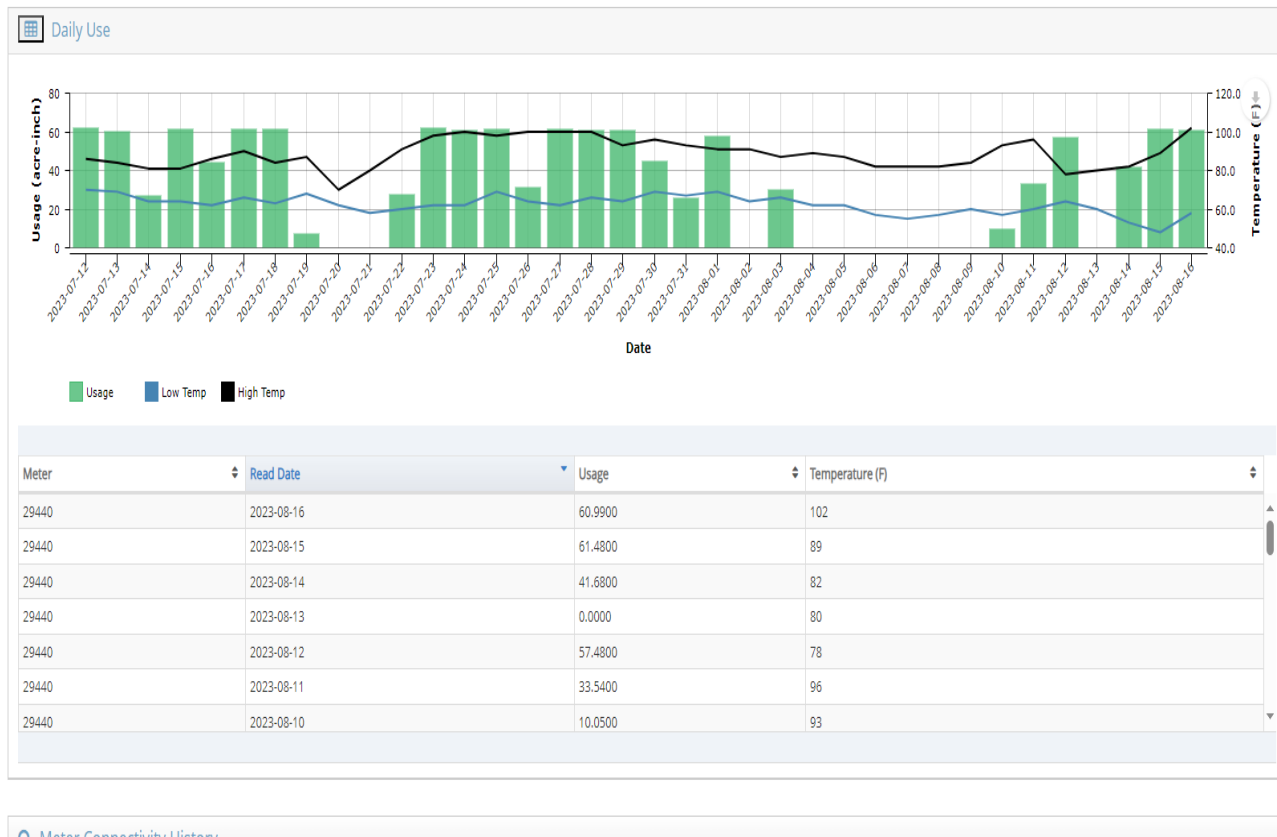


URNRD Remote Water Monitoring and Efficiency

Annual Report, March 2024

Water Sustainability Fund Application #5221



The URNRD was awarded a \$375,336 grant by the Natural Resources Commission in December 2018 and executed a contract with the Department of Natural Resources in February 2019. The project entails equipping irrigation well flow meters throughout the URNRD (Perkins, Chase and Dundy counties) with radio-based telemetry units so that water management is improved with real-time water usage information provided to irrigators, and the URNRD.

The screen shot above illustrates current usage and other information about an individual meter transmitted by the telemetry equipment that is being installed. The information is displayed on a meter-data-management system developed in tandem with the Water Sustainability Fund (WSF) project to provide staff with information to identify usage trends that aids such things as flagging potentially malfunctioning meters. A separate portal that displays usage data to farmers as granular as hourly irrigation applications has been developed and also utilizes the radio-based system that's comprised of a network of towers and gateways erected by neighboring electric

utilities that have partnered with the URNRD. The URNRD pays the partnering utilities a communication/data transmission fee for use of their network infrastructure. The fee the URNRD pays for each meter is approximately \$1 per month; comparatively, monthly cellular fees would be approximately \$3/month and fees for satellite-based transmissions about \$5/month based on the most current information that we have.

Project Progress

More automated meters and radios that transmit water-usage data were purchased and installed in late 2023 with WSF funds than any period since the grant contract was awarded in 2019. This was made possible by exhausting other project funds before the beginning of the year and completing modifications to the automated meter heads to prevent electrical interference from outside sources.

In late summer 2023, 423 automated meter heads and associated radios and hardware were purchased. Meter heads are installed onto existing meter bases. Pictured below are the meter heads:



A sensor is installed in the bearing connected to the prop that detects prop revolutions and generates pulses that are translated by the meter head into flow rates based on the programming of the meter. Typically, each prop revolution generates two pulses that are equal to 2.5 gallons. The meter heads are battery operated and have a battery life of an estimated 5-9 years.

The meters are equipped with Sensus outputs so data can be transmitted through the Sensus FlexNet radio network that neighboring electric utilities have installed the necessary infrastructure – namely towers and base stations – to utilize and that is shared with the URNRD. The FlexNet system is a long-range radio solution that communicates on an FCC-licensed

spectrum. A significant advantage of Sensus is that the actual meter readings are transmitted, rather than pulses that are automatically calculated into a water-usage value. This provides assurance that interruptions of data acceptance won't compromise the readings themselves once transmissions resume. In the case of a system where pulses are transmitted then calculated into usage values, for instance, a power outage at a tower would prevent acceptance of pulses that couldn't be restored. Once power resumed, pulses would of course be transmitted again but the "missing" pulses during the outage would be absent from the usage calculation, causing incorrect water-usage totalizer readings associated with the meter. With Sensus output, such an outage wouldn't compromise the totalizer readings: When power at the tower resumed, the latest totalizer reading from the battery-operated meter that included all usage during the time of the outage would be transmitted.

The picture below illustrates a fully installed system at an irrigation well. The tan box at the top of the pole connected via cable to the meter head is the Sensus radio that transmits the data. It has an estimated battery life of 20 years:



We chose to do the installation of the telemetry systems ourselves and employ four technicians adept at configuring, installing and repairing the systems. The familiarity they have gained by doing the installations and repairs has helped improve our troubleshooting capabilities which we believe will be of long-term benefit to our data collection activities and to farmers who will use the data to improve irrigation scheduling.

Technicians begin the installation process by removing existing mechanical meter heads and meters and bringing them to the URNRD shop. There, they detach the old odometer-style meter head from the shaft of the meter itself, install sensors into the prop bearings or new bearings complete with sensors, and attach the new meter head to the meter. Programming of all new

meter heads is checked for accuracy. The telemetry-equipped meters are then reinstalled at the well sites and attached via cable to Sensus radios. Depending on the location of the well, radios are either mounted to the “A” frame at the center of center-pivot systems or, when wells/meters are not near the “A” frames, to the top of poles bolted to irrigation pipe to acquire the height needed to dependably communicate with base station towers. Technicians began installation of the 423 units in late fall 2023 and, thanks to favorable weather, completed the work in January.

Near completion is a customer-facing dashboard of usage information that will help irrigators improve irrigation scheduling. The customer portal will allow irrigators to see historic, year-to-date, recent, and date-selected water usage from all of their meters on their smart devices and/or home computers. The primary usefulness of the tool to irrigators is expected to be real-time knowledge of how their accumulated water usage year-to-date affects their remaining water allocation that is established by the URNRD. For instance, the allocation for 2023-2027 will be 62.5” of water use per acre, total, over that five-year period. During the course of an allocation period, irrigators often want to know how much remaining allocation they have so they can for how much they will irrigate in the future to avoid exceeding the allocation and being penalized by the URNRD. Currently, having that information requires driving to the middle of a center pivot, manually reading the meter, calculating the number of acre inches used per acre, and subtracting that from their remaining allocation the URNRD provided the previous winter. While none of those steps is particularly difficult, there are enough of them that practically speaking it prevents many irrigators - especially those that farm many fields – from regularly using the information to make irrigation decisions. Having the information at their fingertips, we believe, will improve on-farm water management and lessen instances of irrigators exceeding the allocation.

Project Activities To-Date and Upcoming

The vast majority of the project funded by the WSF grant is done and the project will wrap up by mid-to-late this year. To-date, almost all the grant funds have been expended. Of the approximately 3,300 irrigation wells within the URNRD, all of them metered, about 1,800 have been converted to telemetry systems. Fewer meters have been, and will be, converted with the WSF grant than originally anticipated due to significant increases in costs of the telemetry equipment. Prices increased an average of more than 23% from the time the grant was awarded in 2019 until summer 2023 when equipment was last purchased.

Thank you and please contact me if you have questions about our project.

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