North Unit Irrigation District

Optimize Conveyance Efficiency and Control in North Unit Irrigation District Main Canal

WaterSMART: Water and Energy Efficiency Grants for Fiscal Year 2021

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Technical Proposal and Evaluation Criteria

Executive Summary

Date: September 15, 2020
Applicant Name: North Unit Irrigation District
City/County/State: Madras, Jefferson County, Oregon

To improve energy and water efficiency, North Unit Irrigation District (the District) proposes to improve conveyance efficiency and operational control by upgrading the automation at nine gated check structures and seven measurement sites within the main canal of its distribution system. By installing the latest technology in sliding gates, coded to reduce energy consumption and stabilize changes in flow rate within the canal, the District will remove unnecessary water loss resultant of a manual distribution system. The project will take two years to complete, ending April 2023. This project is located within the North Unit canal network, which is a Bureau of Reclamation Project, though managed by the District.

The District delivers irrigation water to nearly 59,000 acres through the 300 miles of open and piped canal. Operationally, the distribution system is controlled by manual gates, check structures filled with wooden boards and, for the lucky few, sliding gates wired with automation approaching 45 years in age. The District is a junior water right holder in the Deschutes Basin, and functions on an "on-demand" system which changes the flow rate within the system daily to match the requested demand of the farmers and ranchers. Because the District matches daily demand, staff adjusts the flow rate within the open canal system by 5-35% daily. And without accurate means to match the demand, water is often inefficiently used, requiring the diversion of more water from the river to compensate.

By finetuning the operational conveyance, this project will reduce the amount of water discharged unnecessarily from the system and reduce the volume of water initially diverted from the Deschutes and Crooked River. The current gates are energetically inefficient, uncoordinated, hazardously outdated, and limited in operational range and precision. This project will support the following goals:

- Task A – Water Conservation: Enhance irrigation conveyance efficiencies within the District to save 3,300 acre-feet per year.
- Task B – Energy-Water Nexus: Optimize the operational energy efficiency by installing collaborative programming across the check structures for succinct automation.
- Task C – Benefits to Endangered Species: Improve conditions for Endangered Species Act (ESA) listed Mid-Columbia steelhead trout in the lower Crooked River, and ESA protected Oregon spotted frog in the Upper Deschutes River.

Background Data

District and Project Introduction

North Unit Irrigation District provides irrigation water to nearly 59,000 agricultural acres in Jefferson County, Oregon and serves over 900 patrons. The District is part of the Deschutes Project, which was funded and, until 1955, managed by the Bureau of Reclamation. The District primarily diverts water from the Deschutes River but supplements from the Crooked River. Since the Deschutes River is over-allocated and because the District is the junior water right holder to the Upper Deschutes River, 70% of the water diverted into the District comes from storage in Wickiup Reservoir. In recent years, both water sources have been challenged by drought and a reduction in winter storage in Wickiup Reservoir in efforts to support endangered species habitat and life cycles in the Upper Deschutes River. These challenges have drastically reduced water access and require more mindful water management strategies. Though other irrigation districts within the Deschutes Basin have experienced change because of the endangered species, no other irrigation district carries the burden more than the junior right, North Unit Irrigation District.

The District is based in Madras, Oregon (the irrigated acreage spreading out through Jefferson County), but the North Unit Project spans for miles upstream; first releasing water from Wickiup Reservoir into the Deschutes River, which travels 60 miles to its diversion into the District's main canal in Bend, Oregon. Once in the main canal, the water travels 30 miles through the partially lined and open canal before crossing over the Crooked River by box flume and entering the District's irrigated agricultural land. From Wickiup Reservoir to the tail end of the irrigation district, water travels over 120 miles and takes nearly four days to make the journey. The distribution system is made up of 65 miles of main canal and 235 miles of laterals. The project is vast but also cleverly designed and inherently energy efficient; aside from pumping water from the Crooked River Canyon, the entire system is gravity fed.

Before the construction of the reregulating reservoir, Haystack Reservoir, in 1957, water operations within North Unit Irrigation District was wildly inefficient. Farmers and ranchers would place their orders 3-4 days in advance, demand would then be calculated and released from Wickiup Reservoir. The ordered water would take 2-3 days to arrive, at which point many farmers had changed their minds, forgotten, or were motivated by the change in the weather to sometimes let the water pass by. The watermaster of the time recall creating waterfalls at tail ends of many laterals because effective coordination was futile. In 1957, the Bureau of Reclamation with North Unit Irrigation District constructed Haystack Dam to create the reregulating reservoir. The improved water efficiency after its construction was immeasurable. Since its construction, the reservoir actively captures water excess diverted from the rivers, supplements flow if demand changes too quickly, and has allowed for fine-tuned discharge. The reservoir divides the District: 40% of the District served by the passing main canal flow above the reservoir and the remaining 60% tightly managed by the calculated discharge from Haystack Reservoir.

The region has a respectable agricultural legacy worth protecting. These 59,000 acres of irrigated land managed by North Unit Irrigation District make up nearly half of all the irrigated acres served by the Deschutes River in the Deschutes Basin. Though vast in acreage, the District holds the junior water right on the Deschutes River, and are only able to supply, on average, 2.00 acre feet per acre of water from the Deschutes River and 1.00 acre-feet per acre from the Crooked River to their patrons. Very little can be grown with only 2.00 acre-feet per acre let alone 1.00, but patrons within the District have created remarkable value from what little they receive. The agricultural region served by the District has become the most economically prosperous, agricultural region in Central Oregon. In a recent economic study comparing the Agriculture and Irrigation in Oregon's Deschutes and Jefferson Counties (May 2017), it was reported that within North Unit Irrigation District 13,000 acres of specialty crops were harvested, such as vegetable and grass seed, per year. Most notable of the vegetable seed is the hybrid carrot seed; within Jefferson County alone, our patrons grow over 55% of the nation's and 40% of the world's hybrid carrot seed. This equates to a gross income from agricultural sales totals of $74.4 million in Jefferson County and over $260 million to the Central Oregon economy in 2012. To put this value into context, the five irrigation districts senior to North Unit Irrigation District (which group within Deschutes County) divert 60% more water from the Deschutes River and only harvest an average 239 acres of specialty crop per year. For the senior water rights holders in Deschutes County, this equates to an average $26.1 million and contributed $91.3 million in total economic impacts. The agricultural region served by the District contributes nearly three times the economic value to Central Oregon by only using roughly one third the water.

While the senior water right holders deliver at 45-50% water efficiency, North Unit Irrigation District has worked hard to improve its system delivery efficiency closer to 60% and its on-farm to nearly 93% efficient. The efficiency comes from not only the operational benefit of function as an "on-demand" system (where water is only delivered if ordered 24-hrs in advance) or by pushing for many piping and lining projects throughout the District, but out of necessity for survival. Remaining piping projects have been outlined in our System Improvement Plan (SIP, 2017), which is estimated to return roughly 60,000 acre-feet in water savings upon its completion and awaits funding and time. But these piping projects outline in the SIP will take decades to complete, and stress from dramatic changes in water management require more immediate and diverse solutions to ensure the District's survival.

Natural river flow from both the Deschutes and Crooked River is no longer enough to support all the dependent irrigated acreage. The Deschutes River has been over-allocated since the planning of all the irrigation projects in the early 1900's; though in the 1930's, the construction of Wickiup Reservoir designed to sustain the North Unit project did functionally resolve this over-allocation for many decades. Wickiup Reservoir holds 200,000 acre-feet at full capacity and from this storage the District pulls an average of 70% of the districts total diverted water.

In times of water shortage, such a shortage in natural river flow from the Deschutes River or in the case Wickiup Reservoir does not fill, the District supplements its supply by pumping from

the Crooked River through the District's pump station. The advantage in supplementing from the Crooked River comes from it being from a different watershed; meaning when drought hits the Deschutes River watershed, it does not always hit the Crooked River watershed. In a non-dry year, the District has needed to pump ~11,000 acre-feet from the Crooked River, while during dry year conditions and water shortage within the Deschutes the diversion from the Crooked River has double to an average of 22,000 acre-feet. The increased diversion results from the costly purchase of 10,000 acre-feet from Prineville Reservoir, a back-up plan not always available. In one of many efforts to improve water supply and efficiency, the Crooked River Pump Station was identified as a location in need of renovation and received funding to install a Variable Frequency Drive on one of the diversion pumps through the Bureau of Reclamation's WaterSMART program (funded in 2019 through WaterSMART Drought Resiliency Program). The diversion technology will soon create a flexible pumping rate that matches the diurnal variations of the river flow rate while also ensure enough flow remains in the river to meet fish and wildlife needs including ESA-protected species. The project is only one of many necessary changes needed to chip away at the concerning deficit in available water supply.

In addition to resilience through shortages felt by low precipitation, the District is in desperate need to conserve water and lessen the impact from drastic management changes to Wickiup Reservoir for the threatened Oregon spotted frog (OSF). For the threatened species, 30,000 acre-feet of storage from Wickiup Reservoir is unusable by the District because it is released during the winter season to supply over-wintering and breeding habitat for the OSF. And in coming years the release rate could potentially increase to where 60,000 acre-feet of storage per winter will be released from Wickiup Reservoir. It is dreary to imagine the damage a 30,000-60,000 acre-feet loss in storage can have when the District only diverts roughly 215,000 acre-feet per year. This will remove roughly 15-30% of the Districts available supply.

Figure 1. Wickiup Reservoir September 30th, 2018: The Reservoir's capacity at 2%, exposing the in-take for the dam which had not been exposed in over 50 years.

The first wake-up call came in 2018. The Deschutes Basin experienced a promising, wet spring followed by a detrimental summer drought. Wickiup Reservoir started the season full, but such extreme, unpredictable conditions, layered with multiple dependents on Wickiup Reservoir and increased storage release for the OSF, led to its drain down to an abysmal 2% remaining (Figure 1). The reservoir had not reached such lows in its 75 years of recorded history. The District

strategized ways to endure the water shortage but was limited by its technology. It became obvious that any reduction in dependence on the Deschutes River reduced the detrimental competition for the stored water in Wickiup Reservoir. The need for improved conveyance efficiency became obvious as a tangible means to reduce unnecessary waste and to reduce the volume of water needed to supply the District.

The second call came in 2019. As a result of the emptied reservoir, a deficit in groundwater recharge slowed the recharge of the reservoir and lowered the natural flows within the spring-fed rivers. The winter was dry but so followed a wet spring which doused the cities along the eastern range of the Cascades; but little snow fell overtop the reservoir. Wickiup Reservoir continued to discharge the 30,000 acre-feet for the OSF and was only able to fill to 70% by the end of the spring, the lowest elevation to start the season in Wickiup Reservoir in recorded history. As a result, the District restricted its allotment to match the available storage: the patrons were to use 75% of their *minimum* allotment (1.50 acre-feet/acre for Deschutes River, and 0.75 acre-feet/acre for Crooked River water rights). The farmers and ranchers of the region could not help but to fallow 25-30% of their fields. The reduced allotment has disproportionately impacted the region; the few larger farmers might endure without irreparable damage, but the impact on smaller farmers and the dependent agricultural economy has yet to be grasped. Recall, these farmers and ranchers have worked hard to maximize their water efficiency to 93%, there is still plenty to be done within the District, as well as throughout the Deschutes Basin, to match their success.

The many staff within the District work hard to accurately calculate and time water changes to maximize water efficiency, but the automation within the North Unit Main Canal (NUMC) has limited operational efficiency. The archaic gate structures and manual check board system within the many check structures are highly ineffective, and in need of replacement for increased energy and water conservation. Currently, the District can measure changes in water flow rate at five locations within the NUMC: (1) at the point of diversion from the Deschutes River, (2) at the Crooked River Flume where Crooked River mixes into the main canal, (3) discharging from Haystack Reservoir, (4) 30 miles downstream of the discharge at Haystack Reservoir, and (5) at the end of the NUMC, just before its final few deliveries. Daily, the staff calculate the demand. They then schedule changes to Haystack Reservoir discharge based on the distance the water needs to travel to reach the targeted lateral or region. They then attempt to maintain 10 cfs flowrate at measurement end of the NUMC (measurement site 65.12); 8-10 cfs then being used by water users beyond that point so there is little to no loss from the District. Outside of these measurement locations visible through a central SCADA system, one must physically visit the sites to track the movement and trend of the canal flow between these sites. Additionally, the 240 miles of lateral canals are checked daily by ditchriders but otherwise left unmonitored without automation to alarm canal breaches or unplanned fluctuations in flow rate. Changes made at Haystack Reservoir take an average of 8 hours to arrive the tail end of the NUMC, and unfortunately, between those sites, there are old gates with failing automation which often malfunctions. The malfunctions have caused waves both upstream and downstream of the gate,

stark build-ups, and releases of water that either dry up downstream canals or flood out the end of the District. Yet, without the ability to measure and track the flowrate at or near these older gates, the miles of canal become an operational black box.

This project proposes to install 7 flow measurement sites and upgrade nine key check structures downstream of the Haystack discharge with one to three new sliding gate(s) each and subsequent Rotork motors to replace the current single gate automation installed. And more importantly, control the gate through a coded programmable logic control (PLC), installed to replace the flip-switch automation which can jerk and constantly create troublesome waves for miles within the main canal, for local deliveries and lateral canals. The PLCs will communicate via cellular contact to a central SCADA system that will provide tactical coordination and control over the distribution network. The installed code will provide three imperative improvements to the distribution system: it will first track the flow rate and gate positions over time which informs operational decisions, second it will have anticipatory code that will soften the impact from the responsive shifts in gate position, and third it will collaborate by considering the operations of neighboring gates to avoid compounding issues. With these improvements, it has been estimated that 3,300 acre-feet per year can be conserved.

Endangered Species

Because the District pulls from both the Deschutes and Crooked River, water savings and improved efficiency in the District's water management abilities will benefit aquatic life in both river systems. The Deschutes Watershed is home to the threatened Oregon spotted frog, Middle Columbia Steelhead, and Bull trout protected by the Endangered Species Act (ESA). The Upper Deschutes River is home to the Oregon spotted frog while the Crooked River is home to Middle Columbia Steelhead, the endangered Bull trout, Spring Chinook Salmon, Summer Steelhead, and Redband trout. Both the Deschutes and Crooked River require a minimal amount of stream flow, temperature, and clarity to provide for these species.

The threatened Oregon spotted frog has found habitat in the headwaters of the Deschutes River in Crane Prairie Reservoir and along the Deschutes River below Wickiup Reservoir. To endure the winters and successfully spawn in the spring, the frog finds safe habitat in calm side pools along the reservoirs and rivers. These pools are maintained by increasing winter discharge from Wickiup reservoirs into the rivers or halted discharge to ensure Crane Prairie reservoir fills the calm side pools along the reservoir edges.

The Crooked River was once a major spawning ground for anadromous fish such as spring Chinook salmon, and Steelhead trout. And home to non-migratory fish such as Redband trout and Bull trout. The installation of Cove Power Plant on the lower Crooked River had blocked upriver migration for spring Chinook salmon until 2019, when the installation of a fish passage connected the middle-Crooked River to Lake Billy Chinook. The construction of Bowman Dam also blocked fish passage to the headwaters of the Crooked River. Though attempts have been made to install fish passage, the populations have not yet recovered. Current plans to re-

introduce endangered steelhead have motivated water quality and habitat reviews of many sections of the Crooked River. And the District is committed to facilitating river improvements for fish and wildlife by reducing the disturbance to river flow.

Energy Uses and Sources

Because the District is gravity fed, it is inherently more energy efficient than other water systems, but there are still points of improvements. The District has one major and one minor source of power consumption that will both be reduced with the completion of this project. A significant amount of power is required to pump water 200 ft up and out of the Crooked River Canyon and into the North Unit Main Canal. This being the largest source of power consumption by the District, it is also used as a drought resilience strategy. As water is conserved through conveyance efficiency, there will be a decrease in power consumption through pumping. The comparative minor source of power consumption comes from the many automated gates within the main canal.

Elsewhere in the District, ten automated gates within the main canal constantly respond to changings in canal flow. Each structure is controlled with wiring and automation over a half century old, requiring more power to operate. With the improvements from this project, the automation will not only be energetically more efficient, but the logic control will limit unnecessary movements in the gate to wisely mediate and dampen changes in the canal flow.

The District also invites the innovation of hydro technology where possible. It hosts two hydropower facility within its main canal, one 10 miles upstream of Haystack Reservoir and one 2 miles downstream of the reservoir. The facilities are owned and operated by Apple, Inc. They are three-megawatt hydro facilities that functions off the 150-450 cfs passing through its turbines. When online, they produce enough power to supply electricity for 3500 homes. And the District also incorporates smaller-scaled renewable energy at its remote automation sites. Hydropower has been installed to power pivotal motors such as to power the 24-volt actuator on the recently piped 58-11 lateral and solar power at over half of the measurement sites throughout the District (funded in part by the Bureau of Reclamation WaterSMART 2015-2020).

Past Working Relationship with Reclamation

North Unit Irrigation District has a long-standing relationship with the Bureau Reclamation as part of the Deschutes Project. The Deschutes Project includes Wickiup Dam and Reservoir, Haystack Dam and Reservoir, the North Unit Main Canal, and associated delivery facilities. The Deschutes project was authorized by a finding of feasibility by the Secretary of the Interior dated September 24, 1937, approved by the President on November 1, 1937, pursuant to section 4 of the Act of June 25, 1910 (36 Stat. 836) and subsection B of section 4 of the Act of December 5, 1924 (43 Stat. 702). Construction of Haystack Dam and reregulating reservoir was authorized by act of the Congress on August 10, 1954, (68 Stat. 679, and Public Law-573). In 2007, a congressional bill and contract modification, initiated and funded by the District, was passed that authorized the District to participate in conserved water projects. Previously the District could

not participate in federal grant funded conservation projects as a result of the conditions of their contract with the U.S. Bureau Reclamation.

The District has participated in numerous water conservation projects with Reclamation's financial support. Projects are summarized below:

In Progress

2019-2020 - Variable Frequency Drive at Crooked River Pumping Station (R19AP00101)- North Unit Irrigation District installed a variable frequency drive (VFD) on one of the nine pumps located at the Crooked River Pumping Station. The Pumping Station uses 450-HP pumps to push water 120 ft out of the Crooked River Canyon. The VFD brings precision and stability to the diversion flow rate and gives access to up to 3,000-acre feet of water to which the District holds a water right, yet in the past could not access with diversion technology.

2019-2020 - Electronic Water Order (R19AP00076)- North Unit Irrigation District converted paper-based record keeping to electronic form. The software also provided staff and patrons to view water consumption in real-time, which provides the tool for mindful and conservative water management.

Reclamation Funding: $25,000

Completed

2015-2019 – 58-11 Pipeline Phase II (R15AP00109) - North Unit Irrigation District piped the remaining 3 of 5 miles of sublaterals 58-11 and conserved 380 AF of canal seepage per season in three phases. The saved water was again returned to the Crooked River in an effort to increase water quality and quantity for Middle Columbia Steelhead reintroduction.

Reclamation Funding: $704,478

2012-2016 – 58-11 Pipeline Phase I (R12AP13010) - North Unit Irrigation District piped the first 2 of 5 miles of sublateral 58-11 and conserved 380 AF of canal seepage per season in three phases. The saved water was again returned to the Crooked River in an effort to increase water quality and quantity for Middle Columbia Steelhead reintroduction. Reclamation Funding: $942,982

2015-2017 - Haystack Ramp Flume (R15AP00054) - Funding for BOR Water Conservation grant and Apple, Inc. to install a ramp flume below the discharge at Haystack Reservoir for water measurement. Reclamation Funding: $18,337

2011-2016 – Central Oregon Irrigation District (COID) I Lateral (R12AP13009) - Funding for BOR WaterSmart grant, OWEB and Pelton Fund to pipe a portion of COID's I Lateral. The conservation water from this project will be transferred to NUID lands with Crooked River water rights. Cooked River water rights will be transferred instream as described in the Main Canal Lining Project Below. Reclamation Funding: $600,000

2011-12 – North Unit Irrigation District Energy and Conservation Initiative (R11SF80303)- Line approximately five miles of its Main Canal and conserve up to 7,880 acre-feet (AF) of water from the Deschutes River. The saved water will be used to irrigate lands currently supported by water that is pumped from the Crooked River. The Crooked River water rights displaced by the new water resulting from the lining project will be retired to support water quality and fish habitat improvements in the Crooked River. Reclamation Funding: $1,000,000

2011 – 58-9 Surge Pond (R11AP1C008) – Construct a surge pond at the confluence of Lateral 58-9 and Lateral 58-11 to improve water management capacity. The surge pond is designed to hold 25 to 30 acre feet of water and will be utilized to catch irrigation water surges in the system and utilize the water for irrigation rather than allowing it to flow off the irrigation district and carry excess sediment into the creeks, degrading critical fish habitat. Reclamation Funding: $130,000

2010 – Haystack Flow Measurement (R10AP1C052) – Install a Horizontal Acoustic Doppler Current Profiler within the district's easement near the base of Haystack Dam just downstream where the bypass chute and Haystack discharge come together. Reclamation Funding: $10,899

2010 – Modernization of the Bend Diversion (R10AP1C006) NUID will replace and/or install at the headgate, river site, flow monitoring station and the canal site flow monitoring station SCADA Programmable Logic Controllers, river/gate position sensors, and cellular modem to communicate data. Reclamation Funding: $31,016

2009 – WCFSP Lateral 58-9 Piping Phase II (09FG1U1446) Install 22,000 feet of pipe to provide improved water management; eliminate soil erosion; pressurize a portion of the water delivery system and improve water quality. Reclamation Funding: $318,663

2009 – WCFSP Ramp Flume – Lateral 58 (09FG1U1421) Install a ramp flume on Lateral 58 to for more accurate measure of water at the head end of the lateral to conserve an estimated 900 AF of water per year. (Revised to installation of an acoustic Doppler). Reclamation Funding: $16,270

2008 – WCFSP Pipelines 41-6 Lateral and 43-7-1 Lateral (1425-08-FG-1L-1350) Convert sections of two earthen ditches to pipe to conserve water by reducing seepage and evaporation losses. Reclamation Funding: $38,906

2007 – Water 2025 Challenge Cost Share Program, Lateral 58-9 Pipeline Phase I – improve Lateral 58-9 by converting one half mile of open earth ditch to two parallel pipes to conserve water and thereby increase available water supplies associated with Reclamation's Deschutes River Project. Reclamation Funding: $237,002

2007 – Water 2025 Challenge Grant, Telemetry & Action Plan. Partner with 5 other irrigation districts in Central Oregon to install flow measurement telemetry stations at 18 strategic locations across the 5 districts to measure the benefits of water conservation. Two sites were installed on the district. Reclamation Funding: $8,818

2007 – Piping Laterals 53, 58-13 and 63-1. Upgrade 3 laterals from open ditch or leaking pipe to plastic pipe to conserve water, increase water use efficiency and enhance water management. Reclamation Funding: $55,410
2006 – Lateral 58-3, pipe 1,800 feet to conserve water and enhance on farm irrigation efficiency. Reclamation Funding: $20,017
2005 – Water 2025 GIS and Aerial Imagery Consortium: Using Technology, Best Practices and Information System Management to Support Conservation Program Development and Implementation. Reclamation Funding: $25,000
2005 – Automation and Telemetry Financial and Technical Assistance to install telemetry at Haystack Reservoir, 58 lateral turnout, 37–6 lateral and 58-11 lateral to conserve water and enhance water management through automation. Reclamation Funding: $24,100
2004 – Lateral 51-1, piping approximately 3,500 feet of the distribution system to prevent seepage losses and soil erosion. Reclamation Funding: $11,470
2004 – Lateral 58, this project included 6,600 feet of pipe and abandon a section of lateral that passes through an industrial park. This piping project saved water and prevented soil erosion by decreasing canal seepage. Abandoning the section through the industrial park will kept runoff from parking lots and roofs from entering the irrigation system. Reclamation Funding: $66,972
2003 – North Unit Small Pipelines 2003 – piping of various short sections of canals in the distribution system to prevent erosive destruction of the canal banks by livestock and to save water. The project included installation of three pipelines for a total of 6,291 feet. Reclamation Funding: $38,000
2002 – Lateral 58-1, pipe approximately 5 miles of open canal to save water and reduce soil erosion by decreasing canal seepage. Reclamation Funding: $107,188
1998 – Lateral 51-4, demonstration high head pressure pipeline system, installation of 25,000 feet of pipe to enclose an open canal. Reclamation Funding: $105,000
1995 – Lateral 52, installation of 12,500 feet of pipe to enclose an open canal. Reclamation Funding: $126,000

Project Location

North Unit Irrigation District is in Jefferson County, Oregon and is the junior water right holder for the Deschutes Basin. Water is stored within Wickiup Reservoir to supplement natural flow, which is located 60 miles upstream along the Deschutes River from Bend, Oregon. In the regions surrounding Bend, five of the eight irrigation districts of the basin are nestled close to the city. The District diverts flow from the Deschutes River into the North Unit Main Canal (NUMC) which travels another 30 miles before arriving within the District's boundaries in Jefferson County. Once within the District, the main canal services roughly 30% of the irrigatable acreage from whatever volume of water is passing through the main canal from the Crooked and Deschutes River diversions (Figure 2). While the remaining 70% is serviced by the discharge of Haystack Reservoir, which, thanks to a Bureau of Reclamation WaterSMART Grant in 2015 for

the Haystack Ramp Flume Project, can control the discharge from the reservoir with remarkable precision.

Downstream of the Haystack Reservoir are nine automated gates controlled by archaic automation systems: the two governing the diversion into or bypass of Haystack Reservoir, Gate 50, Gate 51, Gate 56, Gate 58, Gate p58, Gate 61, and Gate 64. Each are named by the mile markers from the diversion from the Deschutes River in Bend (via the canal). They are also located every 1-5 miles from Haystack Reservoir to the end of the main canal (Table 1). There are also seven major laterals still managed by a manual diversion gate and rated weir structure: Lateral 45, Lateral 57, Lateral 58-11, Lateral 59, Lateral 61, Lateral 63, Laterals 64 (not pictured).

Table 1. Site name and GPS location.

Automated Gate/Measurement Site Name	Longitude, Longitude
Feeder Canal Gate Automated Gate	44.501067, -121.162063
Bypass Gate Automated Gate	44.501067, -121.162063
Gate 50 Automated Gate	44.570801, -121.158948
Gate 51 Automated Gate	44.585436, -121.161473
Gate 56 Automated Gate	44.628815, -121.151293
Gate 58 Automated Gate	44.651341, -121.135918
Gate p58 Automated Gate	44.680020, -121.141885
Gate 61 Automated Gate	44.702050, -121.117925
Gate 64 Automated Gate	44.744288, -121.132421
Lateral 45 Flow Measurement Site	44.521764, -121.149290
Lateral 57 Flow Measurement Site	44.642903, -121.140296
Lateral 58-11 Flow Measurement Site	44.709005, -121.065062
Lateral 59 Flow Measurement Site	44.686111,-121.138143
Lateral 61 Flow Measurement Site	44.700433, -121.117821
Lateral 63 Flow Measurement Site	44.722846,-121.125273
Lateral 64 Flow Measurement Site	44.744533,-121.132118

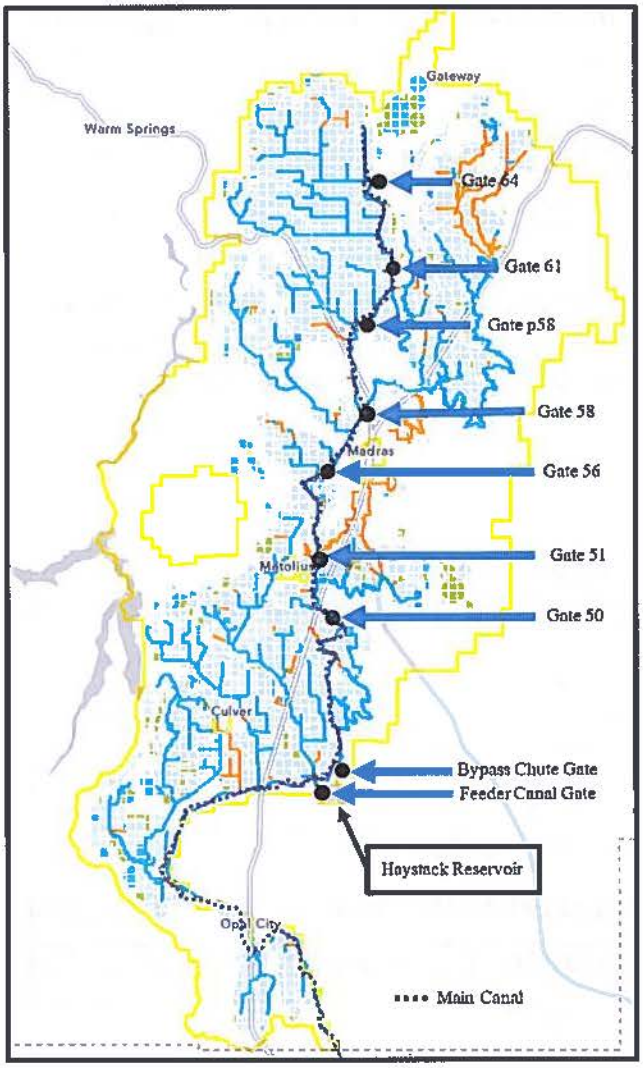

Figure 2. A portion of the distribution system is serviced by the main canal upstream of Haystack Reservoir, while the remaining majority is supplied by precise discharge from the reregulating reservoir. The project is located below Haystack Reservoir and is a part of the precision water management attempted through the strategic releases from the reservoir.

Technical Project Description

Site Preparation

This project will install automation on the current structures that exist. Most of the gates are sliding gates, the remaining are radial gates. The sliding gates will be redesigned and upgraded with in-house construction. The radial gates will be affixed with new motors and automation to replace the current manual configuration. The measurement sites will be installed in sections with a drop above and below the site, and where a professional can rate the section for measurement accuracy. While the gate removal and installation, as well as the stilling basin construction, must occur between October and April when the canal is dry, other activities such as gate construction, powder coating, automation and wiring installation, and code can occur at any time.

At eight of the nine gates, a cement check structure exists affixed with I-beam frames. The frames hold wooden boards as a check bay, leaving the center frame open for an automated sliding gate. The frames are so that additional sliding gates can be installed in the open bays, and the existing sliding gate can be replaced with new technology. To prepare the site, the current gate will be removed with a backhoe from the current I-beam frame and the frame cleared for the new gate. Four gates will be prepped and installed the first winter, and the remaining 5 will be prepped and installed the second winter.

Gate Construction

The sliding gates will mimic a customized design recently installed as part of the 58-11 Pipeline Project Phase I. The design improved the fit and reliance of the gate, while maintaining the longevity of its components. The gates will be fabricated in-house and assembled first to ensure

the accurate construction. Once accuracy is confirmed, the gates will be then disassembled, then sent to be powder coated by a local company. Once powder coated, the gates will be reassembled and installed at each site.

Gate Installation

Using a backhoe, each steel-framed sliding gate will be installed into their designated check bay and secured to the I-beam frame.

Automation Installation

At each gate location, a stilling basin exist made of corrugated tube and controls the current "trigger-switch" automation. These structures are filled with sediment, rusted at the base, and in need of replacement. At each station, a new stilling basin will be constructed to house the shaft encoder. From the shaft encoder, electrical conduit runs from the stilling basin to the NEMA box secured near the old, automated control box. Also, to the NEMA box, electrical conduit links the gate motor and the position sensors. The NEMA box houses the programmable logic control and a cellular modem to link gate control to a central SCADA system hosted in the cloud. The SCADA system is hosted by Campbell Scientific, Inc and is a customizable platform, managed and created by North Unit staff.

SCADA Design

Programmable logic controls (PLC) will be purchased for each gate and coded to control the gate's coordinated movements and to connect to a centralized SCADA system. Not only will the gates within at each structure be synchronizing, but the programmable logic controls can converse with other gates to better anticipate changes in flowrate across space and time. The centralized SCADA system will improve staff's ability to coordinate efficiency changes in flow rate across space and time to conserve water, and to identify errors in the distribution system that could create waste issues.

Project Timeline

The project will be broken into three phases (Table 2). The first two phases focus to ambitiously complete the project in two years, with the third season contingent on unfinished work due to weather or unforeseen hang ups. Phase I will include Gate 50, 51, and 56, and the feeder and bypass gates at Haystack Reservoir. Phase II will include the remaining gates: Gates 58, p58, 61, and 64.

Table 2. Project timeline and goals for completion.

Year 1									
Task	Apr-Oct 2021	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	March 2022	Apr 2022	Apr-Oct 2022
Gate Construction	X								
Remove Gates		X							
Prepare Frames			X						
Install Gates			X						
Install Motors				X					
Install Automation					X				
Create SCADA					X	X	X	X	
Pull online								X	X
Online Troubleshooting									X
Year 2									
Task	Apr-Oct 2022	Oct 2023	Nov 2023	Dec 2023	Jan 2023	Feb 2023	March 2023	Apr 2023	Apr-Oct 2023
Gate Construction	X								
Remove Gates		X							
Prepare Frames			X						
Install Gates			X						
Install Motors				X					
Install Automation					X				
Create SCADA					X	X	X	X	
Pull online								X	
Online Troubleshooting									

Evaluation Criteria

Evaluation Criteria A: Quantifiable Water Savings

Estimated Water Savings: It is estimated that by upgrading the operational control at the nine check structures and installing a central SCADA system, that 3,300 acre-feet per year of unnecessary loss can be conserved through effective water management. This conserved water will be stored within Haystack Reservoir for more efficient use overtime and will not be spilled at the end of the ditch into natural waters.

Describe Current Losses: Currently, this water that will be conserved discharges into the natural waters surrounding the district. When discharged to the natural river and streams surrounding the district, the water is no longer usable by the district, and instead becomes of vector for pollutant transport. Sediment, pesticides, noxious aquatic weeds, nutrients, etc. are transported via this

discharge. To make up for the water ineffectively used and discharged, water is diverted upstream to compensate or fields are left fallow because not enough water exists to replace the loss.

Describe Estimated Water Savings: In preparation for this project, the District performed a two-year study focused to improve water efficiency within the District. The study compared the daily discharge rates through over 40 tail-measurement sites across two time periods: historic (2014-2016) vs. adaptive (2017-2019) operations. The District not only measures the flow rate at the diversion and tail-ends of the district, but also at each running turnout, lateral and sublateral. The District makes these measurements regularly to support an on-demand system where water is ordered 24-hrs in advance and changes are made daily to the canal network flowrates. Historic operations represented the *control* or "in-action" conditions and were performed through 2014-2016. The District uses Haystack Reservoir, located midway through the distribution system, to re-regulate flow within the system and finetune the flowrate for remaining 60% of the water users located downstream. The adaptive operations were applied from 2017 to 2019; the adaptive methods included discretized releases spread out over time from Haystack Reservoir and to manually mimic the potential control capable with improved automation. The timing and magnitude of each release were designed to account for the time it takes for water changes at Haystack to reach the regions of the district where the changes were needed. A region where many users were scheduled to turn off the following day would warrant a decrease in discharge from Haystack, timed so that the decrease arrived at the hour the ditchrider would be closing down the lateral headgate and pushing water back into the main canal. This adaptive method applied during the study relied on measurement sites currently in place and trialed the automation/SCADA (proposed in this grant) at a few key sites. The results validated the need for this project by increasing water efficiency through operational management and decreasing drainage into natural waters by 3,300 acre-feet.

As shown in Table 3, the total losses for the years in this study are broken down by losses from the main canal and those from the remaining lateral canals and summed to capture the total loss measured during that irrigation season By applying adaptive operations made possible through improved automated gate control and data acquisition, the District only discharged on-average 9,114 acre-feet each year through this site as compared to the 12,451 acre-feet discharged historically. When comparing the average discharge volumes across the two time periods, the study observed the quantifiable savings of 3,337 acre-feet as a result of adaptive operations. With the automation and control made possible through this project it is anticipated that this savings will be maintained and further increased.

Table 3. Cumulative loss and savings reported 2014-2019 during preliminary study. Values are a summation of the losses measured April through October each year and reported in acre-feet.

End of the Main Canal sum flow through measurement site 65.12 and does not overlap the measurements reported by the ditchriders for the remaining end of lateral canals.

Historic Management		Adaptive Management	
2016	13,005.95	2019	8,878.05
2015	11,764.03	2018	9,569.76
2013	12,584.31	2017	8895.3063
Total	12,451.43		9,114.37
Net Savings			3,337.06 acre-feet

Loss is considered as the water passing through the final measurement site at the end of the main and lateral canals, which then serves the final water user and often overflows into a drainage towards natural waters. Though all canals require operational water to function and a loss of zero may not be possible, improved water efficiencies decrease the flowrate at these locations as close to zero as possible. Loss is measured daily at the tail-ends of the main canal (as measured at site 65.12) and sublateral canals (as measured by each ditchrider) by measuring the flowrate through rated structures. These flowrates are then converted to acre feet and summed across the irrigation season. The total loss from the historic operations in 2018 was then compared to the total loss measured during the adaptive operations in 2019, capturing the improved water efficiency as represented by the reduction in total losses. Additional data records are provided in the attached Exhibit A.

Irrigation Flow Measurement:

a. The average annual water savings estimate assumes the reduction in water spilled equates to water saved. This savings estimate has been determined by summing the total loss measured leaving the main canal and the many sublaterals across a two-year period. The total loss of each year was then compared against each other to estimate the possible savings achievable with this type of technology. It was assumed that 2018 water operations reflected historic operations and loss values, and that 2019 represented the adaptive management. It was assumed that the stability and control manually created through discretized changes out of Haystack mimic the desired effects made possible by improved, fine-tuned automation at the 9 key automated gates within the Main Canal. Supporting data is attached. Included in the date are the daily readings reported by the ditchriders, and the daily readings reported by measurement site 25.75.

b. The essence of our calculations relies on accounting the current losses and reduced operational spill. All data and calculations provided above also apply here.

c. The measurements made by the ditchriders differ in accuracy to the measurement site 65.12 because different means of measurement are applied. Measurement site 65.12 is

a rated site, affixed with a shaft encoder and a programmable logic control recording data every 15 minutes within +/- 0.05 cfs accuracy. The data used for the main canal loss within this study relied on the daily average of these 15-minute readings. The measurements made by the ditchriders were manual measurements using a weir stick through a rated weir structure. These measurements were made once a day, comparable to a single data point rather than a daily average. It is assumed that the flow rate measured by the ditchrider is representative of the flow for the next 24 hrs between measurements. The weir stick and structure measurements are made within +/- 0.01 cfs. The existing accuracy has been established through proper utility of the water measurement equipment and the use of rated sections.

d. At measurement site 65.12, a Waterlog H-3301.3311 incremental shaft encoder is installed within a stilling basin. Upstream and downstream of this measurement site are drops in the canal which break the connection and influence of other gates and deliveries up and downstream. Oregon Water Resource Department came to measure the flow profile across a broad range of flowrates to create a rated curve based on the height of flow through this section. A staff gauge on the outside of the stilling basin is used in conjunction with flow profile to create an equation that equates pool height to flow rate. That equation was entered into the programable logic control and checked regularly for accuracy. The ditchriders use weir sticks through the Cippoletti weir structures. The accuracy is limited by the graduation of the weir stick, which only measured to 0.01 head value (+/-0.01 cfs).

e. By stabilizing the flow within the main canal through improved automation, waves and drops in the canal flow will reduce. Also, the response time to resolve a missed target flow rate will be quicker to reduce loss through spill out the tail end, or risk of crop damage when canal flows drop too low to maintain deliveries.

f. The actual water savings will be verified through the reduced spill from measurement site 65.12 and the tail end readings provided by the ditchriders. An additional qualitative verification can be made by tracking the decrease in "free water" not charged to the farmers.

Evaluation Criteria B: Water Supply Reliability

1. North Unit Irrigation District is the junior water rights holder to the Deschutes River, a river overallocated since the start of the 20th century. In response to the obvious overallocation, North Unit Irrigation District with the Bureau of Reclamation constructed Wickiup Reservoir to provide for the 58,000 acres planned within the North Unit Project. Since, the District relies heavily on Wickiup Reservoir to survive. During an average year, 70% of the water diverted for the District comes from Wickiup Reservoir, identifying this reservoir as the Districts primary lifeline. Most years this reservoir fills, providing 200,000 acre-feet for the District's 58,000 acres of irrigatable acres. In 2016, a

lawsuit against North Unit Irrigation District and the other irrigation district who have storage in Wickiup Reservoir and Crane Prairie Reservoir changed the management of Wickiup Dam, significantly cutting into the supply stored in Wickiup Reservoir. The lawsuit focused on the impact Wickiup dam operations have had on the endangered Oregon spotted frog (OSF) habitat, overwintering and reproductive success. In response, the Deschutes Basin Habitat Conservation Plan (final draft in review 2020) was proposed to adapt dam operations to reduce any impact on the endangered species of the Upper Deschutes River. Within this agreement, for the first 5-7 years Wickiup Dam dischargers 30,000 acre-feet of stored water (20% of the Wickiup Reservoir's capacity) throughout the winter to provide key overwinter and reproductive habitat for the OSF. Water released in the winter cannot be diverted for irrigation and considered unavailable to the District. As a result, the Wickiup Reservoir was completely drained by the end of the 2018 and 2020 irrigation season, leaving only the Deschutes River to pass through the reservoir. As a result of the record low season-end capacity, and increased winter releases, Wickiup Reservoir started 2019 and 2020 irrigation season with record low starting capacities, 137,000 and 141,000 acre-feet, respectively. The District then started both 2019 and 2020 irrigation seasons with tight allotments rarely seen throughout its history, limiting water usage to 60-75% of a water user's minimum water right. As a result, 30-40% of the District land has been left fallow to pool resources and endure the water shortage. Yet, even with the limiting allotments, the District has needed to shut down periodically because of drought and shortage. The shutdowns design to refill storage reservoirs so delivery at key times, such as fall "water back," can be achieved before winter.

Unfortunately, after another 5-10 years further (specifics still under discussion within the draft Deschutes Basin Habitat Conservation Plan), the winter discharge rate will increase to 60,000 acre-feet throughout the winter for the endangered OSF. The eventual goal being to release 100,000+ acre-feet of stored water throughout the winter, synonymous to returning the Upper Deschutes to its management prior to the construction of Wickiup Dam in the 1930's. It should go without saying that if 200,000 acre-feet of stored water makes up roughly 80% of District's diverted water, that removing 30,000, 60,000 and especially over 100,000 acre-feet of water will surely dry up this agricultural region within the next few decades.

Any effort to improve the water efficiency within any of the irrigation districts dependent on the Deschutes River supports the removed reliance on storage with Wickiup Reservoir and supports the survival of North Unit Irrigation District. This project is one of many focused on maximizing the control and water efficiency of the District's open canal network and invaluable towards the District's survival. Currently this project will help make up 3,300 of the 30,000 acre-feet of storage currently released in the winter for the

OSF and no longer accessible to the District. It also lays the groundwork for further innovation through controlled flow measurement technology.

Frequency of Natural Drought: The Deschutes Basin includes both the head waters for the Deschutes and Crooked Rivers and has experienced more frequent and extreme droughts. Climate scientists have predicted more rain in lieu of snowpack and more extreme weather events such as drought or severe storms in the Pacific Northwest; and the past three decades have proven to support these predictions. Five of the past ten years have set climate records for the century, each breaking the record of the last (Table 4). The winters have been equally as variable, with either minimal snow or record-breaking precipitation events that have collapsed buildings and flooded the region. For agriculture, this has lowered the certainty that Wickiup Reservoir will fill as a result of melted snowpack, and an increased summer irrigation demands in order to endure the extreme heat and dry spells. Currently, the average difference between the available water diverted during a normal versus a dry year is 23,000 acre-feet per season. It is expected that the droughts will become more extreme; therefore, increasing the gap between supply and demand and mandating more to endure the shortages.

*Table 4. Estimated Percent of Total Diversion by Source. Access to natural flow from the Deschutes River drops drastically during dry years. *10,000 acre-feet is purchased from Prineville Reservoir as a drought resilience strategy, Prineville Reservoir is not a primary water source for the District*

Estimated Percent of Total Diversion by Source

Water Source	**Non-Dry Year**	**Dry Year**
Natural Flow: Deschutes River	25%	10%
Storage: Wickiup Reservoir	70%	80%
Natural Flow: Crooked River	5%	5%
*Stored: Prineville Reservoir**	0%	5%

Frequency of Management-Caused Shortage: In addition to the natural shortages, the recent operational changes to Wickiup Reservoir (as of 2016) in protection of the ESA Oregon spotted frog have introduced regulatory droughts more extreme than most natural droughts experienced by the District. On average, limited supply during a natural drought have necessitated the District to reduce the diversion total by ~30,000 acre-feet a year. To provide for the Oregon Spotted Frog over-wintering habitat, the District must discharge- without means of recovery- 15,000 acre-feet each winter. Each spring, in April alone, the District releases another 15,000 acre feet to provide breeding habitat for the frog, bringing the total to 30,000 acre feet each year lost to habitat creation for the frog as well as all other benefiting fish and wildlife. With time, the winter discharge rate is planned to double or triple, leading to 45,000- 60,000 acre-feet of unrecoverable storage loss each winter. With the current discharge agreement alone, the loss of stored water already

exceeds the average historic deficit for natural droughts. The strength behind preserving the Deschutes River and all dependent fish and wildlife comes from it being a well-established Wild and Scenic region, rich with wildlife and a valued salmon passage. Rather than obstructing these goals, the District has switched their focus toward the Crooked River. As a basin, fellow irrigation district, water resource managers, key environmental groups, etc. have identified the need for the District to shift dependence away from Wickiup Reservoir and instead gaining access to water through the Crooked River.

Economic Impact: As a result of an average, natural shortage, the difference between a sufficient supply and a struggling water shortage for the District is 23,000 acre-feet. In a non-dry year, the District diverts on average 210,000 acre-feet into our system to provide the 2.00 acre-feet per acre defined by our junior water right. During a dry year, the average diversion drops down to 187,000 acre-feet which can only support a 1.80 acre-feet per acre allotment with the current delivery system. For farmers, decreasing the allotment by 0.20 from 2.00 to 1.80 acre-feet per acre (10% loss of total available water) fundamentally changes their plan for that year and the economic loss follows them to the next. In comparison, a 0.20 acre foot per acre loss to senior water users would only reduce their water usage from ~6 to 5.8 acre feet per acre (3% loss) which is unmeasurable by their current delivery technology and has no impact on their economic production. Shortages from changes in reservoir management (Oregon spotted frog) have decreased the allotment to 1.50 acre-feet per acre from the Deschutes River, which has not been seen in decades. Allotments at this level challenge the risk-to-reward balance of every individual dependent on that water for their livelihood.

Senior water rights holders sustain their high allotment through dry and non-dry years to support urban areas and minimal agriculture, grossing $26 million in agricultural sales and economic value. With the 2.00 acre-feet per acre for Deschutes River and 1.00 acre-foot per acre for Crooked River allotments, the District supports a respectable agricultural community with a $194 million economic impact, grossing over $75 million in sales alone. However, with this large gross return, the wealth is not spread in a way that returns to the farmers because this region also pays the most per drop of water than any other irrigation district in the region. The region gives excessively to the economy, but the cost of water cuts deeply into operational costs, limiting each private farmers' and ranchers' financial stability. Operational costs are high because of the burdens placed on the District as a junior water right holder. They must pay to purchase additional water from Prineville Reservoir, pay to pump water from the Crooked River since there is not enough natural flow left in the Deschutes River, and pay for legal counsel to properly manage the influence irrigation water management has on endangered species and the greater watershed.

In response to the decreased allotment, farmers within the District struggle to switch between types of crops because a switch might require different equipment or more labor than available. Therefore, even if the opportunity arrives to grow a different crop on less water, if the farmer cannot afford the equipment or labor, the field will instead be left fallow. Most of the irrigated acres in the District are set up to grow wheat, hay or grass seed; an important minority grow high-value, "cash crops" such as hybrid carrot seed, garlic, and peppermint oil. Many farmers who contribute to the over 55% of the nations' and 40% of the world hybrid carrot seed (grossing over $15 million in carrot seed alone); but not all will be able to carry that production demand and risk under such a small allotment. Normal or wet years provide for more water-thirsty wheat harvests, while dry years must limit to grass seed production of the least risk. Unlike popular belief, cash crops such as garlic, or carrot seed, do not increase significantly during dry years because of the risk involved in their production. The process requires high investment in drip tape and labor which are often covered by the high return. But the risk to reward does not make it a better drought resilience strategy over fallowing land. It is unknown how much is economically lost due to the choice in planted crop type and reduction in planted acres chosen to sustain operations through such a low allotment.

Water Quality Impact: Water shortages within the District lead to an economic loss on a regional to global scale, while also introducing water quality concerns within the basin from fallowed land. Because the water allotment is normally low, there is little room to buffer the impacts of droughts and water shortages. Decreased allotments in response to water shortages are applied equally across all District acres, and as a result the allotment is often below the minimum irrigation demand for most crops. In order to ensure that the crop they do plant can survive and meet necessary quality requirements, the farmer will leave much of their fields fallow and bunch their water rights on fewer acres. Land fallowing has been an effective drought resilience strategy, but the fallowed land erodes, causing water and air quality issues as the topsoil is washed or blown away. Great efforts to increase cover crop usage and sediment catch ponds have been employed throughout the District, but there is still much more to be done. Erosion has caused most sediment ponds to fill, and maintenance on these private ponds have been hard to fund or sustain. Because the allotment is normally low, roughly 3,000 acres (5% of all irrigatable acreage) is left fallow within the District. Based on the past 10 years, that total acreage fallowed doubles during a water shortage- endangering surrounding water ways to water quality issues under unfortunate circumstances. The response of the agricultural community on a 1.25 acre foot per acre for the Deschutes River and 0.60 acre foot per acre for Crooked River allotment (as set in 2020) has not been fully understood due to its rarity, but it can be predicted that the amount of fallowed land will increase significantly and beyond any historic level.

2. This project will benefit agricultural, environmental and the local community and economy within Jefferson County, as well as the United States and the global economy. Recall, Jefferson County is predominantly an agricultural community, where most businesses rely on the patronage of growers in the area. The growers within the District provide over 55% of the hybrid carrot seed for the nation, and over 40% of the hybrid carrot seed for the world. Based on the significant deficit in water supply, many fields have been left fallow, many businesses and farms filed bankruptcy, as growers have struggled to survive on 60-75% of their income multiple years in a role due to insufficient water supplies. Conservation projects being imperative to balance the releases from Wickiup Reservoir throughout the winter with the summer demands of the agricultural economy of North Unit Irrigation District.

   By improving conveyance efficiency through this project, the District will require less water to make the expected deliveries. Less water for the District further supports the release of winter flow from Wickiup Reservoir for the endangered OSF. It also indirectly supports the reintroduction of the ESA-protected Middle Columbia Steelhead to the Crooked River. Improved stability and control remove spill into the Crooked River which improves the water quality within the Crooked River. The poor water quality observed leaving agricultural lands, high in turbidity, pesticides, nutrients, and more, impacts the habitat quality the sensitive aquatic life.

   This project indirectly benefits the Warm Springs Reservation, home to three Indian tribes. The Warm Springs Reservation is located just outside the northern edge of North Unit Irrigation District, the proximity leads to shared resources, jobs, and community. Impacts on the growers within North Unit translate to the local economy which includes that within the reservation. The reservation, also, has partnered with Portland General Electric to design and advocate for the reintroduction on the Middle Columbia Steelhead to the Crooked River.

   The conserved water will be held within Haystack Reservoir for a more controlled and targeted release during the irrigation season- in exchange for winter releases for the endangered OSF from Wickiup Reservoir. Currently, 40,000 acre-feet of stored water is released during the winter for the OSF, a deficit the District cannot afford without improved conveyance efficiencies like this project. This is only one of many steps needed to improve conveyance efficiencies within the District distribution system, and to remove the water shortage burden off the farmers.

3. The Deschutes River Basin Habitat Conservation Plan (HCP) was voluntarily started in 2008, though it has inspired lawsuits along the way and to further to come, it has also led to the creation of a collaborative network among diverse parties. The HCP has brought together the federal environmental agencies, non-profit agencies, irrigation districts, and local municipalities to create a working document that addresses shared goals. The need

for collaboration further led to the creation of the Coalition for the Deschutes which focused to create a *Shared Vision* for the health of the Deschutes River that supports fish, families, and farms. The Coalition for the Deschutes brings together stakeholders in recreation, non-profits, government, environmental, industry and agriculture, food and beverage, and general community members abroad to support the increased efficiency of irrigation district distribution systems in exchange for flow in the Deschutes river for aquatic species like the OSF. North Unit Irrigation District holds a seat on the board, among others, of this collaborative group and supports their efforts to find shared resolution for this effective management of natural resources within the Deschutes Basin.

4. North Unit Irrigation District operates at 60% water efficiency throughout its distribution system, this project has the potential to increase that efficiency and support the District through water shortages. By needing less water to make deliveries, the region can survive in light of the significant loss in its water supply.

Evaluation Criteria C: Implementing Hydropower

This project does not include hydropower. It can, however, collect the data needed to identify locations within the district suitable for hydropower by measuring flowrate within the main canal.

Evaluation Criteria D: Complementing On-Farm Irrigation Improvements

Though there has been heavy NRCS involvement within the District to improve the water efficiency on-farm and water quality from on-farm runoff, this project does not directly encourage on-farm innovations. Instead, this project supports NRCS activity currently underway within Jefferson County. Focus has been placed by the NRCS to provide EQIP funding for on-farm efficiency projects within the Agency Plains and to create a Pesticide Stewardship Program focused to reduce pesticide transport into natural waters. This program focuses to replace furrow irrigation with sprinkler and to install settling ponds or beaver dam analogs to increase sedimentation and filtration prior to the spill's return to natural waters. This region is within North Unit and will directly benefit from the installation of these gates and automation sites. Though this project does not lead to EQIP funding, the current EQIP project focus will benefit from this project and the efforts underway. This project will reduce operational water that historically spills onto grower's land and overflows into natural water, contributing to contaminant transport into natural waters.

Evaluation Criteria E: Department of Interior Priorities

This project is designed to *create a conservation stewardship legacy second only to Teddy Roosevelt.* The District is challenged to release more stored water to create habitat along the banks of the Deschutes River. This timing of habitat creation has created conflict because it challenges the Districts ability to efficiently manage all their available water. However, by optimizing our diversion technology from the Crooked River, as previously referencesd, we are achieving three higher goals: (1) reduce the demand on Wickiup Reservoir and therefore the

conflicting competition with endangered species for stored water, (2) improve stability in our water supply, whether caused by management or environmental changes to the watershed, and (3) ensure water quality and precise quantity is maintained in the Crooked River in anticipation for Middle Columbia Steelhead reintroduction. The District has been very supportive of *restoring trust with local communities* by seeking cooperative solutions to balance operational demands or limited logistical barriers with greater watershed goals. Not only has this project ensured the protection of habitat for fish and wildlife, but it has also strengthened relationships with local natural resource offices, fish and wildlife officers, water authorities and energy providers. Its value in *striking a regulator balance* comes from this projects ability to sustain quality habitat for the ESA Middle Columbia Steelhead within the Crooked River by maintaining a constant flow on the river, while also reducing competition for stored water with the ESA Oregon Spotted Frog because our water will be more efficiently diverted from the Crooked River. Lastly, the process of *modernizing our infrastructure* will improve our energy efficiency, lower our operations cost, and improve our ability to effectively manage our water supply with respect to our patrons and the fish and wildlife of our watershed.

Evaluation Criteria F: Project Implementation

The project will be performed during the non-irrigation season while the main canal is drained of water. The non-irrigation season is from October to March, and often this time is needed to make repairs on the system and prepare for the follow season. The project will be implemented between October and February to avoid competing with necessary "startup" maintenance in March and will be limited by weather since the non-irrigation season overlaps with the winter. The project will be implemented in three phases and each phase will follow the same three stages: (1) the staging, (2) the installation, and (3) the furnishing. Staging will include clearing out the old gates and equipment and installing the frames for the new automated gates. The installation not only requires installing the new sliding gates, but also the Rotork motors. And the furnishing will include the operational wiring, upgrading the programmable logic control and troubleshooting to finalize the project. Each check structure will be furnished to completion, one at a time, to avoid confusion, errors, and allow for the benefit of learning from the previous gate.

Phase 1: Staging

Following the end of the irrigation season in October, the canals will be drained of water and the check bays will be cleared of their wooden boards. An excavator will be used to remove the old sliding gate and motor from the check structure. An equipment truck will provide power through a generator to effectively disassemble the current gate structure. All parts will be removed, and new frames will be installed on the three central check bay windows. This phase will take the longest of the three. First, removal of each gate will take 3 days per site to properly remove and clear old framing. Installing the new frames will take 3 days per site.

Phase 2: Installation

Once the frames are constructed, the sliding gates will be installed into the frames with the excavator. The Rotor motors will then be secured and installed on top of the sliding gates. Conduit for the new wiring will be installed. Installing the sliding gates will take 3 days per site, installing the motors will take 2 days, and the conduit will take 1 day.

Phase 3: Furnishing

Lastly, the motors will be wired to the programmable logic control. And the programmable logic control will be coded to control the three gates, have its only automation logic, and synchronize that gate into the greater network of gates within the main canal. Wiring the motor will only take one day per site. Creating the code and integrating the logic control into the greater network will take weeks- through the same code can be used for each site, compounding the time needed.

Year 1 will include the feeder canal and bypass chute gates at Haystack Reservoir, gate 50, 51, and 56. Year 2 will include Gates 58, p58, 61, and 64.

Evaluation Criteria G: Nexus to Reclamation

This project improves the conveyance efficiency of the North Unit Irrigation District, also known as the North Unit of the Deschutes Project (a Bureau of Reclamation Project). The District receives and manages project water, though the District is still repaying its debt to the Bureau. The project proposed is within Reclamation project lands, involves Reclamation facilities, takes place in the same basin as other Reclamation projects, and contributes water to a basin where other Reclamation projects are located.

Project Budget

Cost-Share Requirements

This project will leverage $244,871.44 of federal investments along with $266,739.11 of non-federal investments to provide the maximum benefits to all funding partners. The District will provide the $266,739.11 of in-kind and cost share to match the 50:50 cost share.

Pre-Project Costs

North Unit Irrigation District anticipates that this project, as funded by Reclamation, will start April 2021 and no pre-project costs will be encored prior to said Reclamation funding.

Funding Partners

The District has no additional partners for this project.

Other Federal Funds

No federal funds have been requested or received from other sources.

Pending Funding Requests

No additional funding is pending.

Funding Summary

Table 5. Summary of non-federal and federal funding sources.

Funding Sources	Funding Amount
Non-Federal Entities	
1. North Unit Irrigation District in-kind contributions	$266,739.11
Non-Federal Subtotal	$266,739.11
Requested Reclamation Funding	$244,871.44
Total Project Funding	**$511,610.55**

Budget Narrative

Salaries and Wages: The salaries and wages listed in the budget are the in-kind/indirect contributions from the North Unit Irrigation District. District employees will provide the labor in the installation of the construction of the enclosing structure, guidance of the installation, and monitoring of the project logistically and financially. The price per hour set for District employees was based on their current wage as of January 1, 2021. Employee's wages will increase on January 1 of each year of the project and based on the Collective Bargaining Agreement will increase a minimum of 2.5% to 4% based on the CPI that year.

The Operations Manager Gary Calhoun will oversee the entire project. The Watermaster/ Construction Manager will manage the construction of the structure, the installation of the sliding gates and final furnishing details necessary for automation. The Special Projects Manager, Lisa Windom, will manage and coordinate the integration of the automation into the current automation system and design a data measurement system to record and analyze the success of the project. All three will be involved in updating operational protocol to ensure the new equipment is operated to meet all regulations and water management goals. The Finance Manager Jackie Looney and Water Records Clerk II Susan Light will complete the necessary grant paperwork and accounting. The majority of the work will be performed by the maintenance staff, who will also be transporting and operating equipment. All removal, fitting, fabricating and installing of the gates, the motors, the automation are all performed by the maintenance staff. An estimate of hourly time is listed in the budget breakdown with an hourly rate based on current wages effective January 1, 2021. The personnel wages usually increase January 1 of each year based on the CPI.

Fringe benefits: Hourly fringe benefit rates were calculated based on individual employee benefits. These rates will change over the life of the grant based on current rates. Fringe benefits and rates include the following

1) FICA/Medicare tax - 7.65%

2) Unemployment tax - 0.10%
3) Workers' Compensation – 3.74% project employees & 0.12% administrative and office employees
4) 401k retirement – 5.75%
5) Health insurance – 9.30 per hour
6) Life Insurance - $0.09 per hour
7) Short Term Disability Insurance - $.19 per hour
8) Health Reimbursement Arrangement - $0.38
9) Employee Housing Benefits- $0.93 per sq. ft.

Travel: This project requires the transport of four vehicles, 20-40 miles round trip, over 40 days of work. Each car is experiencing $0.58 in gas and wear per mile for a total of 4,883.60 miles.

Equipment: This District will use equipment owned by North Unit Irrigation District and operated by internal staff to construct the enclosure building. All equipment will be transported from the District's central base to the gate structure by the Districts truck and lowboy. The 320 Excavator will be used to remove the existing gate structure and install the new one.

Materials and Supplies: This project requires materials to fabricate, fit the gate frame and protect the new wiring through weather resistant conduit. Each station will require an on-site programmable logic control which will control the gate, collect data, and transport to a central SCADA system via cellular connection.

Contractual: The District will not enter into any contracts to complete this project.

Environmental and Regulatory Compliance Costs: This project will need a completed environmental assessment per the Bureau's direction, the cost of which has been included in the budget.

Reporting: District staff will be responsible for the reports on the status of the project as per the grant guidelines. The hours spent on reporting are included in the in-kind hours reported in the budget. The office manager will prepare the financial reports and the manager and assistant manager will provide the progress reports.

Other Expenses: None

Indirect Costs: None

Total Costs: $511,610.55

Detailed Project Budget

Please refer to Table 6, which provides the detailed breakdown of all costs encountered during the project.

Table 6. Proposed itemized budget for project Optimize Conveyance Efficiency and Control in North Unit Irrigation District Main Canal.

	RATE	NUMBER	UNITS	TOTAL COST
PERSONNEL COST				
Mike Britton, General Manager	$ 54.65	0	hours	$ -
Gary Calhoun, Operations Manager	$ 38.40	90	hours	$ 3,456.00
Josh Bailey, Watermaster/Construction Manager	$ 33.39	148	hours	$ 4,941.72
Jackie Looney, Office Manager	$ 34.07	23	hours	$ 783.61
Lisa Windom, Special Projects Manager	$ 29.01	219	hours	$ 6,353.19
Sue Light, Water Records Clark	$ 26.13	41	hours	$ 1,071.33
Maintenance Staff 1-Marcus	$ 25.37	850	hours	$ 21,564.50
Maintenance Staff 2-Kent Moe	$ 23.17	1882	hours	$ 43,605.94
Maintenance Staff 3-Lane	$ 25.37	568	hours	$ 14,410.16
Maintenance Staff 4- Rex	$ 25.37	512	hours	$ 12,989.44
SUBTOTAL				*$ 109,175.89*
FRINGE BENEFITS				
Mike Britton, General Manager	$ 23.15	0	hours	$ -
Gary Calhoun, Operations Manager	$ 24.24	90	hours	$ 2,181.60
Watermaster/Construction Manager	$ 28.55	148	hours	$ 4,225.40
Jackie Looney, Office Manager	$ 14.63	23	hours	$ 336.49
Lisa Windom, Special Projects Manager	$ 19.20	219	hours	$ 4,204.80
Sue Light, Water Records Clark	$ 13.51	41	hours	$ 553.91
Maintenance Staff 1	$ 22.18	850	hours	$ 18,853.00

Maintenance Staff 2	$ 14.31	1882	hours	$ 26,931.42
Maintenance Staff 3	$ 19.83	568	hours	$ 11,263.44
Maintenance Staff 4	$ 14.35	512	hours	$ 7,347.20
SUBTOTAL				*$ 75,897.26*
-				-
TRAVEL	-	-	-	-
Employee Transport	$ 0.58	8420	miles	$ 4,883.60
SUBTOTAL				*$ 4,883.60*
-				-
EQUIPMENT	-	-	-	-
321DLCD Excavator	$ 63.79	576	hours	$ 36,743.04
Equipment Transport-Lowboy	$ 56.07	468	hours	$ 26,240.76
Work Truck w/ Tools and Generator (Car 27)	$ 19.38	712	hours	$ 13,798.56
SUBTOTAL				*$ 76,782.36*
-				-
SUPPLIES AND MATERIALS	-	-	-	-
SCADA	-	-	-	-
RTMC PRO	$ 1,225.00	1	each	$ 1,225.00
TRMCRT-D	$ 85.00	1	each	$ 85.00
Onsite Automation/PLC	-	-	-	-
CR1000X	$ 1,700.00	16	each	$ 27,200.00
Cell210-V	$ 450.00	16	each	$ 7,200.00
Short Wave Radio	$ 200.00	1	each	$ 200.00
Wiring	$ 300.00	16	each	$ 4,800.00
NEMA Box	$ 150.00	16	each	$ 2,400.00
Gate Position Sensor	$ 180.00	16	each	$ 2,880.00
WaterLOG Shaft Encoder	$ 1,400.00	15	each	$ 21,000.00
Settling Basin Conversion	$ 200.00	16	each	$ 3,200.00
Gate/Rotork Motors	-	-	-	-
Sliding Gates	$ 2,436.34	16	each	$ 38,981.44
Rotork Motors	$ 4,700.00	16	each	$ 75,200.00
Radial Gate Motor Boxes	$ 13,500.00	4	each	$ 54,000.00
SUBTOTAL				*$ 238,371.44*
-				-
CONTRACTS	-	-	-	$ 0.00
-				-
OTHER				

Reclamation environmental and cultural compliance costs	$6,500.00	1	-	$ 6,500.00
SUBTOTAL				$ 6,500.00
TOTAL DIRECT CHARGES				$ 244,871.44
INDIRECT/INKIND CHARGES				$ 266,739.11
TOTALS	-	-	-	$ 511,610.55
NUID		**In-kind**		$ 266,739.11
BOR		**Federal**		$ 244,871.44
Total				**$ 511,610.55**

Environmental Compliance

The project will complete any environmental compliance discovered in its assessment.

Funding Plan and Letters of Commitment

The District provides its commitment to funding this project.

Environmental and Cultural Resources Compliance

The project will complete any environmental compliance discovered in its assessment. The automation currently installed on these gates is not original, and an assessment has been performed on the North Unit Main Canal to capture the historic and cultural value of the open canal network. There has also been an in-depth cultural assessment performed by the Bureau of Reclamation to capture the cultural resource of the canal network: *Sage Brush to Clover, The U.S. Bureau of Reclamation North Unit of the Deschutes Project, Volume I and Volume II.*

Required Permits or Approvals

There are no required permits for this project.

Letters of Support

Please see Exhibit B for attached letters of support.

Official Resolution

Signed during the September 7, 2020 meeting with the District's Board of Directors (See Exhibit C)

Table 7. Adaptive management was applied 2017-2019. The loss measured by the ditchriders, and Main Canal as measured at measurement site 65.12, are averaged. Similarly, the historic management was applied between 2014-2016, the total loss each year was averaged. The averages were then compared to provide the total savings expected by applying the adaptive management.

Adaptive Management: 2019 Operational Spills				
	Farm Delv.	**Ditchriders**	**Main Canal (65.12)**	**Net Loss**
April	-	-	127.32	127.32
May	12.59	504.50	641.12	1,158.21
June	13.00	1,005.68	547.14	1,565.82
July	27.61	1,009.13	741.87	1,778.61
August	23.42	1,141.01	581.48	1,745.91
September	3.47	1,135.16	773.21	1,911.84
October	6.05	300.25	284.05	590.35
Total	86.14	5,095.73	3,696.18	8,878.05
Adaptive Management: 2018 Operational Spills				
	Farm Delv.	**Ditchriders**	**Main Canal (65.12)**	**Net Loss**
April	23.93	1,204.72	347.21	1,575.86
May	49.04	1,184.63	277.41	1,511.08
June	34.27	1,627.75	56.18	1,718.20
July	44.69	1,293.25	202.69	1,540.63
August	28.76	1,163.76	298.15	1,490.67
September	19.25	1,018.27	221.11	1,258.63
October	3.37	380.11	91.21	474.69
Total	203.31	7,872.49	1,493.96	9,569.76
Adaptive Management: 2017 Operational Spills				
	Farm Delv.	**Ditchriders**	**Main Canal (65.12)**	**Net Loss**
April	7.05	689.70	479.52	1,176.27
May	98.18	1,157.28	253.60	1,509.06
June	81.74	1,248.54	149.32	1,479.60
July	86.70	1,279.67	152.17	1,518.54
August	87.50	1,220.76	96.74	1,405.00
September	51.58	1,214.67	45.15	1,311.40
October	12.91	476.68	5.84	495.43
Total	425.66	7,287.30	1,182.35	8,895.31

Historic Management: 2016 Operational Spills				
	Farm Delv.	**Ditchriders**	**Main Canal (65.12)**	**Net Loss**
April	78.75	999.32	878.03	1,956.10
May	75.43	1,211.22	1,299.82	2,586.47
June	91.36	1,088.37	865.65	2,045.38
July	87.29	1,157.58	923.25	2,168.12
August	109.38	1,203.57	740.22	2,053.17
September	82.53	1,154.53	651.76	1,888.82
October	15.88	260.46	31.55	307.89
Total	540.62	7,075.05	5,390.28	13,005.95
Historic Management: 2014 Operational Spills				
	Farm Delv.	**Ditchriders**	**Main Canal (65.12)**	**Net Loss**
April	14.05	590.59	504.99	1,109.63
May	35.43	1,205.89	584.27	1,825.59
June	70.21	1,046.37	894.99	2,011.57
July	10.91	1,102.08	1,024.54	2,137.53
August	11.90	1,122.69	727.95	1,862.54
September	18.25	1,088.26	1,167.54	2,274.05
October	13.88	546.74	(17.50)	543.12
Total	174.63	6,702.62	4,886.78	11,764.03
Historic Management: 2013 Operational Spills				
	Farm Delv.	**Ditchriders**	**Main Canal (65.12)**	**Net Loss**
April	61.45	970.99	740.04	1,772.48
May	117.66	1,519.93	351.37	1,988.96
June	126.45	1,119.48	426.97	1,672.90
July	86.42	1,262.45	674.48	2,023.35
August	63.97	1,198.10	918.59	2,180.66
September	29.85	1,194.21	1,033.25	2,257.31
October	0.79	353.69	334.17	688.65
Total	486.59	7,618.85	4,478.87	12,584.31

Historic Management		Adaptive Management	
2016	13,005.95	2019	8,878.05
2015	11,764.03	2018	9,569.76
2013	12,584.31	2017	8895.3063
AVERAGE	12,451.43		9,114.37
Average Savings			3,337.06 acre-feet

Exhibit B (1/4)

COALITION FOR THE DESCHUTES

September 8, 2020

TO: Bureau of Reclamation

RE: North Unit Irrigation District WaterSMART 2021 Request for Project to "Optimize Conveyance Efficiency and Control in North Unit Irrigation District Main Canal"

The Coalition for the Deschutes (CFD) would like to express support for the Bureau of Reclamation WaterSMART 2021 project to optimize conveyance efficiency and control in the North Unit Irrigation District main canal. This system will stabilize flow within the canal network, eliminate unnecessary spill and control flow so that only the exact amount of water that has been ordered will be flowing through the canals. This will conserve water and eliminate spill into natural waters (which causes water quality issues downstream).

North Unit Irrigation District has worked closely with CFD to create projects and programs focused on restoring the health of the Deschutes River, encourage community collaboration and engagement, and to align projects with the Shared Vision. The Shared Vision focuses on restoring the health of the river so that fish, families, and farms can thrive and is supported by over 50 non-profits, local businesses, governmental agencies, irrigation districts, environmental groups, and local community members at large. The first step of this Shared Vision includes water efficiency projects within the irrigation district that lead to more water left in the Deschutes River. This project brings action to the shared goals held by North Unit, CFD and the many partners of the Shared Vision. By improving the conveyance efficiency and operational management of the water used for irrigation within North Unit, less water from the Deschutes River is needed to serve the farms within its district and more water is left instream to support endangered species such as the Oregon spotted frog, protected by the Endangered Species Act (ESA).

CFD has worked determinedly along side North Unit in the pursuit of sustainable and effective solutions towards balancing the needs of the Deschutes River and those of the agricultural communities. This project aligns with the values and efforts needed to realize our Shared Vision, supporting the health of the Deschutes River and the survival of the communities and farms dependent on it.

Sincerely,

Gail Snyder
Executive Director
Coalition for the Deschutes

Exhibit B (2/4)

September 8, 2020

TO: Bureau of Reclamation

RE: North Unit Irrigation District WaterSMART 2021 Request for Project to "Optimize Conveyance Efficiency and Control in North Unit Irrigation District Main Canal"

The Jefferson SWCD would like to express support for the WaterSMART 2021 project to optimize conveyance efficiency and control in the North Unit Irrigation District main canal. This system will stabilize flow within the canal network, eliminate unnecessary spill and control flow so that only the exact amount of water that has been ordered will be flowing through the canals. This will conserve water and eliminate spill into natural waters (which causes water quality issues downstream).

Most of the automation sites included in this project are located downstream of Haystack Reservoir and their upgrade will directly support the spill reduction into the Frog Springs drainage, Mud Springs/Trout Creek, Campbell Creek, and Rattlesnake drainage. This project will support an ongoing water quality program conducted by Jefferson County SWCD focused on reducing spill volume and its connection to natural waters. The proposed project will slow surface runoff containing sediment and nutrients consequently improving the water quality of Trout Creek. Trout Creek provides critical spawning habitat for summer steelhead and resident redband trout.

The Jefferson County SWCD supports NUID in the completion of this beneficial project. Since 2006 the Jefferson SWCD has contributed over $100,000.00 of in-kind technical assistance to assist NUID with piping projects and will commit to continued support in the future.

Sincerely,

Staci Merkt
District Manager

625 SE Salmon Avenue ~ Suite 6 ~ Redmond, OR 97756 541.699.3170

Exhibit B (3/4)

September 8, 2020

Mike Britton
North Unit Irrigation District
2024 NW Beech St.
Madras, OR 97741

Re: North Unit Irrigation District (NUID) WaterSMART 2021 Request for Project "Optimize Conveyance Efficiency and Control in NUID Main Canal"

The purpose of this letter is to express support for the Bureau of Reclamation WaterSMART funding for the SCADA, gate automation and flow measurement sites proposed by NUID in their 2021 application "Optimize Conveyance Efficiency and Control in NUID Main Canal."

The Oregon Water Resource Department (OWRD) has been working for decades with NUID and many partners to resolve prevalent water shortages as a result of periodic droughts and recent changes to Wickiup Reservoir operations. This project not only supports water conservation efforts needed to endure the water shortages, but it embodies natural resource stewardship through its responsible and tactical management. Not only has OWRD taken the time to rate NUID canals for flow measurement sites in the past, but it supports the continued installation of measurement devices and additional technology designed to effectively manage water more effectively in the open canal network.

OWRD has observed drought conditions within the Deschutes Basin 8 years out of the last 10. Each year, the drought has disproportionally impacted NUID because it is both the second largest irrigation district in the state, and the junior water right holder to the Deschutes River (an over appropriated river). Effective resource management through increased operational control and conveyance efficiency is the first step to endure the water shortages within the Deschutes Basin. OWRD has observed the dedication NUID has towards water efficiency and conservative water management and is confident this project will not only support the survival of the irrigation district but that this is the right District to implement the project.

If you have any questions, please call me at 541.306.6885.

Sincerely,

Kyle Gorman
Region Manager, South Central Region
Oregon Water Resources Department

Exhibit B (4/4)

MIDDLE DESCHUTES
WATERSHED COUNCIL

625 SE Salmon Ave., Suite 6
Redmond, Oregon 97756
(541) 604-9444
middledeschuteswc@gmail.com
middledeschuteswatershedcouncil.org

September 10, 2020

RE: Middle Deschutes Watershed Council Letter of Support for North Unit Irrigation District's Canal Efficiency and Control Optimization

Dear Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Review Team:

On behalf of the Middle Deschutes Watershed Council (MDWC), I am pleased to express support for the proposal set forth by the North Unit Irrigation District (NUID) to decrease spill volume and increase control of water transport and seepage in local canals. Funding this project is critical for the immediate and long-term water quantity and quality in the Deschutes River basin which is essential to aquatic restoration efforts throughout Central Oregon. As an organization that works collaboratively to restore aquatic habitat and provide educational opportunities for the community, the MDWC enthusiastically supports the advancement of irrigation canal technology.

Improving canal efficiency and control optimization of NUID's main canal will result in multiple ecological benefits to five watersheds within the agricultural communities of Central Oregon: Frog Springs, Mud Springs, Trout Creek, Campbell Creek, and Rattlesnake. Important to note is the high-quality summer steelhead habitat in Trout Creek, an area vital to support the population of Columbia River steelhead. By eliminating unnecessary spill of untreated agricultural tailwater into tributaries of the Deschutes River, like Trout Creek, NUID is preparing for future agricultural water needs in a most responsible and ecologically-sound manner.

Consideration of funding this canal efficiency, control optimization, and canal lining project will support the mission of MDWC to involve local people to enhance and protect the natural resources of the Middle Deschutes Watershed, namely through finding innovative solutions to problems posed by agricultural activities around rivers and streams of Central Oregon.

I look forward to continuing the partnership that MDWC has developed with NUID, and I recommend funding this project in its entirety. Please feel free to contact me with any questions.

All the best,

Jenna Keeton

Jenna Keeton
Middle Deschutes Watershed Council Coordinator

NORTH UNIT IRRIGATION DISTRICT
RESOLUTION NO. 2020-08

Optimize Conveyance Efficiency and Control in North Unit Irrigation District Main Canal

WHEREAS: The proposed project will involve the replacement and installation of automated gates within key controlling check bays within the main canal. The gates will be automated through an upgraded programmable logic control with code designed to smooth out fluctuations within the main canal and provide a connected SCADA system which simplifies operational control. The project will reduce the frequency and volume of water released in excess out the tail end, significantly reduce the labor required to manage the main canal, and reduce the potential safety risks associated with manually managing these gates. By improving conveyance efficiency, the District will improve its endurance through water shortages. The project will consist of in-house gate construction and installation of Campbell Scientific dataloggers. The project will stabilize river flows for endangered species, optimize diversion conveyance and minimize unnecessary loss and instability within the open canal network; and,

WHEREAS: The proposed project will strengthen the conveyance water, energy and operational efficiency for the District by increasing control within the main canal, whose benefits will cascade out to improve sub-lateral conveyance stability and reduce tail end flow.

NOW THEREFORE, BE IT RESOLVED that the Board of Directors agrees and authorizes that:

1. Michael Britton is the district official with the legal authority to enter into an agreement for financial assistance under the WaterSMART Grant;

2. The Board or governing body has reviewed and supports the proposal submitted;

3. The applicant is capable of providing the amount of funding and/or in-kind contributions, specified in the funding plan; and

4. If selected for a WaterSMART Grant, the applicant will work with the Bureau of Reclamation to meet established deadlines for entering into a cooperative agreement.

DATED: September 8, 2020

Martin Richards
Chairman

ATTEST:

Michael Britton
Secretary- Manager