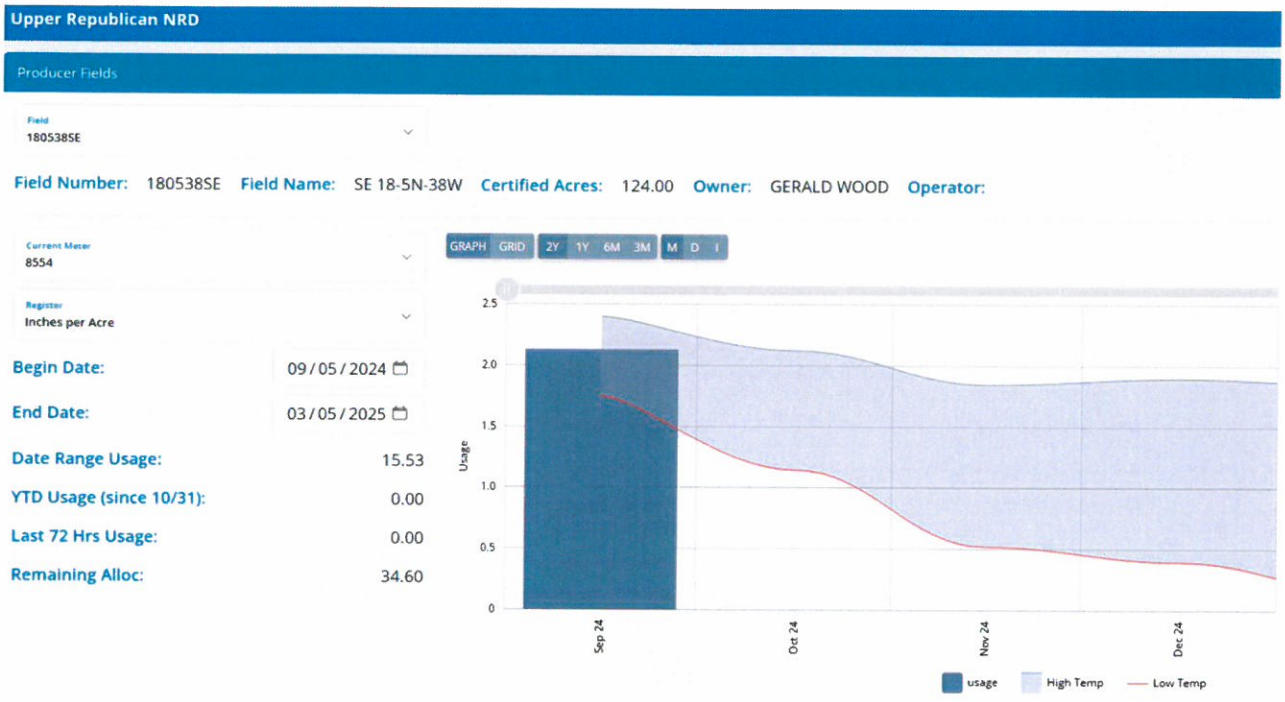
URNRD Remote Water Monitoring and Efficiency

Final Report, March 2025

Water Sustainability Fund Application #5221



This is the final closeout report for a $375,336 grant awarded to the Upper Republican NRD (URNRD) by the Natural Resources Commission in December 2018. The project entailed 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.

All irrigation wells within the URNRD have been required to be metered since the late 1970's to monitor flow and ensure water usage doesn't exceed the URNRD's limits on water usage, known as allocations. The meters all utilize propellers mounted inside irrigation pipes that spin when wells are operating and record water usage on analogue meter heads that resemble old-style mileage odometers. 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.

The project primarily entailed removing 523 meters from irrigation pipes and transporting them to the URNRD shop where the odometer-style meter heads were replaced with automated, digital meter heads capable of transmitting water-usage data. The conversion requires removal of the old meter head from a curved metal shaft the propeller is mounted to, and removal of the propeller and bearing attached to it. In many cases new bearings had to be installed that were capable of housing a sensor that detects prop revolutions and sends the information to the meter head where it's converted into a flow rate and totalizer. Prop revolutions caused by water flow generate electric 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 pictures below show a meter that was converted.

The meters are equipped with Sensus outputs so data can be transmitted through the Sensus FlexNet radio network. Two neighboring electric utilities have installed the necessary infrastructure – namely 190' towers with antennas and base stations to collect data – to utilize the Sensus network for their electric meters. The URNRD pays the partnering utilities a communication/data transmission fee for use of their network infrastructure. The fee the URNRD pays for each irrigation meter is a little less than $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.

The Sensus 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.

A Sensus radio transmitter that transmits usage data via the radio network is connected via cable to each automated meter head. The transmitters are powerful, having 2 watts of broadcast power, and have an approximately 20-year battery life. They are either mounted on metal A-frames of irrigation-system pivot points or, when irrigation wells and flow meters are a distance away from pivot points, attached to poles we've mounted on irrigation pipe. Below is a picture of such an installation. The tan box at the top of the pole is the Sensus transmitter.

Water-usage and other information about an individual meter is transmitted every four hours and contains hourly data. For example, a transmission that occurs at noon will contain hourly data from 8 a.m. – 9 a.m., 9 a.m. – 10 a.m., 10 a.m. – 11 a.m. and 11 a.m. – noon. The information is displayed on a meter-data-management system developed in tandem with the WSF project to provide staff with information to identify usage trends that aid such things as flagging potentially malfunctioning meters.

A separate portal that displays usage data to farmers has been developed (illustrated at the beginning of this report). This portal allows farmers to see their cumulative water usage over any

time period they wish, as granular as hourly usage. There are several obvious benefits to replacing perceptions or estimates of water use with data specifying exactly how much is applied, however we expect that the primary usefulness will be irrigators' 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 is 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 plan for how much they can irrigate in the future and avoid exceeding the allocation and being penalized by the URNRD. The penalty includes losing allocation. Currently, having up-to-date usage 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 doing it and using the information to make irrigation decisions. We believe that in many cases irrigators exceed their allocation and use more water than they otherwise would because they are unaware of their remaining allocation relative to their recent water usage. Having the information at their fingertips, we believe, will improve on-farm water management and lessen instances of irrigators exceeding the allocation.

The URNRD greatly appreciates the assistance this grant provided in modernizing and improving water management in our district for years to come.

Nate Jenkins
Assistant Manager