solely on energy requirements within the TVWD distribution system and treatment system for Clean Water Services. Therefore, actual energy savings almost certainly exceed estimates provided as they are not inclusive of conveyance energy used by Portland Water Bureau and the Joint Water Commission.

Does the calculation include any energy required to treat the water, if applicable? Yes. The calculations do include energy required to treat water. Energy required for water treatment is embedded in the figure provided by Clean Water Services as discussed previously in section heading, **“What is the estimated amount in kilowatt hours per year?”**

Will the project result in reduced vehicle miles driven, in turn reducing greenhouse gas emissions? Yes. Due to the reduced need to manually check commercial meters monthly and residential meters every other month, 5,425 gallons of gasoline per year in meter reading and maintenance vehicle consumption is estimated to be eliminated with completion of the AMI Project. The Environmental Protection Agency’s Greenhouse Gas Equivalency Calculator estimates the in-turn greenhouse gas emission reduction at 48.2 metric tons of Carbon Dioxide equivalent. Added to the energy associated greenhouse gas emissions reductions, total greenhouse gas emissions reductions for the project are estimated at 102 metric tons of Carbon Dioxide equivalent.

Will the project result in any renewable energy components that will result in minimal energy savings/production (e.g., installing small-scale solar as part of a SCADA system)? Depending on the vendor selected to provide the communication network for the AMI system, there is potential to incorporate additional small-scale solar equipment that would result in additional renewable energy components and savings to the project. TVWD’s water system is monitored 24-hours a day, seven days a week. In addition to watching water flows and pressure, the state-of-the-art Supervisory Control and Data Acquisition (SCADA) system monitors several water quality parameters and security alarms. If the system identifies anything out of the ordinary, alarms alert an operator to the possible problem and staff are dispatched as needed.

F. Evaluation Criterion C - Sustainability Benefits: (20 points)

Up to 20 points may be awarded under this criterion. This criterion prioritizes projects that address a specific water and/or energy sustainability concern(s), including enhancing drought resilience, addressing the current and future impacts of climate change, and resolving water related conflicts in the region. In addition, this criterion is focused on the benefits associated with the project, including benefits to tribes, ecosystem benefits, and other benefits to water and/or energy supply sustainability.

1. Enhancing Drought Resiliency

Does the project improve ecological resiliency to climate change? Yes. First, the AMI Project will modernize TVWD's water management facilities and equipment to increase energy efficiency by installing AMI technology, reducing fuel consumption and frequency in maintenance of vehicles previously used to collect meter readings. Second, the AMI Project will quantifiably reduce energy consumption through significant improvements in water use efficiency and conservation that would reduce pumping and importation of water from Portland Water Bureau (PWB), where water originates from the Bull Run Watershed and the Columbia South Shore Wellfield (CSSW). The Bull Run Watershed is located in the Cascade Mountain Range east of Portland and is an unfiltered surface water supply. The finished water is delivered to the PWB's 50 MG Powell Butte Reservoir. Any reduction in water loss and overall consumption would have an impact on increasing energy efficiency of overall system operations.

The energy required for conveyance and treatment within TVWD's service area is estimated at 2479 kWh/MG based on energy usage and water production billing data. A reduction in consumption by 873.33 AFY due to the AMI Project's increased water use efficiency and decreased water losses could result in savings of approximately 530,443 kWh per year on the potable water system and wastewater treatment system. Also, installing AMI within the TVWD service area is estimated to eliminate the consumption of 5,425 gallons of gasoline annually and provide a reduction in greenhouse gas emissions of 102 metric tons of Carbon Dioxide Equivalent.

TVWD relies primarily on electricity from Portland General Electric Company (PGE), but as a steward of our environmental resources, the District invested in two solar arrays at the District's main office in Beaverton, Oregon. TVWD has also installed a "Micro-Hydro" power generator at the Center Street Pump Station that generates energy from the flow of water through the pipes.

Will water remain in the system for longer periods of time? If so, provide details on current/future durations and any expected resulting benefits (e.g., maintaining water temperatures or water levels). Savings of 873.33 AFY represent 13 days of Average Day Demand for the fiscal year 2021. This augmentation of supply will make TVWD more resilient to water shortage events and also be available for other beneficial uses such as sustaining in-stream flows to support native fish species habitat and recreational purposes. Pertaining to the Tualatin River specifically, Clean Water Services staff has indicated that a water use reduction on the order of 873 AFY has the potential to reduce thermal load contributions to the river by 22.4 kcal/day. This supports Clean Water Services' efforts to mitigate thermal load to the river when treated effluent is returned to the stream.

Will the project benefit a protected species? If so, what is the relationship of the species to the water supply? The AMI Project will have tangentially related benefits to protected species. OAR 690-086-140(5) requires municipal water suppliers to identify the following for each of its water sources: 1) any listing of the source as water quality limited (and the water quality parameters for which the source was listed); 2) any streamflow-dependent species listed by a state or federal agency as sensitive threatened or endangered that are present in the source; and 3) any designation of the source as being in a critical groundwater area (See **Environmental Policy** section for a more complete discussion). Located within the Tualatin River watershed is the Tualatin River National Wildlife Refuge. From the U.S. Fish and Wildlife Services:

Our refuge conservation management often includes specific focus on endangered or threatened species that are found on our refuge, and restoration of key habitat types. Through ongoing restoration projects, public outreach and education, Tualatin River National Wildlife Refuge is able to further conservation efforts, including the protection and restoration for specific key federally and state recognized species. The conservation actions for these species involve habitat restoration, and annual surveys to monitor population numbers.

Any ecosystem benefits as a direct result of the project? In addition to benefits to the Tualatin River watershed, the Upper Willamette River and the Lower Columbia River are watersheds containing three threatened native fish species - Winter Steelhead, Fall Chinook, and Spring Chinook. This project will increase the amount of water available for beneficial salmon habitat by reducing usage and loss. It is widely recognized that a key priority of water resource management is the development of water supply conservation techniques to benefit the instream flow needs of fish while balancing the community development needs of people. TVWD's AMI Project will have no negative impacts to endangered, threatened, candidate species or critical habitats. Conversely, the AMI Project would only have positive impacts to species and habitats.

Will the project result in more efficient management of the water supply? Yes. TVWD dedicates substantial resources to maintaining its comprehensive leak detection and repair program, which can only be enhanced by the AMI Project. TVWD already administers leak detection surveys and will provide customers with water savings information, along with account review. The new automated system allows TVWD and its customers to react in real time, saving 873 acre-feet per year and undue property damage, as discussed in section **Current Losses**, above. The AMI data could be compared against past leak detection surveys to create a more accurate accounting of predicted future water loss. In addition, TVWD will utilize a web-based AMI Data Portal to educate customers about leak detection and repair and notify customers when leak indicators are present in meter data and rebates available to upgrade fixtures.

2. Addressing Specific Sustainability or Water Concerns

What is the specific issue in the area that is impacting water sustainability, such as shortages due to drought and/or climate change, increased demand, or reduced deliveries? In recent

years, wildfires and high-intensity rainfall events have presented the greatest challenges to water supply sustainability specifically related to water quality and wholesale providers ability to deliver adequate supply due to reduced treatment capacity driven by high raw water turbidity. In the past 10 years, TVWD has not implemented a water curtailment notice beyond Stage 1: Summer Advisory, which it routinely implements every year during the summer (peak demand) season. Nonetheless, the following is a description of earlier curtailment events that were Stage 2 or higher from drought, which has been the principal cause of water shortages and resulting curtailment for the region in recent years. These events prompted TVWD to develop an effective conservation program and to diversify its sources of supply.

1992 Drought Affecting the City of Portland: During 1992, PWB and its wholesale customers, including TVWD, experienced severe water supply shortages for five reasons: (1) the Bull Run Watershed had experienced the lowest spring rainfall and stream flows since the year 1899; (2) demand for water during May and June of that year was unusually high due to record-breaking temperatures; (3) reservoir levels were low, as is typical in the late summer months; (4) the PWB backup source, the Columbia South Shore Wellfield, at the time was unavailable because of concern that a contamination plume could move into the well field aquifer if the wells were used; and (5) voluntary requests to reduce water use were not effective. (Similar shortages also occurred in 1952, 1987 and 1991.) In response to the severe water supply shortage, the PWB implemented mandatory water restrictions during the peak season. TVWD, as a wholesale customer, was also subject to the curtailment measures declared by the PWB. In response, TVWD adopted an ordinance in July 1992, declaring a water source emergency and imposing mandatory water conservation on its customers. Following a warning, penalties for ordinance violations ranged from \$100 for the first violation to \$500 for repeat violations. TVWD also purchased water from the JWC to partially offset the reduced supply from the PWB and lessen the severity of water curtailment measures. TVWD also activated its three emergency wells and obtained additional water supply from the City of Hillsboro via an emergency connection with that city. In the aftermath, TVWD formed a conservation committee and designed and installed a water-efficient demonstration garden at its headquarters to promote the efficient use of water through innovative landscape design, construction, and maintenance principles. Furthermore, it held landscaping workshops for customers and participated in the conservation activities of the Columbia-Willamette Water Conservation Coalition, which later merged with the Regional Water Providers Consortium. In addition, TVWD purchased an ownership interest in the JWC, which provides access to additional water supply from multiple sources.

2001 Drought Affecting the JWC: The summer of 2001 was not particularly hot, but Hagg Lake filled to only 51%. As a result, all municipalities using supplies from the JWC were asked to curtail use to leave supplies for more senior irrigation water rights, as well as to leave adequate water supplies for instream use. Evaporation in the lake during the summer further reduced municipal supplies. TVWD was able to meet its customers' demands by purchasing additional water from the City of Portland, thereby avoiding the need to ask customers to curtail water usage. Although TVWD ultimately did not need to curtail water use, this event has been mentioned because it demonstrates the ability of water providers in the region to work cooperatively to avoid curtailment.

What are the specific issues in the area that is impacting energy sustainability, such as reliance on fossil fuels, pollution, or interruptions in service? Long-term interruptions in power supplies, breaks in major transmission lines or damage to reservoirs as the result of earthquakes or other causes are also legitimate concerns. The Pacific Northwest is known as a seismically active area with a still rumbling Mt. St. Helen's volcano only 70 miles northeast in Washington State. The area east of Portland, Oregon has been plagued with wildfires for several seasons, but suffered unprecedented damage during the 2017 Eagle Creek Fire that claimed over 50,000 acres. Near the town of Cascade Locks, Oregon the fire burned through an area where the bulk of BPA powerlines stem from the Bonneville Dam on the Columbia River. The Bonneville Dam supplies power to the greater Portland Metropolitan Area and communities throughout the area were without power for several weeks.

In addition to a growing threat of drought due to climate change, numerous other events or conditions in the JWC's and PWB's sources of supply could cause TVWD to experience supply deficiencies. For example, interruptions in service are TVWD's second biggest concern to drought. Water quality problems in the PWB's Bull Run Watershed could reduce supply available to TVWD. Other conditions that could cause supply deficiencies for TVWD include requirements of the Endangered Species Act that reduce access to Bull Run water supplies, or contamination of the PWB or JWC's water supply sources.

How does the project directly address the concern(s) stated above? For example, if experiencing shortages due to drought or climate change, how will the project directly address and confront the shortages? TVWD has adopted a four-stage curtailment plan to be invoked in the event of a water supply shortage. These stages are designed to be initiated and implemented in progressive steps. The plan includes both voluntary and mandatory rationing, depending upon the cause, severity and anticipated duration of the shortage. AMI will significantly improve TVWD's ability to communicate to customers regarding voluntary or mandatory measures activated in response to various curtailment scenarios. AMI will also provide effective tools that will allow the District to effectively monitor and enforce curtailment measures.

Where will conserved water as a result of the project go and how will it be used? This includes whether the conserved water will be used to offset groundwater pumping, used to reduce diversions, used to address shortages that impact diversions or reduce deliveries, made available for transfer, left in the river system, or used to meet another intended use. Water conserved because of TVWD's AMI project will decrease demand and therefore will require reduced draws from TVWD's primary water sources, allowing water to remain available in the distribution system, surface water storage reservoirs, and reducing the need for groundwater pumping from wells that augment supplies during peak-use summer months. This results in TVWD's Water Management and Conservation Plan enhancing the regional ecosystem support by providing resiliency to the Portland Metro Area in times of drought, water shortage and emergency response.

What mechanism will be used, if necessary, to put the conserved water to the intended use? No specific mechanism is necessary to put the conserved water to the intended use. Conserved

water will remain in the surface water and distribution systems and remain available for environmental benefits or use by partners agencies of the Joint Water Commission and the Regional Water Providers Consortium.

What quantity of conserved water will be used for the intended purposes? 100% of the water conserved will contribute to the intended purposes discussed above.

3. Other Project Benefits

How does the project combat climate change? The smart meters and the system's accompanying network provide several important functions that are currently not possible or have to be performed manually. For example, trained technicians currently must manually capture water use on over half of the District's 60,497 water meters, which are read every other month. Accordingly, leaks or tampering may go undetected, and water may be wasted for up to 60 days or longer before being noticed. With the ability to collect, store and transmit water-usage hourly, possibly in as small as 15-minute windows of time, AMI can identify and isolate leaks remotely and nearly automatically, saving both water and our customers' money. The leak detection capabilities afforded by a fully automated AMI system leads to water savings of 873.33 AFY, or 530,443 kilowatt hours (kWh) per year in energy savings. 5,425 fewer gallons of gasoline per year in will be used to manually read the meters using field vehicles, also reducing carbon emissions by 102 metric tons of CO2 Equivalent per year. This translates to a total operational savings of \$548,927 (see Table-6).

Table 6 - Overall Operational Savings Analysis

Operational Savings Analysis for AMI Implementation		
Field Staff Savings	Customer Service Savings	Operational Savings
\$499,112	\$49,815	\$548,927

This project will also reduce the amount of water pumped out of the Bull Run and Tualatin River Watersheds benefiting several threatened fish species including native Spring Chinook, Fall Chinook, and Winter Steelhead.

Does the project benefit Disadvantaged or Underserved Communities? Yes. The AMI Project will conserve 873.33 AFY of potable water, which can defer rate increases to customers, increasing water affordability. Additionally, TVWD has identified service areas by median household income overlaid with accounts past due 31+ days as of July 25, 2022 (see Figure-8 on next page). This data will be used to focus initial installations in areas with the most past-due accounts, beginning in the neighborhoods with the lowest median annual household income. This strategy will prioritize our lower income customers, which will provide more immediate access to information that can help people avoid needlessly excessive water bills due to leaks or unmanaged use.

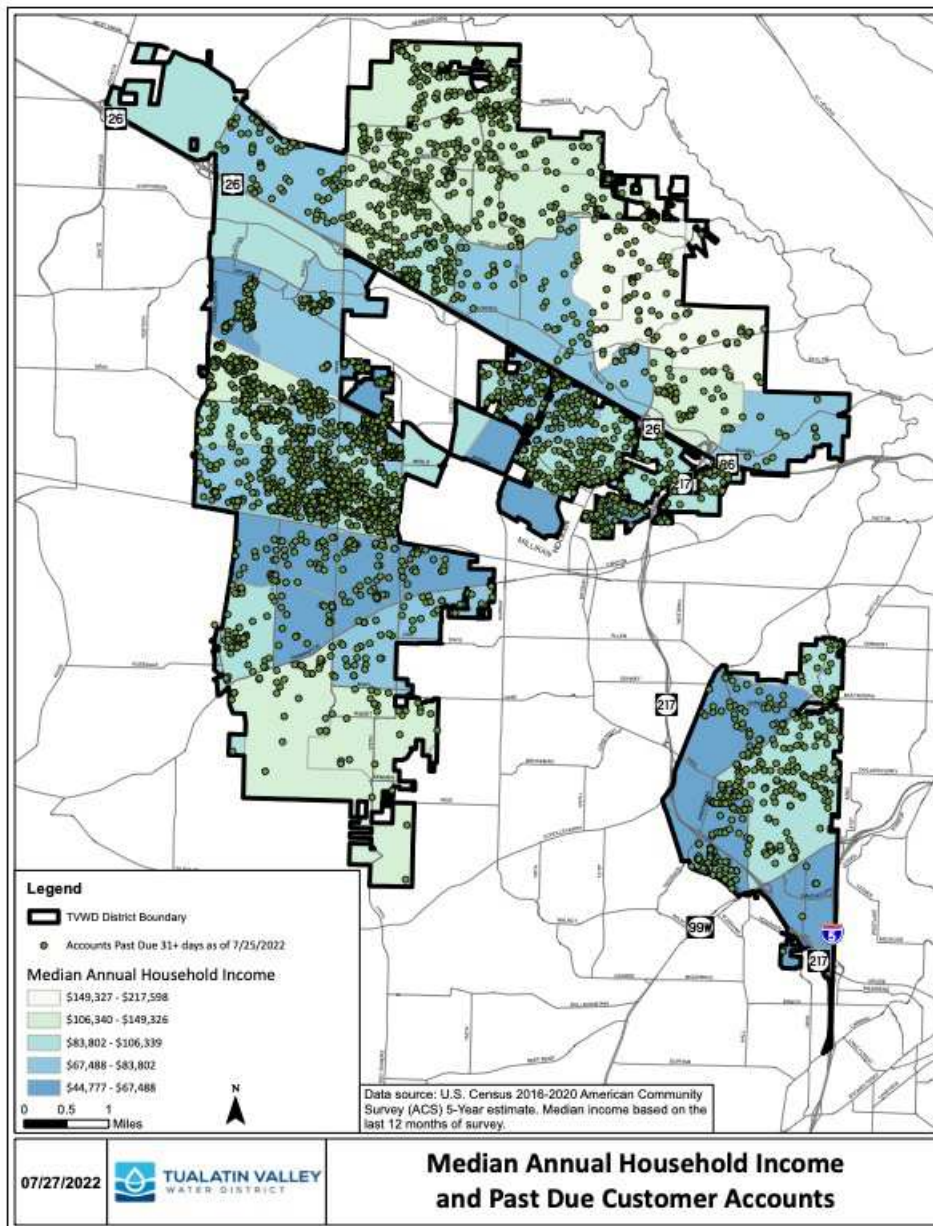


Figure 8 - Accounts Past Due 31+ Days as of 07/25/22

As such, TVWD does have several neighborhoods listed as disadvantaged communities as defined by the Department of Housing and Urban Development (HUD), including Aloha, Oregon, which is located within the project area. With 53,828 people, Aloha is the 13th most populated area in Oregon out of 378 cities. The largest Aloha racial/ethnic groups are White (59.2%) followed by Hispanic (21.6%) and Asian (10.2%), including 11.7% of Aloha families living in poverty.³ See also Figure-1 and Figure-2 for a map of the TVWD boundaries and surrounding areas.

Are there any project benefits for any Tribes? The watersheds providing the water source for TVWD contains no federally recognized tribe. However, TVWD believes this project will further the environmental stewardship goals of any local tribal groups and peoples regardless of their recognized status. Environmental preservation is important for the culture for many northwest native peoples, as they have always used the resources of the land and water to live. Conservation of 873.33 AFY of potable water supports native population’s ability to practice their culture and sustain traditional activities such as fishing.

Will the project address water and/or energy sustainability in other ways not described above? Yes. Discussed in full within the below sections, due to Tualatin Valley Water District’s location within Tualatin Valley, Oregon, any programs and plans evaluated by the District are always viewed with a regional lens on the impact of water sustainability on the area’s tourism, agricultural, and recreation sectors. Tualatin Valley is a farming and suburban region southwest of Portland, Oregon. The valley is formed by the meandering Tualatin River, a tributary of the Willamette River at the northwest corner of the Willamette Valley, east of the Northern Oregon Coast Range. Most of the valley is located within Washington County, separated from Portland by the Tualatin Mountains.

The BCA produced “Triple Bottom Line Impacts” or high-level impacts related to the social, environmental, and economic factors associated with a proposed AMI system and related meter data management solutions were evaluated and ranked for overall consideration of feasibility and risk. These considerations included expected impacts that will affect the day-to-day operations as they might apply to the TVWD staff and customers, and included important considerations and common pitfalls along with corresponding recommended mitigation measures to help improve the success of the project implementation and start-up phase.

Will the project assist States and water users in complying with interstate compacts? Oregon and Washington are partners in the Columbia River Compact, which is charged by congressional and statutory authority to adopt rules for fisheries within Oregon/Washington concurrent state waters of the Columbia River.⁴ Compact authority is delegated to the directors of Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife, or their designees, acting on behalf of their respective fish and wildlife commissions. In addition, the Columbia River *U.S. v. Oregon* treaty tribes have authority to regulate treaty Indian fisheries. As

³ United States Census: Quick Facts - Aloha CDP, Oregon: <https://www.census.gov/quickfacts/alohacdpregon>.

⁴ Washington Dept. of Fish & Wildlife-Columbia River Compact: <https://wdfw.wa.gov/fishing/management/columbia-river>.

part of the compact’s mission, the states develop a pre-season plan that provides guidance for meeting conservation objectives, fishery allocations, and public input for summer/fall commercial and recreational fisheries. As discussed above, the AMI Project will reduce the amount of water pumped out of the Bull Run Watershed, which includes the Upper Willamette River and the Lower Columbia River. The watershed contains three threatened native fish species - Winter Steelhead, Fall Chinook, and Spring Chinook. This project will increase the amount of water available for beneficial salmon habitat by reducing usage and water loss, providing the needed instream flow for fish.

Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)? Yes, TVWD includes portions of the cities of Beaverton, Hillsboro, Tigard and unincorporated Washington County, Oregon. Washington County is the second largest county in the state with an estimated 2018 population of 598,850, which represents an increase of 1.4% annually over the previous 10 years. Customer growth (meter installations) for TVWD increased by about 1.0% annually over the same 10-year period.

Nike’s World Headquarters is served by TVWD, as are Reser’s Fine Foods, Analog Devices and an Intel facility. A light rail corridor running through TVWD (from Hillsboro to the Portland International Airport and Gresham, Oregon) has a special zoning overlay for high-density use. TVWD’s service area is largely single-family residential and multifamily, with principal industries consisting of agriculture, trade, healthcare, business services and electronics.

Tualatin Valley encompasses the Willamette Valley area viticultural area (AVA), as well as the Chehalem Mountains AVA, and Oregon’s two newest AVAs: Tualatin Hills and Laurelwood District

Figure 9 - Tualatin Valley Map



approved by the Alcohol and Tobacco Tax and Trade Bureau (TTB). The two AVAs share a small portion of their boundaries and contain among the highest concentrations of Laurelwood soils in the state. Additionally, the valley’s estate wineries offer a tourism destination with 30+ wineries that are perfect for hosting weddings, corporate events, and family getaways in Willamette Valley wine country. Aside from its famous Pinot Noirs, Tualatin Valley is also known for its rich agricultural influence of Portland’s world-class restaurant scene, as many chefs indulge in the valley’s local farmers markets, u-pick farms, and variety of organic offerings.

The Tualatin Valley excels as an outdoor adventure destination, complete with activities ranging from bird watching to zip-lining. Protected wetlands, nature parks, wildlife watching sites, and the prestigious Pumpkin Ridge Golf Course offer outdoor escapes, while water recreation spots and paddling sites offer a serene experience along the Tualatin River’s many tributaries. With too many amenities, parks, trails, and experiences to name, the area enjoys a rich recreational culture. For these reasons, it is without question that the Tualatin Valley area will continue to see unprecedented growth due to the area’s access to both urban amenities in Portland and the rural lifestyle and agricultural bounty afforded by the Tualatin Valley’s unique climate and geography. Thus, water conservation through the AMI Project will be paramount to providing the quality of life sought out by current and future residents and as we plan for expected growth that will need more water from our finite ecological sources.

Will the project benefit a larger initiative to address sustainability? Yes. As discussed in more detail below, TVWD adheres to its comprehensive **Water Management & Conservation Plan** and its integrated **Curtailment Plan**.

Will the project help to prevent a water-related crisis or conflict? Is there frequently tension or litigation over water in the basin? No. There are no known water conflicts, tensions, or water-related crises related to this project.

G. Evaluation Criterion E - Planning and Implementation: (8 points)

1. Sub-criterion E.1— Project Planning

Is there any district-wide, or system-wide, planning that provides support for the proposed project? Yes. TVWD abides by its **Water Management & Conservation Plan (WMCP)** and its **Curtailment Plan**. In 2015, the Water Rights Services Division of the Oregon Water Resources Department (the Department) approved TVWD’s Water Management & Conservation Plan (the Conservation Plan). The Plan authorized the permitted use of 80.1 cubic feet per second of water under Permit S-49240 until January 2025, which meets the service area’s 20-year demand. TVWD is required to submit progress reports to the Department intermittently with the implementation of water conservation benchmarks scheduled in the Plan. TVWD must submit an updated Water Management Conservation Plan to the Department by January 2024.

TVWD’s Curtailment Plan was developed as a water supply shortage plan to guide the Board of Commissioners and TVWD staff in the event of a water shortage. Water supply shortage plans outline proactive measures that water suppliers may take to reduce demand and to find alternative supply during short-term water supply shortages, which may result from incidents such as: prolonged drought, equipment failure in the system, catastrophic events (earthquake, flooding, landslides or contamination) or events not under control of the water supplier (power outages or malevolent acts).

Describe how the project conforms to and meets the goals of any applicable planning efforts and identify any aspect of the project that implements a feature of an existing water plan(s).

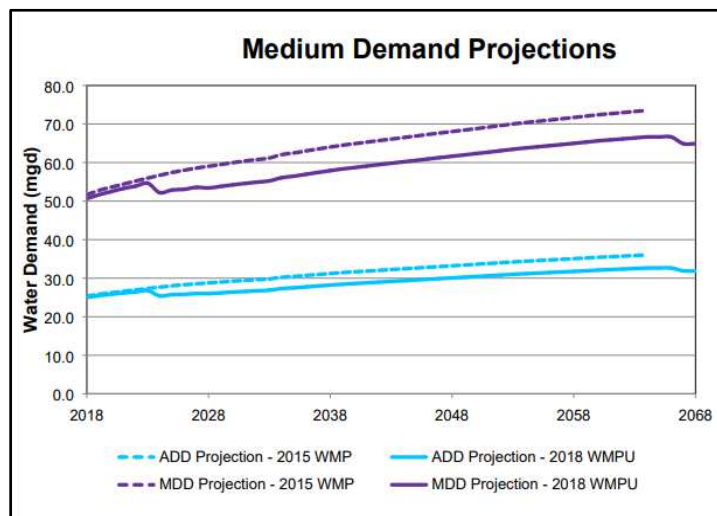
The Oregon Water Resources Department, in its permit authorizing TVWD’s Plan, estimated “unaccounted-for water...at less than 10 percent; however, malfunctioning meters owned and maintained by the Portland Water Bureau (PWB) likely reduce the accuracy of this estimate.” Moreover, the permit mandates TVWD to continue with its leak detection and repair program and its public education program, with the website updated in the next five years. The AMI Project delivers those permitting conditions by:

- Maintaining adequate volume of high-quality water supplies for all TVWD customers.
- Providing clear customer communications and rapid customer service with the planned customer portal website.
- Promoting water use efficiency through improved customer education.
- Facilitating the transition to monthly billing statements.
- Providing virtually real-time customer outreach when leaks are detected.
- Mitigating costs that come with curtailed water use, such as losses in revenue or higher-cost water supplies.
- Having an equitable impact on all users: public and private, urban and suburban, business and residential by prioritizing actions to ensure equitable, permanent positive impacts to historically disadvantaged communities.

How does the project address an adaptation strategy specifically identified in a completed WaterSMART Basin Study or Water Management Options Pilot? There are several ways the AMI Project addresses different adaptation strategies:

1. Development of Water Management or Operating Plans: TVWD’s Conservation Plan is required to provide information about conservation programs as part of the permitting process. The Oregon Water Resources Department acknowledges that TVWD has a “comprehensive water

Table 7 - Water Demand Projections (2018-2068)



conservation program with creative and effective measures.” Below are examples of TVWD’s commitment to our permitting obligations and the District’s ability to address strategies to mitigate the impacts of water shortages resulting from climate change, drought, and increased demands:

2. Development of Water Conservation and Demand Reduction Strategies:

TVWD’s Water Management and Conservation plan requires approval by the Oregon Water Resources Department. To be eligible

for this approval, municipal water providers are required to meet 5-year benchmarks for

initiating or expanding conservation measures, which includes the District continuing to perform its rigorous annual water audit and requires TVWD to communicate with PWB in an effort to address continued testing of historically problematic wholesale supply meters.

Moreover, under Oregon law, TVWD developed a comprehensive water supply shortage and Curtailment Plan to guide the District Board Commissioners and staff in the event of a water shortage. Critical for water system planning, demand projections determine the future capacity of supplies, pumping, storage, and piping. Work was done as part of the District's **2015 Water Master Plan (WMP)** to develop projected demand curves for the District. At that time, data was corrected due to errors in the PWB supply meters. These changes were used when developing the water demand curves.

The District selected a medium demand projection to account for uncertainties associated with future growth and water demand, including but not limited to, demographic growth, Equivalent Dwelling Units (EDU) per account, EDU water use, water loss, long-range weather forecasts, and large user demand projections. For the **2018 Water Master Plan Update (WMPU)**, the demand curves were adjusted to begin in 2018, with the trend line remaining the same as the 2015 WMP (See Figure-4). The decrease in demand shown in 2025 and again towards the end of the planning horizon indicates demand reduction due to customers being transferred to City of Beaverton water service.

3. Development of New Water Infrastructure: System-Wide Metering AMRs were installed for all commercial accounts within three years of the last issued state water permit. The last permit recognized that some of TVWD's current AMR meters have data logging capability that enhances TVWD's ability to confirm leaks. As discussed throughout this application, the installation of AMI meters will provide leak detection much faster than the older AMR technology due to the AMI system's ability to detect leaks in almost real time and alert customers within 24 hours, greatly mitigating water losses.

4. Development of a Monitoring Plan: The AMI Project has several programs and/or controls for monitoring the project to ensure that it is implemented correctly and that funds are spent according to agreed upon terms.

5. Leak Detection Program: TVWD has continued its leak detection program. TVWD owns a leak correlator that it uses to investigate leaks on an individual basis, as needed, and TVWD actively repairs the leaks identified. TVWD continues to promote customer-side leak awareness through the Water Words newsletter, providing free leak kits to customers on request, annual participation in EPA WaterSense's Fix-A-Leak Week activities. TVWD provides tips on locating and repairing leaks on the District's website as well as contributing to the development of leak detection and repair resources including "how-to" videos available from the Regional Water Providers Consortium. Field customer service teams actively investigate issues and contact customers with unusual readings on their meter or high usage. Badger ORION data-logging meters have been very helpful in diagnosing leaks on the limited number of meters that have this functionality.

6. Public Education Program: TVWD continues to provide youth education programs in its K-5 schools and to develop new programs to foster water stewardship. TVWD has a very active and strong relationship with teachers and principals within the Districts service area. TVWD has had contracts with professional actors for three school presentations about water conservation: “Where’s the Water, Watson?” and “What Do You Know About H₂O.” TVWD staff have provided four additional presentations: “Source to the Home,” “Peat Pot Planting,” “What’s the Matter in the Water Industry?” and “Tasting, Tasting, 1, 2, 3” delivering lessons on water resources, water distribution systems and water quality, respectively.

7. EPA WaterSense Program Materials: Partnering with the EPA WaterSense Program is one more way TVWD makes water conservation concepts and messaging simple for customers. TVWD updated its website in 2019 to create a more usable interface and to provide new information. TVWD’s website provides links to the EPA WaterSense program, as well as other water conservation resources, such as the Alliance for Water Efficiency, the Regional Water Providers Consortium and Maximum Performance Toilet test reports. TVWD remains an active partner with EPA in promoting EPA’s WaterSense Program.

8. Professional Associations: TVWD staff continues active participation and leadership in the promotion of water conservation in the region. TVWD staff belongs to the AWWA Pacific Northwest Section (PNWS) Water Conservation Committee, the Regional Water Providers Consortium, Tualatin River Watershed Council and is a partner with the EPA WaterSense program and active member of the Alliance for Water Efficiency. TVWD staff is active in the development of regional conferences and training programs to ensure continuing education opportunities and technical sessions in water conservation are available to regional water resource professionals. TVWD partners with professional trade associations like the Alliance for Water Efficiency and the Irrigation Association, collaborating to bring long-term and sustainable changes in the landscape and irrigation products market that support water-use efficiency.

9. Customer Service: To promote water use efficiency, TVWD provides technical assistance and financial incentives to District customers by providing water-use assessments on request and rebates for installing qualified high-efficiency water using fixtures such as high efficiency toilets, WaterSense labeled weather-based irrigation controllers, and high-efficiency rotating sprinkler nozzles. TVWD staff provides various classes, workshops, training sessions and presentations that cover general indoor and outdoor water conservation, water efficient irrigation, water efficient landscaping, and commercial water conservation. TVWD staff efforts reach all customer classes, landscape professionals, multi-family property managers and other trade groups.

10. Reporting: TVWD also has a water use measurement and reporting program that complies with the measurement standards in Oregon Administrative Rule Chapter 690, Division 85.⁵

⁵ TVWD’s water use records can be found on the OWRD webpage: http://apps.wrd.state.or.us/apps/wr/wateruse_report/.

2. Sub-criterion E.2— Readiness to Proceed

Describe the extent to which the proposed project is capable of proceeding upon entering into a financial assistance agreement. Identify and provide a summary description of the major tasks necessary to complete the project. Note: please do not repeat the more detailed technical project description provided in Section D.2.2.4.; this section should focus on a summary of the major tasks to be accomplished as part of the project.

What permits will be required, and what is the process for obtaining such permits? There are no required permits anticipated for the AMI Project. All the AMI Project work will be conducted at current meter locations and on TVWD property. All project-related approvals will be handled by TVWD and will be executed in a timely and efficient manner.

Has any engineering or design work been performed specifically in support of the proposed project? Not applicable to this project.

Have any new policies or administrative actions been required to implement the project? Yes., Specifically, permission to proceed with the project and official Board Resolution to approve application for Federal funding.

Administration: A variety of tasks are performed on a regular basis by TVWD Customer Service staff. These tasks include determining water waste responding to high bill and conservation related customer calls, monthly bill processing and customer interface amongst others. While difficult to quantify, some of these tasks may be streamlined with an AMI system and appropriate meter data management capabilities in place. TVWD staff have estimated that approximately 7,260 hours per year are currently dedicated to meter reading. Planning projections assumed that a 75% reduction in meter reading time (-5,445 hours/year) could be achieved by implementing AMI with annual cost savings in employee hours of up to \$499,112.

Another positive benefit of the AMI Project will be a customer portal with alerting capabilities where customers can quickly analyze their individual water use, set targets, improve their overall awareness of behavioral impacts on water use and take action to repair leaks rapidly and avoid unnecessary costs. Near real-time consumption data can be analyzed by the water utility to compare differences between system input volume and customer consumption while using this same data for a variety of other enterprise-wide solutions. The proliferation of high-resolution data allows investigations to be conducted to pinpoint where the real or Apparent Losses are occurring while identifying locations where the system is stressed throughout daily operations.

Policy: Curtailment policies aimed at reducing water use during critical periods can be readily enforced using AMI to compare baseline consumption with irrigation use and can easily flag accounts in violation of target consumption goals and drought response programs. The ability to record hourly or more frequent interval data is a significant advancement in metering technology. The more granular AMI data provides customers with the ability to truly understand daily consumption patterns. The benefits of this improved customer engagement have fewer

tangible metrics to assign, although these should not be discounted. Many customers are concerned with water conservation, and the analytics provided by AMI allows them to address their water consumption throughout the day instead of reviewing a bimonthly billing statement. Customer complaints of high-water bills are often more easily resolved, if not self-resolved by the customer. By providing actual data related to consumption for irrigation, showering or other habitual end uses, the customer’s behavior and related water use can be revised proactively in a self-determined manner.

Timeline: The AMI Project has been listed in TVWD’s District Initiatives list of projects and once funded, TVWD will implement this project in FY 2023-2024, FY 2024-2025 and FY 2025-2026. The project is expected to be completed in 36 months. There are no other constraints or contingencies with the non-federal funding share. With the granting of this funding request, TVWD will have all necessary funds and is ready to begin immediately with project implementation steps. TVWD has the resources and authorization to make the contributions and cost-share amounts as shown.

Estimated AMI Project Schedule			
Phase	Task	Start	Finish
Phase 1: Project Planning / Detailed Design	Business Case Analysis	Complete	
	Contract for Project Consultant	Complete	
	Preparation of Detailed Implementation Plan	Jul-22	Jan-23
	Award Notification from Bureau of Reclamation	Jul-22	Dec-22
Phase 2: Procurement	Specification Development	Jan-23	Apr-23
	Procurement	Apr-23	Nov-23
Phase 3: Start-up	Systems Integrations, Public Outreach	Nov-23	Jul-24
Phase 4: Proof of Concept	Proof of Concept, Installation, Deployment Stabilization, Continued Public Outreach	Jul-24	Jun-26
Phase 5: Close Out		Jun-26	Jul-26

Table 8 - Proposed TVWD AMI Project Schedule

H. Evaluation Criterion F - Collaboration: (6 points)

Up to 6 points may be awarded for projects that promote and encourage collaboration among parties in a way that helps increase the sustainability of the water supply.

How does the project promote and encourage collaboration? TVWD is a member of the Joint Water Commission (JWC), which also includes the neighboring Oregon cities of Hillsboro, Beaverton and Forest Grove. Water use by the JWC members is authorized by surface water rights from the Tualatin River basin and “secondary” rights for the use of stored water in Barney and Scoggins reservoirs. Details about the JWC’s (and its member agencies’) water rights, water supply sources, water distribution system, conservation measures and historical and future water demands can be found in the **2021 JWC Water Management and Conservation Plan**, which the

Oregon Water Resources Department (OWRD) approved in a Final Order issued on February 24, 2021. TVWD is also a member of the Willamette River Water Coalition (WRWC), whose members include the neighboring Oregon cities of Hillsboro, Beaverton, Sherwood, Tualatin and Tigard. The WRWC holds a surface water use permit for the use of up to 202 cubic feet per second of Willamette River water in an effort to develop the mid-Willamette River at Wilsonville as an additional regional water supply source. This new, reliable water supply for Washington County is on schedule to deliver drinking water to more than 300,000 Washington County residents and businesses in 2026.

Additionally, TVWD is active in conservation planning and implementation through national, regional and local partnerships. District staff participates on the AWE WaterSense and Water Efficient products committee. Since 2006, TVWD has been very active (including serving as chair multiple times) in the American Water Works Association Pacific Northwest Section (AWWA PNWS) Water Conservation Committee. TVWD also has ongoing partnerships with EPA to promote EPA's WaterSense Program to TVWD customers and with the Regional Water Providers Consortium, through programs such as the Children's Clean Water Festival and the Weekly Watering Number irrigation scheduling tool.

Is there widespread support for the project? Please provide specific details regarding any support and/or partners involved in the project. What is the extent of their involvement in the process? Yes, there is widespread support for the AMI Project from the Regional Water Providers Consortium and its members and Clean Water Services (See the Letters of Support referenced in the Appendix). TVWD is a member of the JWC. All JWC agency partners are members of the RWPC and share common annual conservation objectives as detailed in the approved 2021 JWC WMCP. This project would help TVWD achieve and sustain its ongoing conservation benchmark objectives within its partnered organizations. A Congressional letter of support has also been provided to Reclamation. Moreover, members of the TVWD's Key Customer Contacts group including companies such as Nike and Intel have expressed their support and enthusiasm for the project, even volunteering to participate in pilot projects. In general, the District's customers are eager to have access to the water use data and analytics available from a state-of-the-art AMI system.

What is the significance of the collaboration/support? The significance of the collaboration is that the AMI Project would provide a step forward in contributing towards JWC and TVWD's conservation goals. This AMI Project, if funded, could result in an additional availability of approximately 873.33 AFY of annual water supply that would otherwise be lost and unavailable to TVWD, its partners, and the region. TVWD and the JWC have shared conservation goals which are increasingly important as the population and future use projections in the region continue to escalate. Increased collaboration between TVWD and its customers will demonstrate acknowledgement of TVWD's progressive approach to increasing conservation through improved water management, leak identification and resolution, customer service, education and empowerment.

Will this project increase the possibility/likelihood of future water conservation improvements by other water users? Absolutely. All partnered regional water service providers with TVWD are members of the Joint Water Commission (JWC) and Regional Water Providers Consortium (RWPC) and support each other's programs and projects to help achieve and maintain regional objectives for water supply planning, emergency preparedness and water conservation. Accordingly, regional partners shamelessly duplicate successful conservation and customer service programs to the benefit of all regional customers.

I. Evaluation Criterion G - Additional Non-Federal Funding: (4 points)

Up to 4 points may be awarded to proposals that provide non-Federal funding in excess of 50 percent of the project costs. State the percentage of non-Federal funding provided using the following calculation:

$$\frac{\$19,549,340.00 \text{ (100\% TVWD Non-Federal Funding)}}{\$21,549,340.00 \text{ (Total Project Cost)}}$$

90.7% the non-Federal cost share shall be provided from TVWD funding sources. TVWD is also self-performing an additional \$200,000 local match for project vendor selection, implementation strategy development, and project representation.

J. Evaluation Criterion H - Nexus to Reclamation: (4 points)

Up to 4 points may be awarded if proposed project is connected to a Reclamation project or Reclamation activity.

Is the proposed project connected to Reclamation project activities? If so, how? Yes, about 28% of TVWD water comes from the [Joint Water Commission \(JWC\)](#), which is jointly owned by TVWD and the neighboring Oregon cities of Hillsboro, Beaverton and Forest Grove. The JWC source is comprised of water from Hagg Lake (Scoggins Reservoir) and the Barney Reservoir released into the upper portion of the Tualatin River. When flows are available, water from the Tualatin River is used. It is then withdrawn and filtered through the [JWC water treatment plant](#).

Does the applicant receive Reclamation project water? No. TVWD receives water primarily from the Portland Water Bureau and the Joint Water Commission as discussed under the Background section of the application.

Is the project on Reclamation project lands or involving Reclamation facilities? Yes, Scoggins Dam is a Bureau of Reclamation owned facility. The dam creates Henry Hagg Lake which is the primary water source for the JWC. In 1966, the United States Bureau of Reclamation built the Tualatin Project, bringing additional water to many parts of the Tualatin Valley in the last federal reclamation project in the Pacific Northwest.

K. Performance Measures A.2: Municipal Metering

Provide a brief summary describing the performance measure (or method quantifying actual benefits) that will be used to quantify actual benefits upon completion of the project.

Will new meters be installed where none existed previously or replaces existing meters? The AMI Project replaces 26,074 existing meters with new AMI meters and retrofits 34,423 existing meters with new digital read registers. AMI functionality will be implemented on all existing manual read and mobile/drive-by meters.

Does the project include individual water user meters, main line meters, or both? The AMI Project includes water user meters only. Main line meters are not included in the scope of this project, but will be evaluated for benefit and cost to TVWD customers and the District in the future.

Include a description of both pre- and post-project rate structuring. The District's customers include residential, multi-family residential, commercial (includes churches, hotels and institutions/governments), production (includes industrial), fireline, irrigation, temporary irrigation and wholesale. All customers are billed with a volumetric usage charge along with a monthly fixed charge. The current (2020) volumetric charge ranges from the Block 1 rate of \$5.62/CCF (hundred cubic feet) to the Block 2 rate of \$8.01/CCF (see Figure-10 below).

Meters are currently read once every other month for residential accounts and monthly for commercial accounts, with some exceptions. TVWD sets rates for a two-year period, consistent with its two-year budget cycle. Rates increased recently on November 1, 2021, and will again raise on November 1, 2022, which are reflected in the rates found in Figure-10.

The TVWD Board of Commissioners adopted a two-year rate increase with the first year, effective November 1, 2021, and the second year, effective on November 1, 2022. TVWD's base rate is levied against all customers in the service area on a bimonthly basis based on the size of each meter on the customer's premises. The charge recovers costs associated with providing water to the serviced property, which do not vary with consumption. These costs include meter reading and billing customers for each monthly period, maintenance of meters and service lines in the distribution system, administrative costs, water quality testing and salaries and benefits.

The performance measures that will be used to quantify actual benefits upon completion of the AMI Project will include measures to quantify water savings, improve water management and capture energy savings resulting from the installation of the newer, more technologically advanced water meters. Pre- and post-installation consumption measurements will be analyzed for all customers who are notified by TVWD that they have a leak and for all customers who view their water use data through the Customer Portal. Water consumption at each of the 26,074 sites where new meters will be installed, and the additional 34,423 sites where new digital registers will be installed on existing meters, will be evaluated annually using monthly billing data. Post-installation water consumption for each of the AMI units will be compared against pre-installation consumption to verify water savings.

Figure 10 - TVWD Water Rates (2021-2022)

TUALATIN VALLEY WATER DISTRICT EXHIBIT A - WATER RATES			
VOLUME WATER CHARGE:		Effective 11/1/2021	Effective 11/1/2022
<u>CLASS CODE 1</u>	<u>RESIDENTIAL</u>		
BLOCK 1	0-28 CCF (PER BI-MONTHLY BILLING PERIOD)	\$6.15	\$6.73
BLOCK 2	29 + (PER BI-MONTHLY BILLING PERIOD)	\$8.77	\$9.60
<u>CLASS CODE 2</u>	<u>MULTI-FAMILY</u>		
BLOCK 1	UP TO 1.4 TIMES 12-MONTH MOVING AVERAGE	\$6.15	\$6.73
BLOCK 2	OVER 1.4 TIMES 12-MONTH MOVING AVERAGE	\$8.77	\$9.60
<u>CLASS CODE 3</u>	<u>COMMERCIAL NON-PRODUCT</u>		
BLOCK 1	UP TO 1.4 TIMES 12-MONTH MOVING AVERAGE	\$6.15	\$6.73
BLOCK 2	OVER 1.4 TIMES 12-MONTH MOVING AVERAGE	\$8.77	\$9.60
<u>CLASS CODE 4</u>	<u>PRODUCTION PROCESSES</u>		
BLOCK 1	UP TO 1.4 TIMES 12-MONTH MOVING AVERAGE	\$6.15	\$6.73
BLOCK 2	OVER 1.4 TIMES 12-MONTH MOVING AVERAGE	\$8.77	\$9.60
<u>CLASS CODE 5</u>	<u>FIRELINE</u>		
BLOCK 1	ALL CONSUMPTION	\$6.15	\$6.73
<u>CLASS CODE 6</u>	<u>IRRIGATION</u>		
BLOCK 1	UP TO 1.4 TIMES 12-MONTH MOVING AVERAGE	\$6.15	\$6.73
BLOCK 2	OVER 1.4 TIMES 12-MONTH MOVING AVERAGE	\$8.77	\$9.60
<u>CLASS CODE 7</u>	<u>TEMPORARY IRRIGATION</u>		
BLOCK 1	UP TO 1.4 TIMES 12-MONTH MOVING AVERAGE	\$6.15	\$6.73
BLOCK 2	OVER 1.4 TIMES 12-MONTH MOVING AVERAGE	\$8.77	\$9.60
<u>CLASS CODE 8</u>	<u>LOCAL GOVERNMENT WATER PURVEYORS</u>		
	Volume charges shall be at contractual rates.		
FIXED CHARGES (FOR ALL CLASS CODES):		Effective 11/1/2021	Effective 11/1/2022
	METER SIZE OR EQUIVALENT	BI-	BI-
	SERVICE SIZE	MONTHLY	MONTHLY
	5/8"	\$ 18.60	\$ 37.20
	3/4"	\$ 20.49	\$ 40.98
	1"	\$ 25.25	\$ 50.50
	1 1/2"	\$ 33.93	\$ 67.86
	2"	\$ 50.05	\$ 100.10
	3"	\$ 139.36	\$ 278.72
	4"	\$ 186.73	\$ 373.46
	6"	\$ 300.94	\$ 601.88
	8"	\$ 434.69	\$ 869.38
	10"	\$ 714.95	\$ 1,429.90
		\$ 20.37	\$ 40.74
		\$ 22.44	\$ 44.88
		\$ 27.65	\$ 55.30
		\$ 37.15	\$ 74.30
		\$ 54.80	\$ 109.60
		\$ 152.60	\$ 305.20
		\$ 204.47	\$ 408.94
		\$ 329.53	\$ 659.06
		\$ 475.99	\$ 951.98
		\$ 782.87	\$ 1,565.74

To complement the AMI Project, a comprehensive study will be conducted to further address water savings and customer affordability, which will enhance data management and customer service. Like many water utilities, TVWD balances the affordability of water for low-income customers with the need to pursue water conservation pricing that encourages the wise use of natural resources. TVWD has pursued a long-term commitment to making this balance work. As such, TVWD adopted an aggressive two-tiered rate structure that reflects the cost of meeting peak use in the summer. In 2016, TVWD convened a broad-based Rate Advisory Committee (RAC) to recommend policies related to both affordability and conservation and has since implemented several of the RAC’s recommendations.

The economic realities of the COVID-19 pandemic have reduced TVWD’s financial resources required to effectively investigate conservation-based rate structures that are compatible with affordability for low-income customers and the RAC’s recommendations. If awarded a grant, TVWD will review its current rate structure and affordability strategy to find ways to increase conservation pricing incentives while supporting low-income customers and reduce the volatility of revenue. This comprehensive study will include the collection and analyses of data on the

characteristics of water use by customers, which is useful in evaluating budget-based rate designs that target conservation on outdoor water use during the peak-summer period. The study will include specific rate design proposals for consideration by TVWD’s Board of Commissioners.

AMI Project Performance Measures		
Performance Measure	Target	Measurement Tools & Methods
Accurate Measurement	New system should allow for accuracy measurement tools to quantify savings	The new AMI meters will include an online portal, which will allow the District to quantify leakage, perform diagnostic testing on customer water systems, and other demand assessments.
Water Savings: Customer-Side & Distribution Leak Detection	567.99 AFY savings from improved operator management, conscientious use by customers, and early leak detection	<ul style="list-style-type: none"> - Water consumption reported by the fixed network for each customer will be analyzed over a 12-month period. - Post installation water consumption will be compared against pre-installation consumption to verify savings.
Water Savings: Improved Meter Accuracy	305.34 AFY	<ul style="list-style-type: none"> - Post installation water consumption will be measured over a 12-month period following AMI installation to verify water is better managed. - TVWD technicians will ensure data collection of all meters and will respond to all alerts and alarms generated by the software.
Quantified Savings	<ul style="list-style-type: none"> - Compare pre and post installation flow quantities - Detail underlying assumptions 	<ul style="list-style-type: none"> - The AMI Project is expected to result in significant water savings based on reports and data from several sources supporting our analysis and conclusion to install a full meter replacement. - TVWD will provide detailed post project reports on all water savings achieved. TVWD water customers are expected to reduce their usage when the new AMI meters are installed, billing frequency increases to monthly, and the AMI technicians begin following up on alerts and alarms.
Energy Savings	122,042 kilowatt hours (kWh) per year in energy savings (TVWD only)	Energy savings will be verified by comparing post implementation energy use to the baseline energy use of 3,300 mega-watt hours of average annual energy use, district wide and 429 kWh/MG.
Carbon Emissions Savings	5425 gallons of gasoline per year in meter reading and maintenance vehicle consumption; and carbon emissions reductions on the order of 106,289 pounds of Co2 Equivalent per year.	<ul style="list-style-type: none"> - Verify reduced vehicle miles from asset management mileage and gasoline usage records and estimate carbon emissions savings using 19.59 lbs. of Co2 equivalent/gallon.

The above table summarizes the performance measures of the AMI Project that will demonstrate and quantify actual benefits and effectiveness of the AMI Project for TVWD. Water use monitoring will be provided to BOR throughout the reporting period and will be included in the final report. Water use monitoring will continue beyond that timeframe to be able to make a fair assessment of the actual water savings from this AMI Project.

II. Project Budget

The complete AMI Project Budget includes a Funding Plan, Letters of Commitment, Budget Proposal and Budget Narrative. The SF424A Budget Information form is submitted with this application.

A. Funding Plan & Letters of Commitment (LOCs)

The total cost to implement this project is **\$21,549,340** with a federal cost share amount of \$5,000,000.00 and a non-federal cost share amount of \$16,549,340. TVWD will fund 100% of all non-federal project costs. Thus, TVWD is proposing to fund 77% of the total project.

Cost to be reimbursed with the requested Federal funding	\$5,000,000.00
Total Project Cost	\$21,549,340.00

\$21,549,340 (Total Project Cost)/\$16,549,340.00 (TVWD Provided Non-Federal Funding) = 77%

Non-Federal Entities	
2. Low-Interest Public Loan (2.5%)	\$16,349,340.00
Requested Reclamation Funding	\$5,000,000.00

Cost-Sharing: TVWD will provide 100% of its cost share, so there are no third-party contributions. Item 1) is the District providing \$200,000 in monetary (cash) contributions reallocated from existing budget approvals related to AMR maintenance and operational costs associated with inspecting, reading, and repairing older AMR meters, with much of the costs stemming from vehicle fuel used to drive to each AMR location. The AMI Project will be funded by water sales revenue and interest income. Item 2) is the \$16,349,340 stemming from a long-term, low-interest public loan taken out by the District to be paid back over 20 years at a rate of 2.5% maximum.

Letters of Commitment: There are no LOCs for this project due to TVWD funding 100% of the \$200,000 as its local match and financing the remaining costs through a low-interest, long-term loan entered into by the District to be paid-back over time.

In-Kind Contributions: TVWD does not anticipate any third-party in-kind costs to this project. There are no other committed funding partners participating in this project currently.

Pending Federal Funding Requests: No other funding is pending or has been requested or received from other Federal agencies.

Non-Federal Cash Requested or Received: No cash has been requested or received from a non-federal entity. However, a long-term, low-interest public loan shall be applied for in March, 2023 whether TVWD has been notified of a Federal award or not due to this being a priority project for the District. There are no other federal partners involved in this project.

Costs Incurred Prior to Award: Yes, there are pre-award costs associated with hiring the subcontractor, Diameter Services Inc., who will begin Phase I of the AMI Project with project planning and preliminary design work beginning July 2022. TVWD does not anticipate seeking reimbursement for any costs incurred before the anticipated project start date.

B. Budget Proposal

The total project cost is the sum of all allowable items of costs, including all required cost sharing and voluntary committed cost sharing, including third-party contributions, that are necessary to complete the project.

TVWD's project for installing AMI meters has a total estimated cost of \$21,549,340.00. TVWD has carefully thought through the scope of work required and the necessary commitment of TVWD staff resources required for completion of this project, determining that this is the required budget needed for a successful full AMI replacement project.

C. Budget Narrative

Submission of a budget narrative is mandatory. An award will not be made to any applicant who fails to fully disclose this information. The budget narrative provides a discussion of, or explanation for, items included in Section B of the SF-424A.

Salaries and Wages: Salary and wages for project support and administration will be further defined with the guidance of Diameter Services during Phase 1; Planning and Detailed Design. The Program Manager for this project is Steve Carper for the Tualatin Valley Water District. While Mr. Carper will be involved in managing the project, he will not charge his time to the project as his salary is supported by TVWD's general operating budget. The specific tasks for this position include supervising the project, preparing administrative reports and presentations and attending Board meetings. Subcontracted labor will be used to install new meters, registers and the AMI communication system. All salaries are included under Contractual Obligations within the Project Budget table below.

Fringe Benefits: Subcontracted labor will be used to install new meter, registers, and the AMI communication system. Thus, all fringe benefits, such as taxes and insurance, are included in the under contractual costs within the Project Budget table below.

Travel: Travel expenses are not expected for the general laborers installing the AMI Project.

Equipment, Material & Supplies: The AMI equipment consists of AMI meters, registers, wire connectors and endpoint transmitters located on the top of each meter box. The cost of this equipment is \$4,210,149 for meter replacements, \$2,321,270 for register retrofits and \$7,429,250 for endpoints and \$404,863 for data collection gateways, field programmers and

meter reading equipment. TVWD will install 26,074 meters, 34,423 registers, 60,497 endpoints and six data collection gateways during the 2023-26 Fiscal Years for a total cost of \$14,365,532.00. Materials and supplies for this project include replacement meter boxes and lids and data analytics software with training for a total cost of \$1,873,135.

Contractual Work: TVWD will purchase equipment and materials for this project for a total cost of \$14,365,532.00. Diameter Services will manage the project and subcontract installation of the AMI Project for a total cost of \$3,229,525. New AMI data transmitters may also require drilling holes in the existing meter box lids. A subcontractor may also be utilized to provide the analytic software package and customer facing portal, training and technical support for the new software and ensure data acquisition and access for customers.

Contingency: The District has \$2,081,148, or 9.7% of all the Material and Installation costs for increases in these items given recent supply chain and inflation issues.

Third-Party In-Kind Contributions: There are no third-party in-kind donations of time, rate, supplies and/or materials to be itemized under this project.

Environmental and Regulatory Compliance Costs: There are no environmental and regulatory compliance expense costs that need to be itemized under this project.

Other Expenses: There is no sales tax in Oregon, so this is not an expense itemized for this project.

Indirect Costs: There are no indirect costs to be itemized under the project.

Total Costs: The total cost to implement this project is **\$21,549,340** with a federal cost share amount of \$5,000,000.00 and a non-federal cost share amount of \$16,549,340.

Budget Item Description	Computation		Quantity Type	Total Cost
	\$/Unit	Quantity		
Salaries & Wages (Included in Subcontract)				NA
AMI Installer [Subcontractor]	NA	TBD	/hr.	NA
AMI Installer [Subcontractor]	NA	TBD	/hr.	NA
AMI Installer [Subcontractor]	NA	TBD	/hr.	NA
Project Administer [Subcontractor]	NA	TBD	/hr.	NA
Superintendent [Subcontractor]	NA	TBD	/hr.	NA
Program Manager [Steve Carper, TVWD]	NA	70% of Time	/hr.	NA
Fringe Benefits/Taxes/Insurance (Included in Subcontract)				NA
SUI [Subcontractor]	1.52%	TBD	total salary	NA
Medicare [Subcontractor]	1.45%	TBD	total salary	NA
Workers Comp [Subcontractor]	\$1.467/hr.	[total hrs.]	total hours	NA
Misc. State [Subcontractor]	0.02%	TBD	total salary	NA

FUTA [Subcontractor]	0.60%	TBD	total salary	NA
Social Security [Subcontractor]	6.20%	TBD	total salary	NA
Equipment				\$14,365,532.00
Meter Replacement	\$161.00	26,074	ea.	\$4,210,149.00
Register Retrofits	\$38.00	34,423	ea.	\$2,321,270.00
End Points	\$123.00	60,497	ea.	\$7,429,250.00
Data Collection Gateways	\$67,477.17	6	ea.	\$404,863.00
Materials & Supplies				\$3,954,283.00
Meter Boxes & Lids	\$67.62	26,074	ea.	\$1,763,135.00
Data analytics software & training	\$110,000.00	1	ea.	\$110,000.00
Contingency (Material/Install Increases)	-	-	-	\$2,081,148.00
Contractual Obligations				\$3,229,525.00
Diameter Services Inc.		1	total	\$3,229,525
• Salaries & Wages	-	-	-	TBD
• Fringe Benefits, Taxes & Insurance	-	-	-	TDB
Travel Costs				\$0.00
None	-	-	-	\$0.00
Subtotal				\$21,549,340.00
Funding				
Low-Interest Long-term Public Loan	2.5% max	20 yrs.		\$16,349,340.00
Federal Cost Share				\$5,000,000.00
Total Estimated Project Cost				\$21,549,340.00

III. Environmental and Cultural Resources Compliance

All projects selected for funding under this NOFO will be required to comply with the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), and the Endangered Species Act (ESA), and other Federal environmental and cultural resource laws and other regulations.

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. As with most AMI projects, it is believed that TVWD’s AMI project meets the criteria for a “Categorical Exclusion” under both state and federal definitions. Accordingly, TVWD reviewed the list of categorical exclusions under the Code of Federal Regulations (CFR) for the Environmental Protection Agency, Chapter 40, Sec. 6.204(a)(1)(iii), and concluded that the project meets the following categorical exclusion definition:

Actions relating to existing infrastructure systems...that involve minor upgrading, or minor expansion of system capacity or rehabilitation (including functional replacement) of the existing system and system components.... or construction of new ancillary facilities adjacent to or on the same property as existing facilities.⁶

⁶ 40 CFR, Environmental Protection Agency, sec. 6.204(a)(1)(iii), “Categorical Exclusions and extraordinary circumstances.”

Similarly, Oregon Administrative Rules (OAR) for the Oregon Health Authority defines categorical exclusions under Chapter 333, Division 61, "Drinking Water," subsection (A) as:

Actions solely directed toward minor rehabilitation of existing facilities, functional replacement of equipment, or toward the construction of new ancillary facilities adjacent or appurtenant to existing facilities," have been identified as having no significant effect on the quality of human environment, individually, cumulatively over time, or in conjunction with other actions.⁷

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? No. There are no known species listed or species proposed to be listed as a federal endangered or threatened species, nor are there any designated critical habitats within the AMI Project area since it involves the functional replacement of existing equipment. However, TVWD is aware of threatened species listed in the Willamette River that are within reach of TVWD's Point of Diversion at approximately River Mile 39. For this reason, TVWD has "Curtailment Event Triggers" mandated under OAR-690-086-0160(2) and (3), which TVWD has adopted under a four-stage Curtailment Plan to be invoked to protect the fish in the event of a water supply shortage. These stages are designed to be initiated and implemented in progressive steps, with the plan including both voluntary and mandatory rationing, depending upon the cause, severity and anticipated duration of the shortage.

Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" No. There are no wetlands or other surface waters inside the AMI Project boundaries that potentially fall under CWA jurisdiction as "waters of the United States." No associated impacts would occur and no mitigation is required.

When was the water delivery system constructed? The first pipes were installed in 1940 with the bulk of the present system being constructed in two major expansions; post World War II and during the 1970s. Construction and system maintenance continues presently.

Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? No. The AMI Project will not result in any modification of or affect any individual features of an irrigation system.

Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? There are a number of buildings listed or eligible on the National Register of Historic Places, but the activities of this project will have no impact on those places. The project will simply replace existing water meters serving those buildings.

⁷ Oregon Administrative Rules, Health Authority, Public Health Division, Chapter 333, Division 61, Drinking Water, "Categorical Exclusions," pg. 271; Effective Jan., 2022.

Are there any known archeological sites in the proposed project area? There are a number of known archeological sites in the proposed project area, but the activities of this project will have no impact on those places. The project will simply replace existing water meters serving buildings that may be near archaeological sites.

Will the proposed project have a disproportionately high and adverse effect on low income or minority populations? No. While Washington County has the highest median household income in the state – \$69,743, compared to \$60,212 for Oregon and \$60,336 nationally – TVWD’s service area includes pockets of high unemployment and neighborhoods that struggle with poverty. As such, TVWD has several communities listed as disadvantaged communities, as defined by the Department of Housing and Urban Development (HUD). Given the disparities between our customers and the fact that TVWD is a partner to the \$1.3 billion Willamette Water Supply Project (one of the largest water capital projects in the state of Oregon), TVWD is sensitive to mitigating the cost of the Willamette Water Supply Project on our low-income ratepayers when also pursuing the much-needed water saving efficiencies of the AMI Project.

As such, TVWD has taken care to analyze rates and have concluded that the AMI project will NOT adversely impact any marginalized communities that may be excluded from mainstream social, economic, educational, and/or cultural life. Rather, after installation, the AMI Project has the potential to provide positive monetary benefits to low-income and minority populations by identifying water inefficiencies within their homes and businesses, which helps avoid unnecessarily high cost due to water leaks.

TVWD does acknowledge, however, that due to longstanding political, economic, educational, and employment marginalization, many in our communities do not have access to the technology and/or technological skills needed to be able to participate in online monitoring of water bills or as renters may not have direct access to accounts that a landlord may manage. Due to economic marginalization, many in our communities do not have consistent access to smartphones or computers or they may have their phone service or internet access repeatedly interrupted due to inability to pay bills. Thus, reaching marginalized people via the internet, email, or social media is not the best way to inform these TVWD customers of changes to their service or that an AMI technician may soon be entering their property to install the new devices. Even among those who may have access to the internet and a smartphone or computer, due to educational marginalization, many in our communities do not have the technological skills needed to navigate online portals, read electronic documents, or report billing issues. Thus, TVWD acknowledges that customer project notifications will require different outreach approaches, such as notifications being published in Spanish or phone calls rather than emails being made to customers with questions about water rates or water use in general.

Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands? No. The AMI Project will not limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands. Acknowledged sacred sites to native Northwestern tribes are Wy’east, also known as Mount Hood, and Hyas Tyee Tumwater, also known as Willamette Falls, which are both dozens of miles outside TVWD’s AMI Project area.

Beginning in the 1850's, native sacred burial mounds were discovered near Gaston, Forest Grove, and along the Calapooia river, which are also more than a dozen miles outside the AMI Project area. By the early 20th century, most of these mounds were plowed under by European settlers or excavated by professors from Oregon State University and Lindfield College.

According to the Oregon Historical Society, Tualatin was the name of a collection of related but independent villages whose members spoke a dialect of Northern Kalapuya. Synonyms for this collection of tribal groups include Atfalati, Tfalati, and Twalati (variously spelled). Sixteen Tualatin villages are known by name: these stretched through Tualatin Plains (modern-day Beaverton, Hillsboro, Mountindale, and Forest Grove), the Wapato Valley (Gaston), and the Chehalem and North Yamhill Valleys (Newberg, Carlton, Yamhill). Tualatins suffered greatly from introduced diseases with only about sixty-five indigenous members surviving by 1855, which was the same year the U.S. government concluded its treaty with all of the Willamette Valley tribes. A year later, in 1856, the tribes were removed to the Grand Ronde Reservation, over sixty miles southwest of their original homeland. Descendants of the Grand Ronde Tualatins continue to live in the Grand Ronde area and in other Native communities of the Pacific Northwest.

IV. Required Permits or Approvals

Applicants must state in the application whether any permits or approvals are required and explain the plan for obtaining such permits or approvals.

There are no required permits anticipated for the AMI Project. All the AMI Project work will be conducted at current meter locations on TVWD property. All project-related approvals will be handled by TVWD and will be executed in a timely and efficient manner. Final approval from the Board of Commissioners would be required prior to proceeding with the AMI Project.

V. Overlap or Duplication of Effort Statement

Applicants must provide a statement that address if there is any overlap between the proposed project and any other anticipated proposals or projects in terms of activities, costs, or commitment of key personnel.

No. There is no overlap between the proposed TVWD AMI Project and any other anticipated proposals or projects in terms of activities, costs, or commitment of key personnel. TVWD does acknowledge that it is seeking state and federal funds for a new water treatment facility at a cost of \$60 million total. However, the two projects will be funded using separate mechanisms for matching funds and the projects will be managed by separate TVWD teams.

In partnership with the City of Hillsboro, Oregon, the water treatment facility project includes expanding the intake on the Willamette River in Wilsonville, an expansion of the Willamette River Water Treatment Plant, a new transmission line from the plant to Cooper Mountain, terminal storage on or near Cooper Mountain, and transmission lines to connect to the District's and City of Hillsboro's water systems. TVWD intends for the system to be operational by 2026. Whereas a third-party contractor, Diameter Services Inc., will be managing the AMI Project, which only requires a handful of TVWD employees to install metering equipment and has less administrative requirements.

The TVWD AMI Project also does not in any way duplicate any project or proposal that has been or will be submitted for funding consideration to any other potential funding sources. TVWD will implement this project in FY 2022-2023 and FY 2023-2024. The project is expected to be completed in 36 months.

VI. Conflict of Interest Disclosure Statement

Applicants must state if any actual or potential conflict of interest exists at the time of submission.

Applicability: TVWD, its employees, and third-party subcontractors shall take appropriate steps to avoid conflicts of interest in their responsibilities under or with respect to a Federal financial assistance agreement for TVWD's AMI Project. Moreover, TVWD, its employees, and third-party subcontractors shall also follow the conflict-of-interest provisions in 2 CFR §220.318.

Notification: Should a conflict of interest occur, TVWD shall disclose in writing any potential conflict of interest to the Federal awarding agency or pass-through entity in accordance with applicable Federal awarding agency policy under 2 CFR §220.112. Moreover, TVWD has established internal controls that include, at a minimum, procedures to identify, disclose, and mitigate or eliminate identified conflicts of interest. Additionally, TVWD shall notify the Financial Assistance Officer in writing of any conflicts of interest that may arise during the life of the award, including those that have been reported by sub recipients.

VII. Uniform Audit Reporting Statement

Award entities expending \$750k or more in Federal dollars must submit a Single Audit report for that year through the Federal Audit Clearinghouse's Internet Data Entry System.

Because TVWD is requesting the maximum amount under this NOFO (\$5,000,000), which is well above the \$750,000 threshold for audits, TVWD shall submit a Single Audit report for each year of the award. Accordingly, TVWD shall submit a Single Audit report through the Federal Audit Clearinghouse's Internet Data Entry System.

VIII. Restrictions on Lobbying

Non-Federal entities are strictly prohibited from using funds under a grant or cooperative agreement for lobbying activities and must. Provide the required certifications and disclosures pursuant to 43 CFR §18 and 31 USC §1352.

Under the Certification Regarding Lobbying form that was submitted in Grants.gov with this application, TVWD Conservation Technician, Steve Carper, affirmed to the best of his knowledge, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any

Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

IX. Letters of Support

Attach letters of support from interested stakeholders supporting the proposed project in Appendix.

TVWD has received Letters of Support from U.S. Representative Suzanne Bonamici (OR-1st Dist.), the Joint Water Commission, the Regional Water Providers Consortium, and Clean Water Services. The Letters of Support are found in the Appendix of this narrative per the Notice of Funding.

X. Official Resolutions

An official resolution meeting the requirements set forth above is mandatory. Adopted by the applicant's governing body, verifying the identity of the official with legal authority to enter into an agreement.

An official resolution of support of the TVWD Board of Commissioners was adopted on October 20, 2021. The resolution verifies TVWD's legal authority to enter into an agreement and that the TVWD Board of Commissioners support the submittal of this application. The resolution also established the capability of TVWD to provide 100% of all non-federal project costs through an existing budget allocation and financing the remaining costs through a low-interest, long-term loan entered by the District to be paid-back over time. TVWD will work cooperatively with the Bureau of Reclamation to meet established deadlines for entering into a cooperative agreement. A copy of the resolution is submitted in the Appendix of this application.

XI. Unique Identifier & System for Award Management

Be registered in the System for Award Management (SAM) before submitting its application. TVWD is registered in the System for Award Management (SAM) under The Tualatin Valley Water District.

Provide a valid unique entity identifier in its application. TVWD's Unique Entity Identifier (UEI) is JGU4JG9P71R6, which is currently active and up to date.

Continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency. TVWD has and will continue to maintain and keep current its active SAM registration.

[End of 50-page limit]

XII. Appendix

[Subsequent pages do not count against the 50-page limit]

- A. Letters of Support:
 - 1. Congresswoman Bonamici – OR (1st)
 - 2. Clean Water Services
 - 3. Regional Water Providers Consortium
 - 4. Joint Water Commission
- B. TVWD Board of Commissioner's Resolution (No. 11-21)

<p>SUZANNE BONAMICI 1ST DISTRICT, OREGON</p> <p>2231 RAYBURN HOUSE OFFICE BUILDING WASHINGTON, DC 20515 TELEPHONE: 202-225-0855 FAX: 202-225-9487</p> <p>12725 SW MILLIKAN WAY, SUITE 220 BEAVERTON, OR 97005 TELEPHONE: 503-469-8010 TOLL FREE IN 1ST DISTRICT: 800-422-4003 FAX: 503-469-8018</p> <p>http://Bonamici.house.gov</p>	<p>Congress of the United States House of Representatives Washington, DC 20515-3701</p>	<p>COMMITTEE ON EDUCATION AND LABOR</p> <p>SUBCOMMITTEES: CIVIL RIGHTS AND HUMAN SERVICES, CHAIR HIGHER EDUCATION AND WORKFORCE INVESTMENT</p> <p>COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY</p> <p>SUBCOMMITTEES: ENVIRONMENT INVESTIGATIONS AND OVERSIGHT</p>
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November 3, 2021

Mr. Darren Olson
US Bureau of Reclamation
Financial Assistance Support
PO Box 25007, MS 84-27814
Denver, CO 80225-0007

Dear Mr. Olson:

I am writing in support of Tualatin Valley Water District's (TVWD) application for the Bureau of Reclamation's WaterSMART grant program.

Clean drinking water is essential, and Tualatin Valley Water District is an excellent steward of this vital resource. The community served by TVWD faces twin pressures that demand investment in effective and efficient water infrastructure: an increasing population, and increasingly extreme weather events, including drought, brought on by the climate crisis. With this funding TVWD plans to implement its Advanced Metering Infrastructure (AMI) Project to improve meter readings and management of water resources. The implementation of 60,497 AMI water meters—covering all TVWD users—will transmit consumption data hourly, and program software will run ongoing analytics to optimize how water is managed and delivered. These innovations in technology will enable all TVWD customers to make informed choices about their water consumption, empowering residents to understand and contribute to more efficient use of this precious resource.

TVWD expects this project would result in significant water, energy, and greenhouse gas savings by reducing annual water use by 873 acre-feet per year, with projected savings of approximately 122,042 kWh per year and 5,425 gallons of gasoline or 146,648 pounds of carbon dioxide emissions.

As a member of the House Select Committee on the Climate Crisis, I strongly support infrastructure improvements that will help us save water while providing the growing communities in Northwest Oregon with the resources they need.

I ask for your full and fair consideration of Tualatin Valley Water District's grant application. If you have any questions, please contact Shirley Araiza Santaella on my staff at Shirley.Araiza@mail.house.gov or at (503) 469-6010.

Sincerely,



Suzanne Bonamici
United States Congress



October 27, 2021

Mr. Darren Olson
US Bureau of Reclamation
Financial Assistance Support
PO Box 25007, MS 84-27814
Denver, CO 80225-0007

Dear Mr. Olson:

Clean Water Services (CWS) supports the Tualatin Valley Water District's (TVWD) funding request to the Bureau of Reclamation for their Advanced Metering Infrastructure (AMI) Project, which will reduce system losses and improve water management and end-use efficiencies.

CWS is a water resources management utility serving more than 600,000 residents and businesses in urban Washington County, Oregon providing wastewater collection and treatment services, stormwater management services and managing flow in the Tualatin River to protect public health, water quality and fish habitat.

TVWD's AMI Project aligns with our efforts to create a resilient and connected community. CWS is dedicated to ensuring we can continue to manage the region's water resources — through innovation, collaboration and stewardship — in the face of climate change and future challenges. As regional partners, CWS wants to work with TVWD to proactively meet these challenges.

Conservation is at the heart of CWS operations as we make the best and fullest use out of our water resources. CWS fully supports TVWD's AMI Project because the project is expected to result in 873 acre-feet of water savings annually. Additionally, TVWD's AMI Project will improve metering accuracy and access to billing data, empowering customers to further partner in protecting this essential regional resource.

We value our regional partnerships. This project will be a regional asset and will benefit CWS, our partner agencies and the communities we serve. If you have any questions or require additional information, please contact our Chief of Staff Mark Jockers at 503.681.4450; JockersM@CleanWaterServices.org.

Sincerely,


Diane Taniguchi-Dennis
Chief Executive Officer
Clean Water Services



Beaverton, City of
Clackamas River Water
Cornelius, City of
Forest Grove, City of
Gladstone, City of
Gresham, City of
Hillsboro, City of
Lake Oswego, City of
Milwaukie, City of
Newberg, City of
Oak Lodge Water Services
Portland, City of
Raleigh Water District
Rockwood Water PUD
Sandy, City of
Scappoose, City of
Sherwood, City of
South Fork Water Board
Sunrise Water Authority
Tigard, City of
Troutdale, City of
Tualatin, City of
Tualatin Valley Water District
West Slope Water District
Wilsonville, City of

October 28, 2021

Mr. Darren Olson
US Bureau of Reclamation
Financial Assistance Support
PO Box 25007, MS 84-27814
Denver, CO 80225-0007

Dear Mr. Olson:

The purpose of this letter is to express support from the Regional Water Providers Consortium (RWPC) for Tualatin Valley Water District's (TVWD) Advanced Metering Infrastructure (AMI) Project. The RWPC fully endorses funding TVWD's AMI Project by the Bureau of Reclamation, which will reduce system losses and improve water management and end-use efficiencies.

The Regional Water Providers Consortium serves as a collaborative and coordinating organization to improve the planning and management of municipal water supplies in the greater Portland, Oregon metropolitan region. Formed in 1997, the Consortium serves Multnomah, Clackamas and Washington counties and is made up of [25 water providers](#), including TVWD. Together, these entities provide most of the Portland Metropolitan Area's drinking water. The Consortium's work is divided into the following three categories: [conservation](#), [emergency preparedness](#) and [regional coordination](#). By working collaboratively, the Consortium and its members achieve economies of scale implementing regional programs that save customers water and money.

The RWPC supports TVWD's AMI Project because the project is expected to result in 873 acre-feet of water savings annually. Additionally, this conservation effort will prove especially valuable during critical times of the year when municipal and ecological water demands are at their highest and water supplies are at their lowest.

This project serves as an example for other communities in water conservation and regional collaboration, and TVWD should be acknowledged for their excellent public stewardship. Please feel free to reach out to me should you have any questions regarding our support for this project.

Sincerely,

A handwritten signature in black ink that reads "Rebecca Geisen".

Rebecca Geisen, Managing Director

1120 SW 5th Avenue, Suite 405
Portland, OR 97204
503-823-7528
www.regionalh2o.org
RegionalH2O
ConserveH2O.org
RegionalH2O



November 17, 2021

Mr. Darren Olson
US Bureau of Reclamation
Financial Assistance Support
PO Box 25007, MS 84-27814
Denver, CO 80225-0007

Dear Mr. Olson:

The purpose of this letter is to express the collective and overwhelming support from the Joint Water Commission (JWC) for Tualatin Valley Water District's (TVWD) Advanced Metering Infrastructure (AMI) Project. The JWC fully endorses funding TVWD's AMI Project by the Bureau of Reclamation, which will reduce system losses and improve water management and end-use efficiencies.

The JWC is the primary drinking water supplier in Washington County, Oregon, and is responsible for treating, transmitting and storing potable water for about 450,000 customers. The JWC comprises TVWD and its neighboring cities of Hillsboro, Beaverton and Forest Grove.

The JWC wholeheartedly supports TVWD's AMI Project because the project is expected to result in 873 acre-feet of water savings annually. Additionally, this conservation effort will prove especially valuable during critical times of the year when municipal and ecological water demands are at their highest and water supplies are at their lowest.

This project serves as an example for other communities in water conservation and regional collaboration, and TVWD should be rewarded for their excellent public stewardship. Please feel free to reach out to me or any of the members of the Joint Water Commission should you have any questions regarding our support for this project.

Sincerely,

A handwritten signature in black ink, appearing to read 'Niki Iverson', with a long horizontal flourish extending to the right.

Niki Iverson
Joint Water Commission General Manager
Hillsboro Water Department Director



RESOLUTION NO. 11-21

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF TUALATIN VALLEY WATER DISTRICT, OREGON, APPROVING THE APPLICATION FOR GRANT FUNDS THROUGH THE BUREAU OF RECLAMATION FOR THE WATERSMART: WATER AND ENERGY EFFICIENCY GRANTS FOR FISCAL YEAR 2022.

WHEREAS, the United States Department of Interior, Bureau of Reclamation has provided funds for the program shown above; and

WHEREAS, the Bureau of Reclamation has been delegated the responsibility for the administration of this grant program, establishing necessary procedures; and

WHEREAS, said procedures established by the Bureau of Reclamation require a resolution certifying the approval of applications(s) by the applicant's governing board before submission of said application(s) to the federal government; and

WHEREAS, the Board of Commissioners of Tualatin Valley Water District, if selected, will enter into an agreement with the federal government to carry out the project.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COMMISSIONERS OF THE TUALATIN VALLEY WATER DISTRICT THAT:

Section 1: The District approves the filing of an application through the Bureau of Reclamation for the WaterSMART: Water and Energy Efficiency Grants for Calendar Year 2022 for the "TVWD Advanced Metering Infrastructure Project."

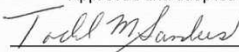
Section 2: District staff certifies that Tualatin Valley Water District, as the applicant, understands the assurances and certifications in the application.

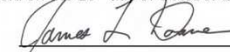
Section 3: District staff certifies that Tualatin Valley Water District will have sufficient funds to operate and maintain the project consistent with grant requirements or will secure the resources to do so.

Section 4: District staff certifies that the project will comply with any laws and regulations including, but not limited to, legal requirements for building codes, health and safety codes, disabled access laws, environmental laws and, that prior to commencement of construction, all applicable permits will have been obtained.

Section 5: The Board of Commissioners appoints the CEO, or designee, as agent to conduct all negotiations, execute and submit all documents including, but not limited to applications, agreements, payments requests and so on, which may be necessary for the completion of the aforementioned project.

Approved and adopted at a regular meeting held on the 20th day of October 2021.


Todd Sanders, President


Jim Doane, Secretary