WaterSMART:
Water and Energy Efficiency Grants for FY 2023

Lugert-Altus Irrigation District: Ozark Canal Conversion Project (Phase 1)

Prepared For:
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Denver Federal Center, Bldg. 67, Rm. 152
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July 28, 2023

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1. EXECUTIVE SUMMARY

Date: July 28, 2023
Applicant Name: Lugert-Altus Irrigation District
City, County, State: Altus, Jackson County, Oklahoma
Applicant Category: Category A, Funding Group III
Project Summary:
The Lugert-Altus Irrigation District, located in southwestern Oklahoma, will convert four miles of open, earthen canal that was constructed in the 1940s to a buried high-density polyethylene pipeline, in an area that experiences significant cyclical drought and extreme high temperatures. The Phase 1 project will result in annual water savings of 1,130 acre-feet per year (AFY) that is currently lost to seepage, evaporation, and operational inefficiencies. Conserved water will increase the reliability and resilience of: 1) irrigation water for the District's 547 farms and their crops which are valued at $100+ million annually, 2) municipal and industrial water for the City of Altus which is permitted for 4,800 AFY provided by the District, and 3) Lugert-Altus Reservoir which is a haven for fish and wildlife and a major recreation destination in southwestern Oklahoma.

Project Timeline: The estimated project period is 32 months:
Start date: May 2023
Completion Date: December 2025

Federal Facility: The proposed canal conversion project is on a Federal facility, the W.C. Austin Project, which is owned by the Bureau of Reclamation. The Bureau of Reclamation transferred operation and maintenance responsibility of the W.C. Austin Project to the Lugert-Altus Irrigation District via contract number I1r-1375. The District paid off their portion of the original construction debt in 1990, and the District is now self-supporting.

2. PROJECT LOCATION

Project Location

The Lugert-Altus Irrigation District (District) is located in Jackson, Kiowa, and Greer Counties in Southwestern Oklahoma, and surrounds the City of Altus (34°38 N -- 99°20 W), see map in Fig. 1. The District is located within the North Fork Red River (NFRR) Basin which encompasses all or part of nine counties in southwest Oklahoma and a southeast portion of the Texas panhandle. The proposed canal conversion project is located on a Federal facility, the W.C. Austin Project, which was constructed in the 1940s to provide water for agricultural irrigation; an augmented municipal water supply for the City of Altus, OK; fish and wildlife conservation benefits and recreation facilities on Lugert-Altus Reservoir; and flood control on the North Fork

of the Red River. The W.C. Austin Project includes the Reservoir, Altus Dam, and the irrigation network of canals, laterals, and drains.

Project Background

The District provides irrigation to 46,000 acres of privately-owned farmland that produces primarily cotton, but also winter wheat, alfalfa, peanuts, and grain sorghum, all valued at $100+ million annually. Irrigation benefits are provided through an irrigation water right that was granted to the District by the State of Oklahoma in 1939 (Application No. 39-23). The irrigation system is fed by Lugert-Altus Reservoir which is located just north of the irrigation district, covers 6,260 acres, and has a water volume of 128,919 acre-feet. The Reservoir impounds the North Fork Red River (NFRR) and is controlled by Altus Dam. The average annual irrigation delivery is approximately 58,000 acre-feet, and is delivered via a network that includes 52 miles of canals, 221 miles of laterals, and 26 miles of drains that were constructed in the late 1940s. There are four primary canals: the Main, West, Altus, and Ozark canals, see Fig. 2. The canals feed numerous laterals and water is delivered to the farms via turnouts. Water is delivered from the Reservoir and Altus Dam through the Main Canal with a design capacity of 1,000 cubic feet per second (cfs) that travels approximately four miles to the northern boundary of the irrigation district. Irrigation water is then split into the West Canal and the Altus Canal. The West Canal has a capacity of 290 cfs and travels west for six miles and then south for five miles. The Altus Canal has a capacity of 710 cfs and travels south for 21.7 miles through the City of Altus. The Ozark Canal is fed by the Altus Canal on the north side of the City of Altus and has a capacity of 180 cfs and continues south and east from the Altus Canal for 14.8 miles.

The delivery system for the District is divided into ten Ditch Rider Districts (DRDs). These DRDs are numbered 1 to 8, 14 and 18. A DRD consists of laterals and canals that deliver water to the farms in that area and each is managed by a single ditch rider. The District tracks the overall efficiency (water released/water sold) of the delivery system by these DRDs.

The irrigation season lasts from mid-June through mid-September. The available water is calculated using the month end storage of the Reservoir, reserve, evaporation rate per day, the number of days left in the irrigation season, total storage that can be delivered, delivery efficiency, and acreage irrigated. District policies regulate deliveries and orders. The farms pay a per acre assessment (which includes water costs) at the end of each irrigation season. The assessment is based on use and budget demands for the year. The current assessment is $20 per acre, with water priced at $50 per acre foot delivered. Those costs are expected to remain stable for the next few years depending on infrastructure needs.

Fig. 1: *Project Location Map*

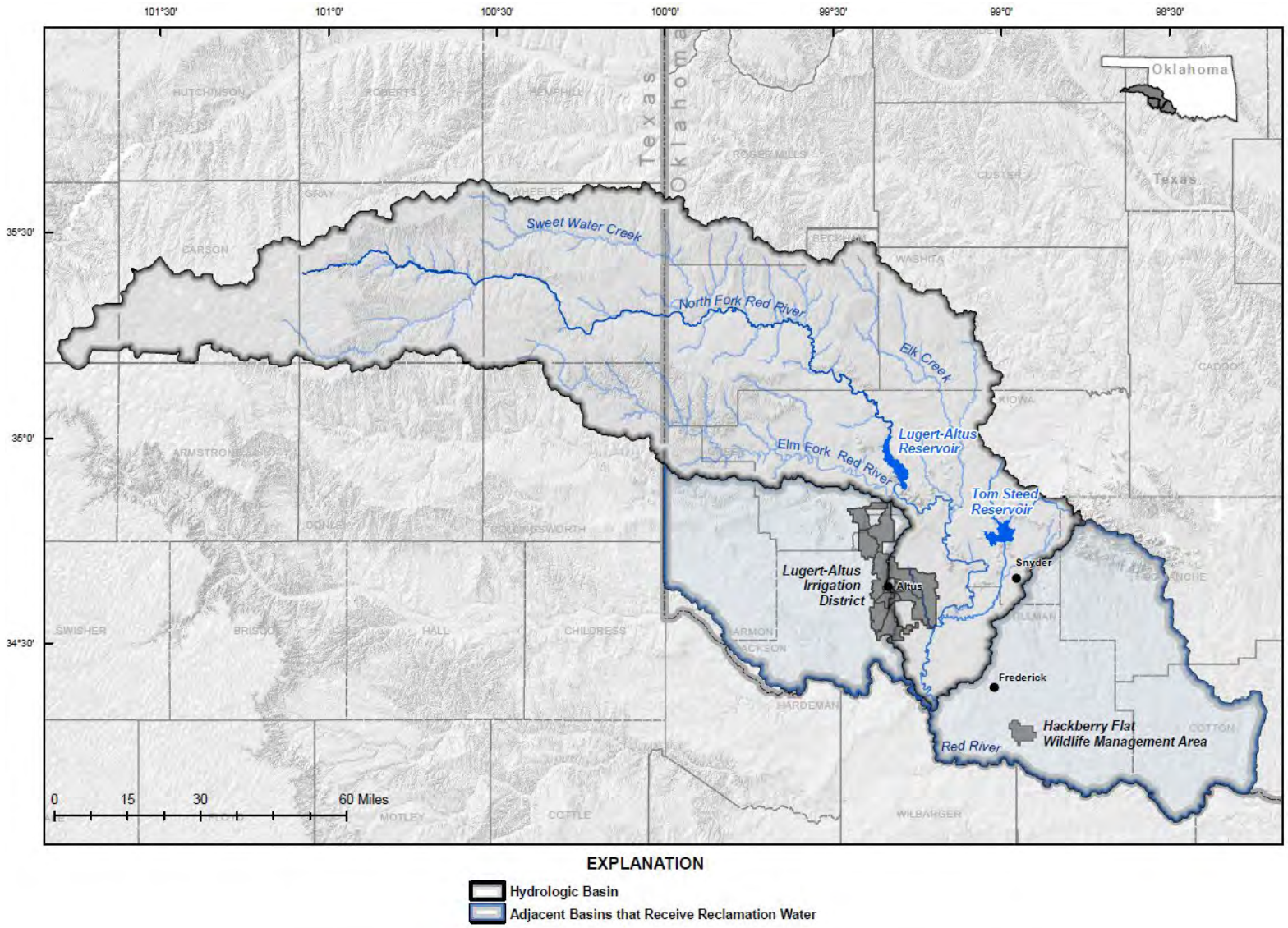
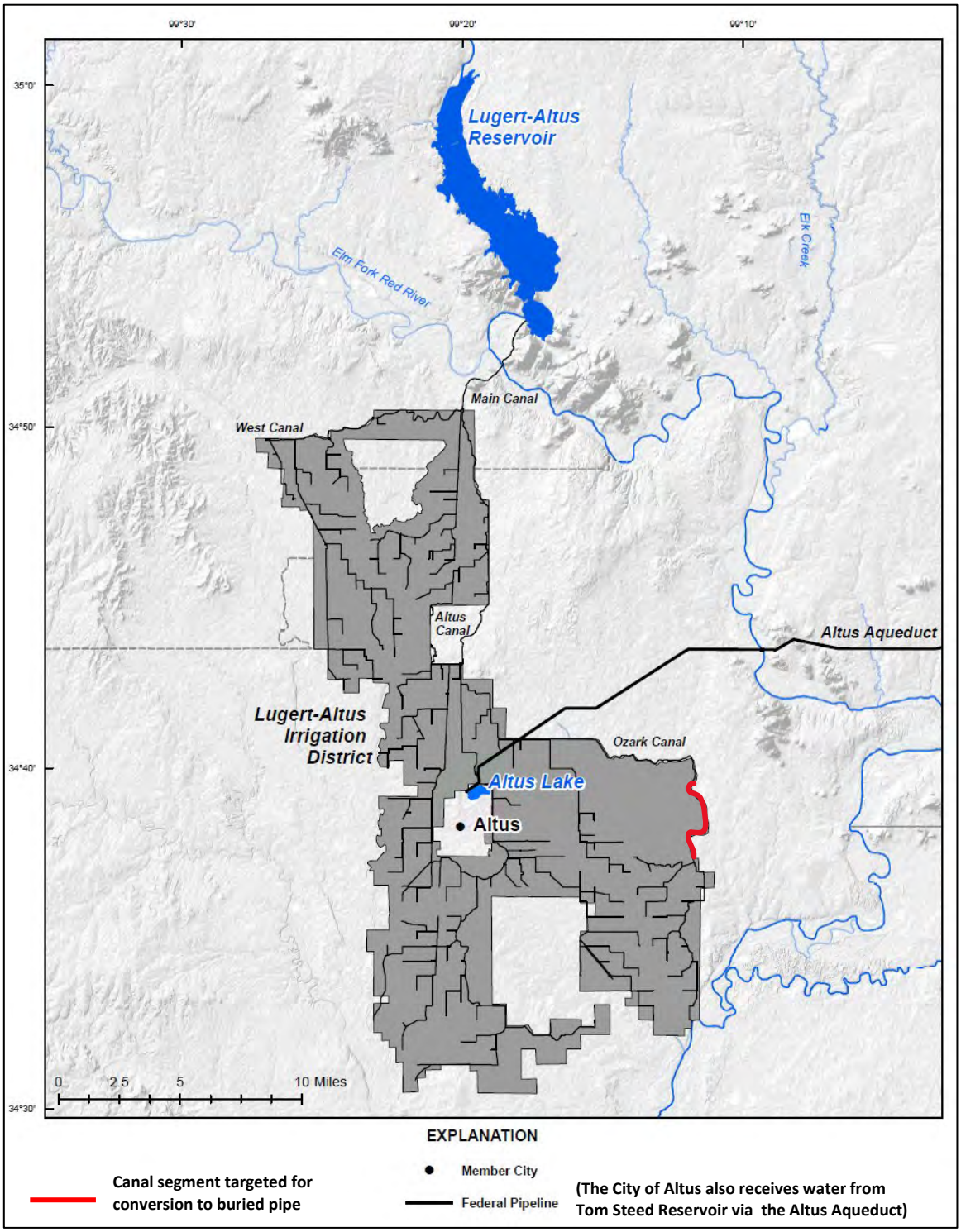


Fig. 2: *Lugert-Altus Reservoir and the District's Canals and Laterals*



Water Sources. Lugert-Altus Reservoir receives its surface water inflow from the NFRR. Groundwater discharge from underlying aquifers contribute base flows to the NFRR. The most significant groundwater feature affecting the Reservoir is the NFRR alluvial aquifer. The NFRR aquifer is located in Oklahoma's Beckham, Greer, Jackson, Kiowa, and Roger Mills Counties and is composed of approximately 777 square miles of alluvium and terrace deposits along the NFRR and tributaries. The NFRR aquifer is the subject of significant analysis in BOR's *Upper Red River Basin Study* (2022, in press).

Supply Challenges. The District's *2021 Water Conservation Plan* (Draft, 2021) outlines the challenges facing water supplies for Lugert-Altus Reservoir, the District, and the 547 farms that depend on the District's irrigation water.

1. Efficiency Losses. These include losses primarily from seepage and evaporation, but also transit inefficiencies, leakages, and over irrigation and resulting tailwaters that are "lost" to other uses. Losses due to seepage, evaporation, and operational losses account for 30-35% of the total 20,455 AF in water losses annually (2021 Water Conservation Plan Update) and are the primary challenge driving the need to convert the District's open canals to buried pipe (see Evaluation Criteria 1, below, for additional details about water losses and savings).

2. Drought, Climate, and Topography. Cyclical drought is the norm in southwestern Oklahoma. In modern times, west-central Oklahoma has experienced four major droughts on record: mid-1930s, mid-1950s, late-1960s/early-1970s, and 2010-2015, see Fig. 4, next page. A favorable pattern was in place for approximately 30 years until the catastrophic drought of 2010-2015 (now the 2010s Drought of Record). Unlike droughts in the past, this drought had a quick onset; reduced rainfall and runoff in the fall of 2010 rapidly manifested into a historic hydrologic drought the following year as surface water supplies dwindled. No region of Oklahoma suffered as much or for so long from the 2010-2015 statewide drought as the southwest. For five years, progressively worsening precipitation deficits dealt a devastating blow to communities, industries, and businesses in southwest Oklahoma. The District's crop losses were significant, and, for the first time in 60 years, the District was unable to provide irrigation water to the District's 547 farms (in 2012, 2013, and in 2014).

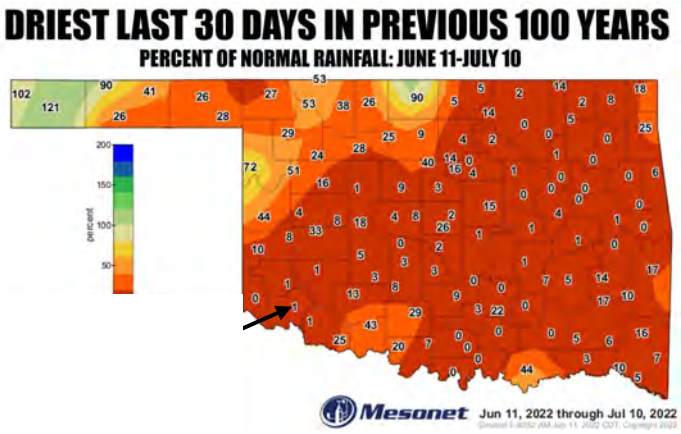


Fig. 3: *Current state of drought in Oklahoma (source: Oklahoma Mesonet)*

Since then, the drought severity has waxed and waned, but the area has mostly remained in a Moderate to Exceptional drought. The Oklahoma Mesonet released data on July 11, 2022 (see Fig. 3) illustrating that the last 30 days in the State have been the driest it has been for the last 100 years. For southwest Oklahoma it is the second driest it has been in the last 100 years with current precipitation only 10% of normal. Oklahoma State University Extension officials have indicated that early cotton establishment is in question, and the winter wheat outcome looks to be devastating with a 50% decline in yields in the western part of the State. The National Weather Service's Climate Prediction Center is calling for drought to persist in the region for at least the next three months.

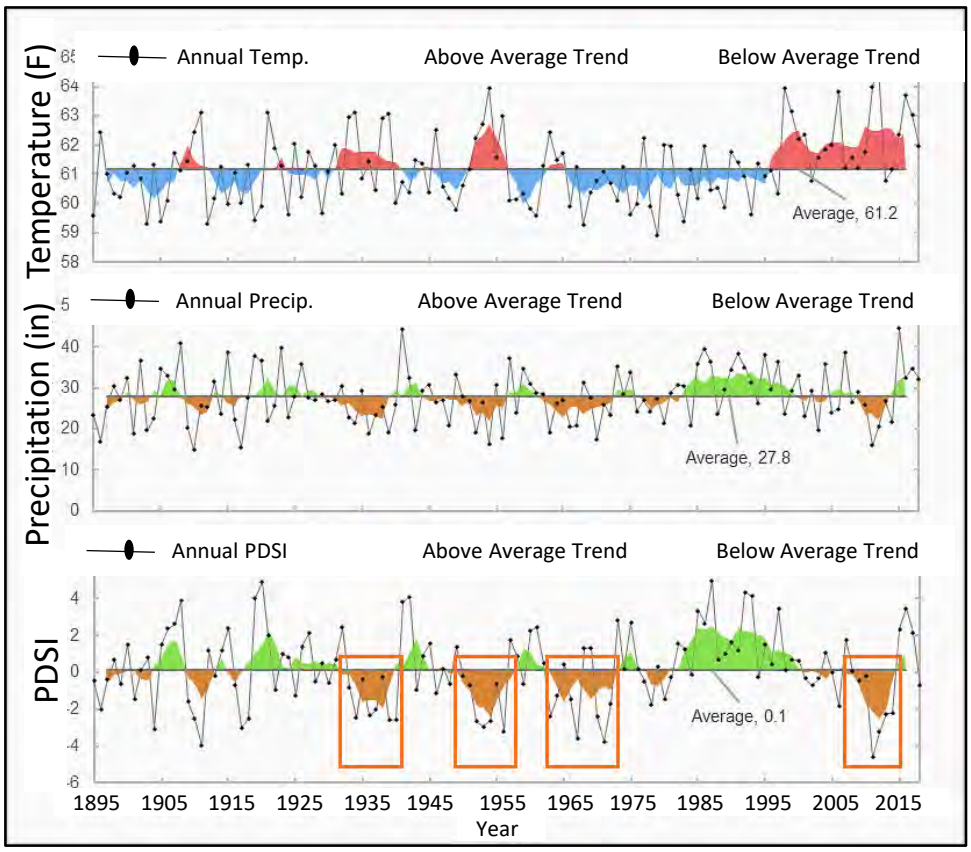


Fig. 4: *Annual and 5-year running averages for temperature, precipitation, and Palmer Drought Severity Index (PDSI); Orange boxes illustrate major droughts on record. Source: Upper Red River Basin Study (2022, in press).*

The Southern Great Plains region, including southwest Oklahoma, is particularly vulnerable to drought because the area lacks the topography and climate needed to generate snowmelt that can feed streams that flow into reservoirs where it is stored for beneficial use. Lugert-Altus Reservoir depends almost entirely on rainfall, as well as runoff and base flows generated by connected aquifers. Once water is in storage, temperature becomes a big factor because it contributes to evaporation which reduces the amount of water in storage.

3. Reservoir sedimentation, caused by upstream erosion, has been captured in Lugert-Altus Reservoir since its construction was completed. The sedimentation accumulates in the Reservoir in what is referred to as the dead pool. Once sedimentation fills and moves past the dead pool layer, the amount of space available for irrigation, municipal and industrial (M&I) water, recreation, and fish and wildlife is reduced. A 2018 sediment survey (reported in the

2021 Water Conservation Plan) estimated a 500 acre-ft accumulation of sediment between 2007 and 2018. Without intervention, beginning in the year 2040, the storage capacity of the Reservoir's conservation pool is projected to be insufficient to deliver the combined water rights held by the District and the City of Altus, due in large part to sedimentation.

4. Human development. Upstream withdrawals directly reduce inflow into the Reservoir while downstream withdrawals can indirectly affect reservoir supply through downstream discharge requirements, if applicable, from the dam. Withdrawals may come from surface water diversions and/or from groundwater pumping in aquifers that have a hydrologic connection with surface water. Some withdrawals are permitted, while other withdrawals for domestic and household uses are not permitted. The District and other local stakeholders have been strong proponents of limiting diversions and pumping to ensure the long-term reliability of the groundwater for all users. It is important that the District and other stakeholders also commit to do their part to ensure the long-term reliability of the groundwater, and the proposed project will help the District meet their part of that commitment.

Demand Challenges. Numerous competing interests are vying for the District's water, and the pressure is especially difficult during low-water years.

1. Agricultural Irrigation. The District needs 115,000 acre-feet per year (AFY) in storage to perfect the permit of 85,630 AFY given to the District's 547 farms to irrigate the 46,000 acres of farmland. The difference (29,370 AFY) is comprised of required water reserves to serve the City of Altus, to meet minimum pool requirements for the Reservoir, and from evaporation losses in the Reservoir. Then, with a 68% delivery efficiency (due to the seepage and evaporation losses described above), 58,200 acre-feet per year is available for irrigation. But the amount available varies: BOR's latest Basin Study found 115,000 acre-feet has historically been available only 15-43% of the time at the beginning of the irrigation season. Low water supplies have a significant impact on irrigation water deliveries. During the 2010s Drought of Record, **zero** deliveries were made for agricultural irrigation in 2012, 2013, and 2014. During those years, agriculture losses are estimated at $300 million.

2. Supplemental Water to City of Altus. Irrigation demands must be balanced with water demands from the City of Altus, OK (see Letter of Support). The City has a right to use 4,800 AFY from the Reservoir for M&I (municipal and industrial) use. In addition, the City's 1954 settlement agreement with the District requires the District to manage irrigation operations such that 10,000 acre-feet of water remains in storage at the end of the irrigation season to ensure that the 4,800 acre-feet can be delivered to Altus, if needed. The District's overall average delivery to the City is 2,716 AFY. However, during the peak of the 2010-2015 drought, only 824 acre-ft, 674 acre-ft, and 1,002 acre-ft were delivered in 2012, 2013, and 2014, respectively, for a total of 2,500 acre-ft. This was the same time period that zero deliveries were made for agricultural irrigation. Despite being a relatively smaller amount than the

irrigation demands, the City's M&I demands are important to consider especially in times of drought.

3. Recreation and Wildlife. Lugert-Altus Reservoir supports a popular recreation and wildlife area in Southwestern Oklahoma. The Reservoir is located within the scenic Wichita Mountains and is surrounded by approximately 11,000 acres of federally-owned land that attract tourism and abundant wildlife. Quartz Mountain State Park, managed by the Oklahoma Tourism and Recreation Department (OTRD, see Letter of Support), is situated on the western side of Lugert-Altus Reservoir. The park provides opportunities for camping, swimming, boating, fishing, hiking, picnicking, etc. One of the prominent features within the park is the Quartz Mountain Resort Arts and Conference Center, which contains a lodge-style hotel, an Arts Institute, swimming beaches, cabins, camping, and numerous other amenities. On the north end of the Reservoir lies the Altus-Lugert Wildlife Management Area (WMA). The WMA is managed by the Oklahoma Department of Wildlife Conservation (ODWC, see Letter of Support) and is comprised of 3,600 acres that support hunting and wildlife viewing.

***Fig. 5**: Arial photo of Lugert-Altus Reservoir in December 2016 (left) at 60% full and during in March 2014 (right) during the 2010s Drought of Record when the reservoir was only 12% full (Upper Red River Basin Study (in press).*

The 2010s Drought of Record had severe impacts on tourism, recreation, and wildlife. In 2014, the Reservoir was only 12% full, see Fig. 5. Many of the Reservoir's docks were exposed, severely restricting access to boating, fishing, and other water recreation sports. Around this time, the entire fishery at Lugert-Altus Reservoir, an estimated 350,000 fish, were killed by toxic Golden Algae which had bloomed after low storage volume increased the concentration of salts and nutrients in the Reservoir.

4. Required Reserves. Approximately 29,000 acre-feet in reserves must be maintained in the Reservoir. As noted above, the District is required to set aside 10,000 acre-feet in accordance with the agreement with the City of Altus to ensure their deliveries. The District must also set aside 10,000 acre-feet of storage to meet minimum pool requirements of the Reservoir, and an additional 5,000 to 9,000 acre-feet to account for evaporation in the Reservoir. Required reserves put additional pressure on the District and represent a significant demand challenge.

3. TECHNICAL PROJECT DESCRIPTION

The project description is based on the preliminary design which was initiated in June 2022. The preliminary design was discussed with Reclamation officials from the Oklahoma-Texas Area Office during June and July 2022, and the description here reflects their input and recommendations. The canal conversion project will take place on the W.C. Austin Project, a Reclamation-owned facility that is operated by the District.

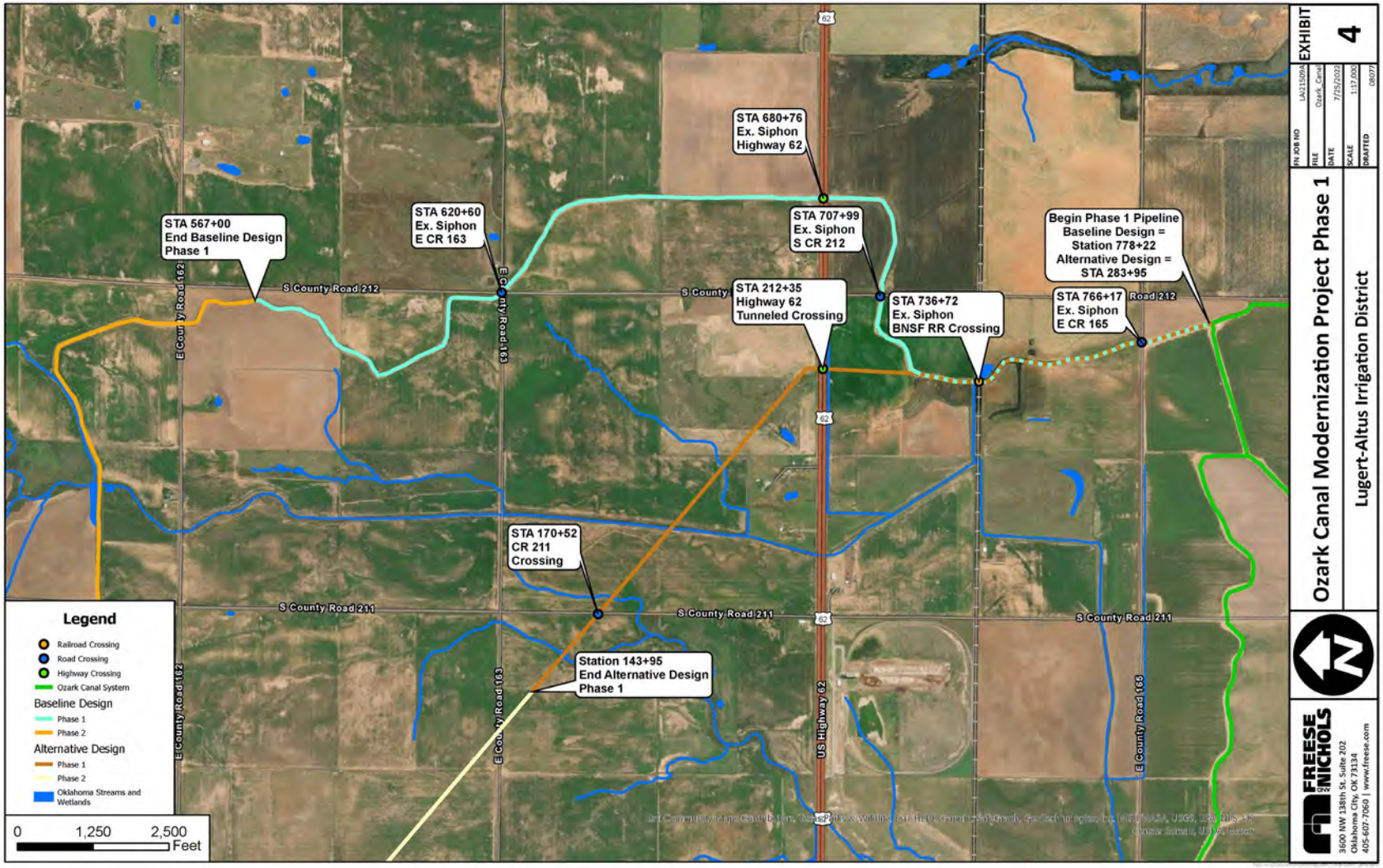
WORK TO BE ACCOMPLISHED

The project will modernize a portion of the Ozark Canal by converting the earthen open canal to buried pipeline. The targeted conversion segment (Phase 1) is four miles in length (21,120 linear feet) in Ditch Rider District (DRD) #8, from Station 778+22 to Station 567+00, see Figs. 6 and 7 (note: the figure shows both the proposed baseline design and an alternative design which is discussed at the end of this Section). This Phase 1 project is the District's first effort to convert their canals to buried pipe. This canal section was chosen because of the high water loss from seepage due to high permeable soils, and because this section has no farm turnouts which will simplify construction and operations for this first major conversion project in the District. The project will use thermoplastic high-density polyethylene (HDPE) pipe (see detailed description in Section A.4). HDPE pipe was selected for the following reasons:

- Low friction factor provides optimal flow characteristics for the project;
- Fused joints provide a leak tight seal resulting in zero water loss;
- HDPE pipe is corrosion resistant and does not require a cathodic protection system;
- HDPE pipe is ideally suitable for low pressure piping systems; and
- Pipe flexibility will allow rounding of some of the shallow canal bends without the need for special bends and fittings.

The pipe will have an internal diameter of 60 inches which is required to convey the design flow of 100 cubic feet per second (cfs). To achieve this internal diameter, based on American Water Works Association (AWWA) C906 Standards, a 65-inch HDPE pipe with a 50 psi pressure class will be required. This pipe will have a dimension ratio (DR) of 32.5, resulting in a 2-inch wall thickness and a resulting inner diameter of 61 inches.

Fig. 6: *Detailed Project Location for the Baseline Design, Phase 1 (the focus on this application)*



Pipeline Construction

A. Trench Width – The proposed pipeline will be installed within a trench excavated at the bottom of the existing canal. Trench width is affected by several factors, including distance required to adequately distribute the loads from the pipe, embedment material, surrounding soil properties, and constructability. Wider trenches allow the loads from the pipe to be distributed over a larger area, but they require more embedment than a narrower trench. It is anticipated that the contractor will compact granular pipe embedment with split-wheel rollers as the split-wheel roller requires less room and allows for a narrower trench. The engineering consultant recommended the trench walls be 18 to 30 inches greater than the outside diameter (OD) of the pipe for most soil conditions.

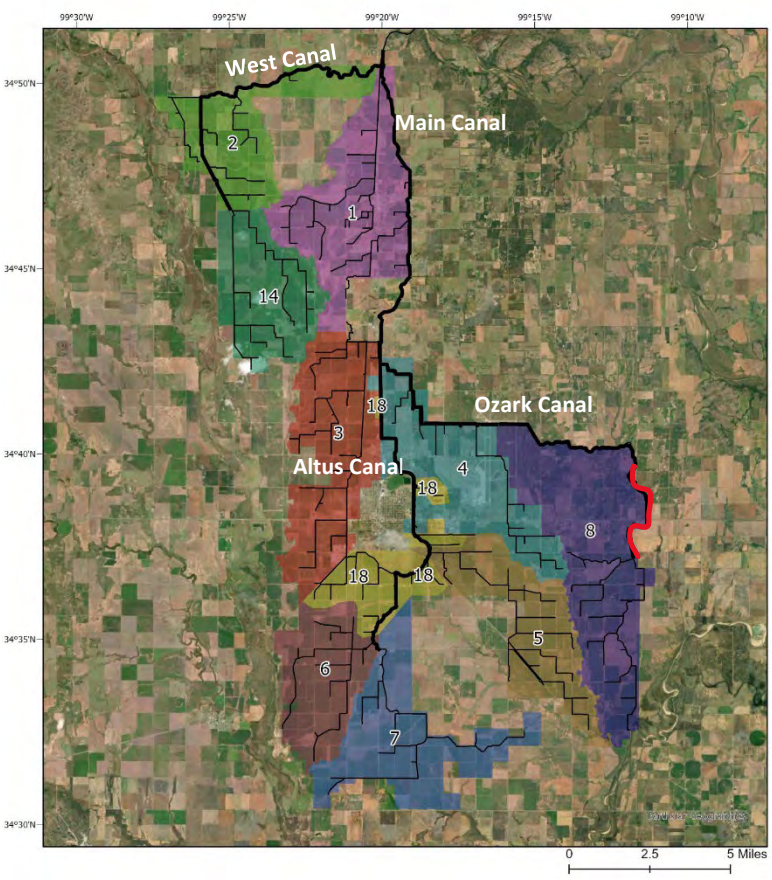


***Fig. 7**: The District's 10 Ditch Rider Districts are pictured; the targeted segment of canal is located in DID #8, and the targeted segment is highlighted in red.*

B. Trench Safety - Trench safety will be the responsibility of the contractor. It is anticipated that the contractor will use trench boxes, and they will be required to submit a trench safety plan sealed by a Professional Engineer licensed in Oklahoma.

C. Embedment and Backfill - The pipeline embedment is critical to support the pipe and prevent deflection or buckling of the pipe. The design of embedment and backfill will meet the minimum requirements of AWWA M9 and M11 as well as the additional requirements included within the specifications.

1. The engineering consultant recommends specifying a granular embedment material of washed gravel or crushed rock, free from large stones, clay, and organic material. This material should have a nominal particle size of 3/8-inch.

2. The embedment around the pipe zone should be compacted to 95% of maximum density in accordance with ASTM D-4253. The embedment material should be brought up to 70% of the pipe diameter for HDPE.

3. Above the pipe zone, the backfill may be trench-excavated material compacted to 95% of standard proctor density.

4. There are several open-cut road crossings on the project. To prevent future settlement of roads, flowable fill will be used in the pipe zone with gravel backfill or flexible base materials brought up to the bottom of the pavement or subgrade.

D. Depth of Cover - Buoyancy and deflection calculations will be performed in preliminary design. Depth of cover will vary across the length of the pipeline. The 60-inch pipeline will have a minimum depth of cover of four feet to prevent floating and deflection.

E. Pipeline Installation - The HDPE pipe joints will be welded together with a heat fusion welding machine. Although typical pipeline installation allows for each point joint to be placed in the trench and welded in place, a contractor installing large diameter HDPE may choose a cartridge style method setting up the fusion bonding machine at the end of the pipe trench and pulling the pipe into and up the trench after it is fused together. Another method would be to fuse the pipeline at the top of the pipe trench and then use slings to lower the pipe string into the trench.

Pipeline Crossings (See Fig. 6, above)

A. Railroad Crossing – A tunneled crossing of the BNSF Railroad (at Station 736.72) will be required across the length of the railroad ROW, approximately 100 feet.

1. The railroad will require a casing pipe that the 65-inch OD carrier pipe will be pushed through. This will require an 84-inch casing, 100-feet in length, utilizing steel pipe or liner plate.

2. The railroad will require geotechnical borings on both sides of the railroad ROW. Bore pits will be excavated outside of the railroad ROW for construction of the casing.

3. The railroad may require a flagger be present on-site during construction of the project.

3. An application with design details will be submitted to the BNSF Railroad and an application fee will likely be required. Railroad approval is typically 4-6 months so an application will need to be submitted shortly after the 60% design is complete.

B. State Highway Crossing – State Highway (SH) 62 is a four-lane divided highway that crosses the Ozark Canal near Station 680+76. The ROW width is approximately 200 feet.

1. Similar to the railroad crossing, the Oklahoma Department of Transportation (ODOT) will require a casing pipe to protect the highway from damage if the pipeline were to rupture. The casing pipe will need to be approximately 84-inch in diameter and be constructed of steel pipe or tunnel liner plate.

2. The tunnel will require geotechnical borings on both sides of the highway ROW for design of the tunnel.

3. An application will be required for the crossing; however, ODOT does not typically require a permit fee. Review and approval should take 2-3 months.

C. Road Crossings – The proposed pipeline will cross four county roads (Jackson County). The engineering consultant will coordinate with the County during the design phase; however, it is anticipated that these roads can be open cut during pipeline construction. The pipeline can be backfilled and the road repaired within a day or two. A flowable backfill is recommended to reduce pipe deflection and compaction of the pipe backfill that could cause a dip in the road. Traffic control plans for the road closures will be provided for review and approval by the County.

D. Creek Crossings – The existing canal crosses several small creeks and drainage ways by a cast-in-place siphon measuring 4.5'x4.5'. There are several options for crossing the creeks:

1. Option 1 - If the condition of the existing siphons is adequate, the new pipe could connect to the existing siphons to minimize cost and disturbance of the creek.

2. Option 2 – The old cast-in-place siphon can be excavated and demolished with the pipeline installed in the same location.

3. Option 3 - The proposed pipeline can be installed across the creeks by open-cut method, with the pipe installed adjacent to the existing siphons. The original siphons can be filled with sand and left in place.

4. The condition of the existing siphons will be evaluated during the preliminary design.

Appurtenances

A. Flow Meter – A flow meter will be installed in this pipeline segment to confirm flow rates and delivery to customers on the Ozark laterals. The flow meter will likely be about 48-inches in diameter and have the ability to measure accurately within a flow range of 12-120 cfs. The flow meter would likely be a spool piece magmeter; however, as the flow could vary between open channel and full pipe flow, some other technologies may be needed. Due to the remote nature of the site, the flow meter will be powered by a solar panel with a battery back-up. Flow data will be transmitted to the District via a cellular system.

B. Access Manways – Access to the pipeline will be needed for inspection and maintenance of the line. 30-inch outlets on the top of the 60-inch pipeline should be adequate for manned entry into the pipeline. 2,000 foot spacing is recommended for the manways, and discretion

will be used to locate the manways near roads or along fence lines. It is estimated that 11 manways will be needed.

C. Air and Vacuum Valves – The pipeline is expected to vary between open channel flow and full conduit flow. For this reason, air and vacuum valves may be required to let air into and out of the system. During final design, the engineer will evaluate air valves versus short standpipes to let air into the system. It is estimated that six air and vacuum valves will be needed. These can be installed on the 30-inch manways to save cost.

Mobilization
Mobilization will include setting up a job trailer, but also stringing the pipe along the canal before the end of the irrigation season (mid-September), so construction can begin by October 1st. The final design will determine if temporary road improvements will be needed for heavy equipment access. The vast majority of roads in this rural area are dirt.

APPROACH TO COMPLETE THE WORK

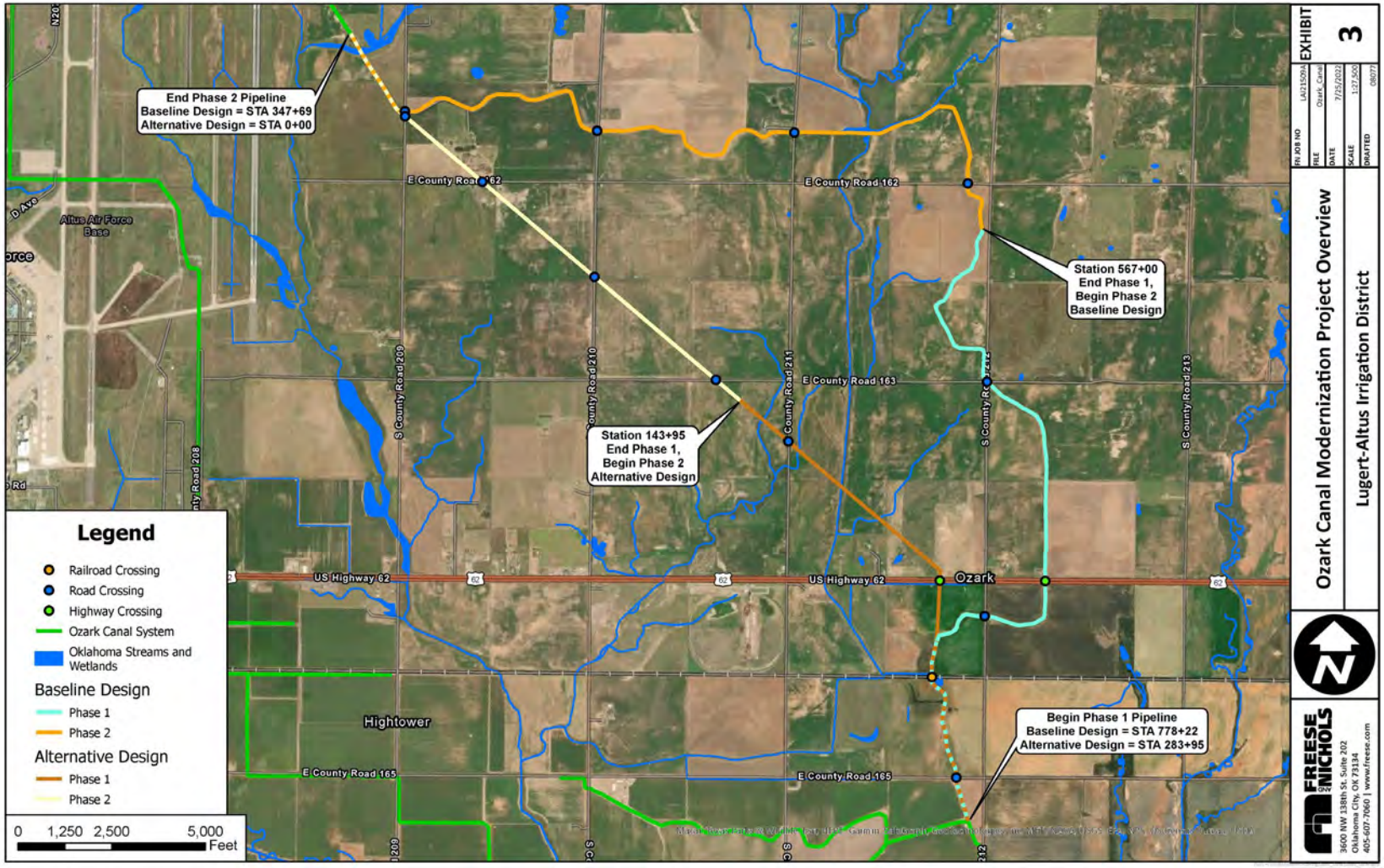
Schedule. Preliminary design was initiated in June 2022. Permitting, environmental and cultural compliance, and final design will run concurrently from December 2022 to December 2023. Construction will take place outside of the irrigation season which runs from mid-June to mid-September, and thus construction will take place from July 2024 to May 2025, with project completion confirmed by punchlist in June 2025 (the project schedule includes additional months to provide a buffer against supply chain and other possible issues).

How the Targeted Canal and Segment were Selected. The pipeline will flow by gravity, so the required design grade must be met for both Phase 1 (this downstream segment) and Phase 2 (the future upstream segment). For this reason, the preliminary design recommends that pipe laying operations begin at the downstream end and proceed up slope.

Alternative Design. The District and their engineering consultant have identified an alternative design during the preliminary design phase, but the alternative design will need further assessment and detailed analysis that will take an additional 2-3 months. If selected for funding, the District will be able to provide additional details about the alternative design at that time, and they plan to work closely with Reclamation to review both designs and make the best decision going forward.

1. Alternative Design – Project Description. The baseline design which is the subject of this grant application calls for the proposed pipeline to follow the existing canal. The proposed project could be shortened significantly by following a more direct path between the proposed endpoints, see Fig. 6 above, and 8 below. This opportunity exists because there are no farm turnouts on this segment of the Ozark Canal. The alternative design alignment would be much shorter than the baseline design. The total length of the District's larger Phase 1 and 2 projects

Fig. 8: *Detailed Project Location for Baseline and Alterative Designs, Phases 1 and 2. The figure shows that the alternative design cuts across the land creating a more direct path between the endpoints.*



would be reduced from 8.15 miles to 5.38 miles. For the proposed Phase 1 project, the pipeline length would be reduced from 21,120 LF (as proposed in this grant application) to 14,000 LF, and would still include the SH 62 and railroad tunneled crossings.

2. Alternative Design – Cost Estimate. The Opinion of Probable Construction Cost for the Phase 1 alternative design for 14,000 LF of HDPE pipeline is estimated at $13,536,000 (2022 Dollars) compared to $19,901,321 for the baseline design. Similar savings are estimated for the District's Phase 2 project.

The overall construction cost savings for the alternate design (Phases 1 and 2) is $12,326,610, which equals a 32% reduction in costs. This savings could be used to convert additional footage of the canal system to pipeline and obtain additional water savings.

Costs for engineering, permitting, survey, geotechnical drilling, construction inspection and land acquisition are not included in the alternative design's cost estimate. It is anticipated that land acquisition and perhaps permitting would be more expensive for the alternative design due to the potential for more archeological survey requirements; however, it is likely that the savings in engineering, survey and geotechnical due to a shorter pipeline length would balance this out. In general, the permitting and NEPA requirements and approach would be similar to the baseline design.

3. Alternative Design – Project Schedule. In addition to saving costs, there is an opportunity to save time on the schedule with the alternative design. Since there is less pipe to construct, and roughly 19,000 feet of the pipeline (for both Phase 1 and 2) is not within the existing canal alignment, Phase 1 construction could start during the irrigation season (the baseline design is completely within the current canal alignment and the schedule avoids work during the irrigation season). Other economies of scale in the alternative design would make it possible to save time on procurement, mobilization, etc.

4. EVALUATION CRITERIA

Evaluation Criterion A—Quantifiable Water Savings (28 points)

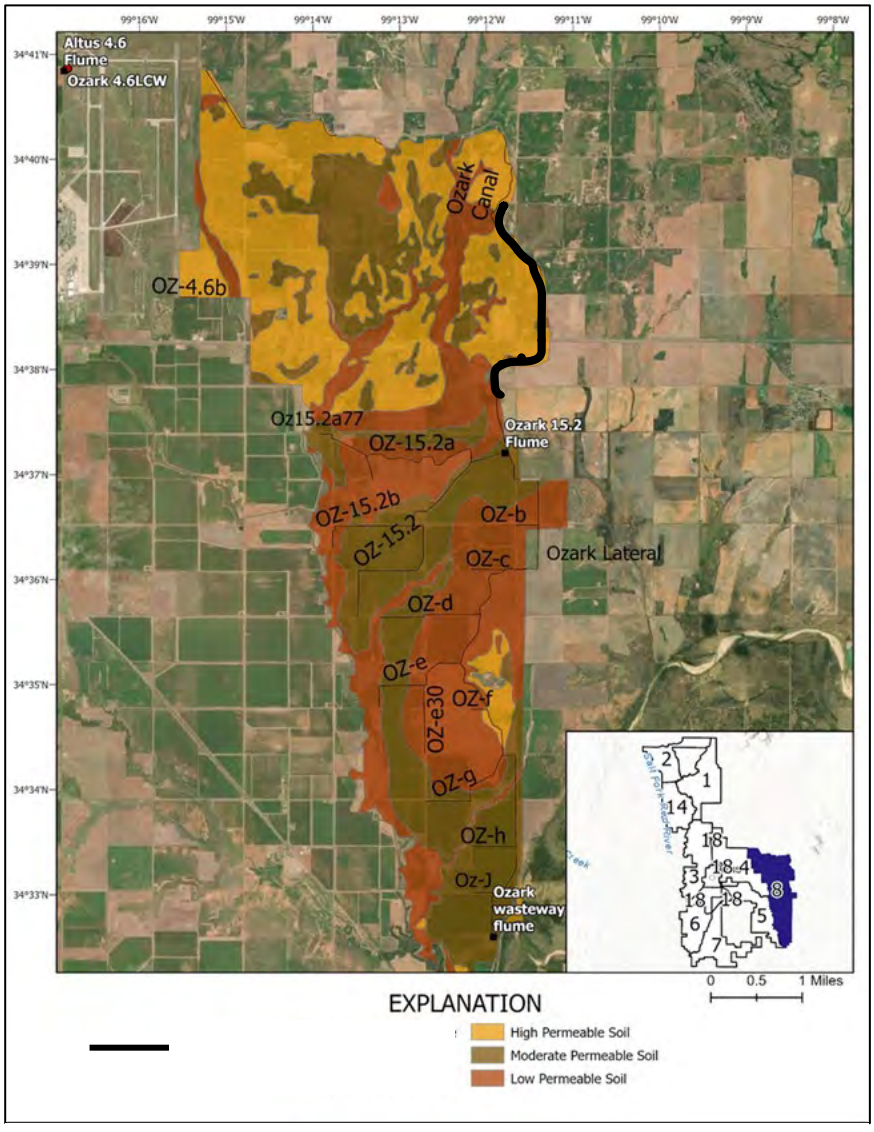
A.1 Estimated Water Savings

The estimated water savings for Phase 1 of the District's canal conversion project is **1,130 AFY**. This estimate is based on:

1) The calculated water loss (due to seepage, evaporation, and operational losses) for the targeted four-mile segment of open earthen canal as reported in the 2021 Water Conservation Plan (the most recent data), see additional details and data below, and
2) The assumption that conversions of open canal to buried HDPE pipe result in 100% elimination of water loss due to seepage and evaporation (i.e., elimination of water loss equals water savings).

A.2 Current Losses

The project is focused on water losses that are due primarily to seepage, evaporation, and operational inefficiencies.



1. Seepage. Water leaves the system in the form of seepage along the entire length of the canal; the seepage is lost to the ground and not available for re-use. The seepage loss provides no significant benefit to the groundwater as it does not percolate deep enough to reach the aquifer. The seepage also supports growth of weeds, brush, and shrubs along the floor and embankment of the canal which negatively affects the stability of the earthen canal, impedes water flow, and increases the need for vegetation management. Brush and overgrown vegetation also provide both food and cover for burrowing animals that can damage the canal system. The

principal factors that influence seepage in earthen canals include the permeability of the soil material within the wetted perimeter and the depth of water within the canal. The soil in the targeted canal segment (DRD #8) is highly permeable and mostly sand, see Figs. 9 and 10. Seepage in this segment of the Ozark Canal is higher than any other segment of the Canal.

2. ***Evaporation.*** Open channel flow exposes water to losses associated with surface evaporation which is affected by temperature, humidity, wind velocity etc., and transpiration from vegetation along the canal bottom or banks. Fig. 4 on p. 6 shows above average daily temperatures in the area going as far back 1995. Evaporation in this segment of the Ozark Canal is higher than any other segment of the Canal, see Fig. 10, below.

3. ***Operational Losses.*** Losses related to system operation and spills result due to:
   - Mismatch between reservoir release and farm turnout delivery;
   - Timing conflicts of delivery between farmer and ditch rider; and
   - Canal breaks that occur due to overtopping or animal activity. High winds deposit weeds and other vegetation in the canal resulting in flow obstruction and ultimately overtopping, and animals burrowing in the embankment can cause structural failure.

The operational losses are compounded in this segment because of its remoteness in relation to the rest of the District (an almost 20 mile roundtrip from the District's offices). Because of the remoteness, these spills are often not discovered or corrected in a timely manner resulting in increased loss.

A.3 Support/Documentation of Estimated Water Savings

Water Loss Calculations. The District estimates water losses using three methodologies:

1. Overall Water Loss for DRD #8 (Reported Losses): This methodology compares irrigation water released by the District to water sold during each irrigation season, and is similar to inflow-outflow measurement. The flow at the head of the Canal is automated with farm turnouts being manual. The release amount is estimated using Reclamation calculations and two flow meters that are located in the system. 'Reported losses' provides an overview of water loss without detail about how the loss occurs, i.e., by seepage, evaporation, etc.

   For DRD #8, water losses from 2015 to 2019 averaged 2,101 AFY (see Fig. 11 on p. 20). The losses attributed to the targeted segment of DRD #8 (1,130 AFY) are provided below, and represent 53.78% of the losses in DRD #8 (1,130 AF water loss in the targeted segment/2,101 water loss in the entire DRD #8).

Fig.10: *Calculated Seepage and Evaporation Losses Based on Soil Permeability and Flow in DRD #8*

Ditch-Rider District #8	Flow (cfs)	Average Wetted Perimeter (ft)	Average Canal Top Width (ft)	Soil Permeability (ft)				Estimated Loss per Irrigation Season (acre-ft)			Estimated Loss per 1,000 LF (ac-ft/ft)
				High[a]	Moderate[b]	Low[c]	Total	Seepage	Evap[d]	Total	
Ozark Canal sta 0+00 to sta 246+39	180	26.1	23.7	5,300	17,000	2,580	24,880	908	28	936	37.6
Ozark Canal sta 246+40 to 330+00	180	24.6	10.2	7,900	0	0	7,900	430	4	434	54.9
Ozark Canal sta 330+00 to 778+20	120	21.5	19.6	23,500	8,750	10,600	42,850	1,471	40	1,511	35.3
Ozark 15.2	50-30	14.8	13.3	0	7,499	0	7,499	143	5	148	19.7
Ozark 15.2	20-10	8.6	7.7	0	9,116	0	9,116	101	3	105	11.5
Ozark 15.2a	20-10	10.5	9.4	0	1,700	9,156	10,856	69	5	73	6.8
Ozark 15.2a77	10	9.4	8.3	0	0	1,388	1,388	6	1	7	4.8
Ozark 15.2b	10-7	7.3	6.6	0	3,830	1,741	5,571	42	2	44	7.9
Ozark Lateral sta 0+00 to 232+99	120-35	16.9	15.1	2,230	3,770	17,220	23,220	303	17	320	13.8
Ozark Lateral sta 232+99 to 356+60	20-10	9.0	8.1	0	10,300	2,000	12,300	128	5	132	10.7
Ozark b	10	7.4	6.7	0	0	1,355	1,355	5	0	5	3.8
Ozark c	5	5.6	5.2	0	0	1,884	1,884	5	0	5	2.9
Ozark d	15-5	6.7	6.1	0	2,586	3,341	5,927	33	2	35	5.9
Ozark e	20-5	6.6	6.0	0	0	6,915	6,915	22	2	24	3.4
Ozark e30	5	7.4	6.6	0	0	3,995	3,995	14	1	15	3.8
Ozark f	10	7.0	6.3	270	0	625	895	6	0	6	7.2
Ozark g	20-15	7.8	7.0	0	3,149	2,995	6,144	43	2	45	7.3
Ozark h	10	7.3	6.5	0	2,540	0	2,540	24	1	25	9.7
Ozark j	10	7.1	6.4	0	1,140	0	1,140	10	0	11	9.5
Total				39,200	71,380	65,795	176,375	3,763	118	3,880	

[a] Seepage rate of 10.3 gallons per sq-ft/day
[b] Seepage rate of 6.0 gallons per sg-ft/day
[c] Seepage Rate of 2.2 gallons per sq-ft/day
[d] Average season evaporation of 24.8 inches

Note: The highlighted row contains data for the segment from Station 778+22 to 330+00; the targeted segment is only a portion of this larger segment, i.e. 778+22 to 567+000, and thus the loss per linear feet is the metric used to calculate seepage and evaporation in the targeted segment.
Source: Lugert-Altus Irrigation District, 2021 Water Conservation Plan

Fig. 11: *Reported Water Losses Overall and by DRD, 2015-2019*

Ditch-Rider Districts	2015				2016				2017				2018				2019				Average Efficiency of Water Loss	Average ac-ft Lost
	Released	Sold	Efficiency	ac-ft lost	Released	Sold	Efficiency	ac-ft lost	Released	Sold	Efficiency	ac-ft lost	Released	Sold	Efficiency	ac-ft lost	Released	Sold	Efficiency	ac-ft lost		
1	5,283	3,763	71%	1,520	6,950	5,129	74%	1,821	7,269	5,299	73%	1,970	7,092	4,736	67%	2,356	9,117	6,946	76%	2,171	72%	1,968
2	3,267	2,075	64%	1,192	4,303	2,962	69%	1,341	4,222	3,017	71%	1,205	5,107	3,292	64%	1,815	5,172	4,035	78%	1,137	70%	1,338
3	6,775	4,702	69%	2,073	6,896	5,105	74%	1,791	7,400	5,402	73%	1,998	10,146	5,808	57%	4,338	9,622	7,070	73%	2,552	69%	2,550
4	3,773	2,872	76%	901	3,587	2,586	72%	1,001	3,921	2,814	72%	1,107	4,266	3,015	71%	1,251	4,696	3,580	76%	1,116	73%	1,075
5	6,195	4,861	78%	1,334	5,989	4,514	75%	1,475	6,551	5,060	77%	1,491	7,241	5,462	75%	1,779	8,789	7,032	80%	1,757	77%	1,567
6	6,126	4,188	68%	1,938	5,671	3,234	57%	2,437	4,453	2,746	62%	1,707	9,046	4,033	45%	5,013	8,212	5,334	65%	2,878	58%	2,795
7	7,336	5,214	71%	2,122	6,050	5,206	86%	844	5,810	4,542	78%	1,268	10,450	5,411	52%	5,039	8,912	7,533	85%	1,379	72%	2,130
8	5,889	4,112	70%	1,777	5,819	3,895	67%	1,924	5,970	4,116	69%	1,854	6,861	4,137	60%	2,724	7,951	5,726	72%	2,225	68%	2,101
14	3,728	1,886	51%	1,842	4,187	2,055	49%	2,132	4,933	2,754	56%	2,179	5,557	2,856	51%	2,701	5,640	3,039	54%	2,601	52%	2,291
18	5,490	4,608	84%	882	5,440	4,645	85%	795	4,708	3,795	81%	913	6,481	5,080	78%	1,401	8,550	7,368	86%	1,182	83%	1,035
Subtotal	53,862	38,281	71%	15,581	54,892	39,331	72%	15,561	55,237	39,545	72%	15,692	72,247	43,830	61%	28,417	76,661	57,663	75%	18,998	70%	18,850
Undefined Loss	1,632	6	-	1,626	4,128	4	-	4,124	3,437	5	-	3,432	(4,111)	6	-	(4,117)	2,964	4	-	2,960	-	1,605
Total Calculated	55,494	38,287	69%	17,207	59,020	39,335	67%	19,685	58,674	39,550	67%	19,124	68,136	43,836	64%	24,300	79,625	57,667	72%	21,958	68%	20,455

Note: This figure highlights the water loss in DRD #8 (averaging 2,101 AFY); the water losses in the targeted segment represent 53.78% of the total DRD #8 losses.
Source: Lugert-Altus Irrigation District, 2021 Water Conservation Plan

2. Calculated Losses for Seepage and Evaporation: This methodology provides data on the source of the District's water loss using higher order calculations for seepage and evaporation (see Fig. 10).

    - Seepage losses were estimated by evaluating the location of canals and laterals within low-, moderate-, and highly permeable soils and overlaying soil survey maps onto the District delivery system using a Geographic Information System. Soil permeability was categorized based on water loss rates established from previous Reclamation studies for seven soil types, see Fig. 12, below. Seepage loss was calculated by multiplying the length of canal/lateral by the water loss rate of the applicable soil permeability type, and then multiplying by the average wetted perimeter of the canal/lateral. Flow rates, depths, lengths, and widths were taken from the original system designs.

Soil Type	Seepage Loss Rate (gal/ft^2 /day)	General Soil Type Classification	Composite Seepage Loss Rate (gal/ft^2/day)
clay	1.5	Low Permeability (Clay Soils)	2.2
silty clay loam	2.24		
clay loam	2.99		
silt loam earth	4.49	Moderate Permeability (Loamy Soils)	6
loam	7.48		
fine sandy loam	9.35	High Permeability (Sandy Soils)	10.3
sandy loam	11.22		

***Fig. 12**: Soil Permeability and Seepage Loss Rates. Source: Lugert-Altus Irrigation District 2021 Water Conservation Plan*

- Evaporative losses were estimated by multiplying average five-year (2015-2019) span evaporation data for Lugert-Altus Reservoir over a 70-day irrigation season by the length and top width of the canal/lateral.

For the targeted segment of DRD #8 (Station 778+22 to 567+00, 21,120 LF), seepage and evaporation result in water loss of 35.3 AFY per 1,000 linear feet per irrigation season, or 745.54 AFY, see Fig. 10, above and calculations below.

Water Savings Related to Seepage and Evaporation

35.3 AFY per 1,000 LF
X
Targeted segment is 21,120 LF /1,000 LF = 21.12 LF

35.3 AFY per 1,000 LF X 21.12 LF = 745.54 AFY

3. Operational Losses: These losses are calculated by measuring end-of-canal average discharge and pro rata over the entire length of DRD #8 (the targeted segment is in DRD #8). Operational losses in the targeted segment of the Ozark Canal are estimated at 18.2 AF per 1,000 linear feet per irrigation season, or 384.38 AFY, as follows:

Water Savings Related to Operational Losses	18.2 AFY per 1,000 LF X Targeted segment is 21,120 LF /1,000 = 21.12 LF 18.2 AFY per 1,000 LF X 21.12 LF = 384.38 AFY

4. Total Water Savings for the Targeted Phase 1 Segment (Station 778+22 to 567+00, 21,120 LF):

TOTAL Water Savings for Phase 1

Water Savings Related to Seepage and Evaporation: 745.54 AFY
Water Savings Related to Operational Losses: 384.38 AFY
Total Estimated Water Savings Phase 1: **1,129.92 AFY (rounded to 1,130)**

A.4 Questions for Canal Piping Infrastructure.

a. How were annual water savings determined.

The estimate of 1,130 AFY of water savings for this Phase 1 project and the associated calculations are described in A.3 (above). The District used the most recent 'calculated water losses' for the targeted four-mile segment of open canal during 2015-2019 to estimate water savings related to the elimination of seepage and evaporation (see Fig. 10). These data are reported in the District's 2021 Water Conservation Plan as water loss per 1,000 linear feet. The calculations in A.3 above extrapolate the savings from seepage and evaporation loss per 1,000 linear feet to the entire 21,120 targeted segment that will be converted. The estimate is based on the assumption that conversions of open canal to buried HDPE pipe result in 100% elimination of water loss due to seepage and evaporation (i.e., elimination of water loss equals water savings).

'Operational losses' is calculated based on associated losses estimated in DRD #8, and specifically by measuring end-of-canal average discharge and pro rata over the entire length of DRD #8. The calculations in A.3 above extrapolate the savings from operational loss per 1,000 linear feet to the entire 21,120 targeted segment that will be converted.

b. How have average annual canal seepage losses been determined.

As described in A.3 above, the method to estimate seepage is a higher order calculation that is summarized above. Seepage is estimated by evaluating the location of canals and laterals

within low-, moderate-, and highly permeable soils and overlaying soil survey maps onto the District delivery system using a Geographic Information System. Soil permeability was categorized based on water loss rates established from previous Reclamation studies for seven soil types. Seepage loss was calculated by multiplying the length of canal/lateral by the water loss rate of the applicable soil permeability type, and then multiplying by the average wetted perimeter of the canal/lateral. Flow rates, depths, lengths, and widths were taken from the original system designs.

c. ***What are the expected post-project seepage/leakage losses and how were these estimates determined.***

The District does not expect any routine post-project seepage and/or leakage losses. The project will use high-density polyethylene pipe (HDPE), see description below, which is water-tight and does not require gasketed joints. This expectation is based on two factors: 1) The District reviewed the implementation and outcomes of canal conversion projects using HDPE by other irrigation districts, and 2) the District has converted some of their open laterals to buried pipe and experienced no/minimal seepage/leakages.

d. What are the anticipated annual transit loss reductions in terms of acre-feet per mile for the overall project and for each section of canal included in the project.

The length of canal that will be converted is 21,120 linear feet (four miles). The total water loss on this segment (due to seepage, evaporation, and operational losses) was estimated to be 1,130 AFY. The average loss per mile is estimated at 282.5 AF per mile during the irrigation season which lasts 70 days each year (mid-June through mid-September).

e. How will actual canal loss seepage reductions be verified.

The estimated water savings data described above use a higher order calculation in order to identify potential savings in the portion of DRD #8 that is targeted by this Phase 1 project. After the project is complete, the District will verify water savings by analyzing “reported losses” which is the difference between water released v. water sold for DRD #8 (which includes the targeted segment). Fig. 11 above illustrates reported losses for the entire DRD #8. The District expects a reduction in the ratio of water released to water sold in DRD #8 by approximately 53.78%.

- DRD #8 – Average Acre Feet Lost 2015-2019 = 2,101 AFY
- Estimated Savings from Phase 1 Project = 1,130 AFY
- 1,130 AFY savings for Phase 1 project / 2,101 AFY lost in DRD #8 = 53.78% reduction

f. Include a detailed description of the materials and equipment being used.

- **High Density Polyethylene Pipe (HDPE).** The primary material used in the proposed project is the estimated 21,120 linear feet of pipe.
  - Pipe - High density polyethylene (HDPE) pressure pipe is a non-corrosive material with few maintenance requirements that has a life span of up to 100 years. HDPE is a flexible pipe and receives much of its strength from the trench embedment, making proper embedment installation essential to the longevity of the pipe. American Water Works Association (AWWA) classifies HDPE pipe as C906 for 4"-63" nominal diameters.
  - Pressure Rating & Wall Thickness - C-906 (DR-32.5, PR 50) pipe is rated for a working pressure of 50 psi, which includes an allowance for surge pressure in accordance with AWWA. HDPE is a suitable material for installation in soil prone to seismic activity because the material is flexible, fatigue resistant, resists rapid crack-propagation failure, and the joints are restrained. In order to achieve a nominal 60-inch diameter for the project, a 65-inch OD pipe with a DR of 32.5 will have a 2-inch wall thickness, resulting in a 61-inch inner diameter.
  - Corrosion Protection - The resin used in HDPE is corrosion resistant to differing electro-potential material found in soil. HDPE is also resistant to the abrasive and corrosive environment that exists in wastewater applications. However, the resin can be more permeable to organic solvents in the soil, such as oil and gasoline. HDPE with at least 2% carbon black can be stored and used for outdoor service, although ultraviolet light exposure can degrade HDPE pipes with low carbon-black content.
  - Joints - HDPE pipe is typically joined by heat fusion, using temperature and pressure to create a conduit that is effectively joint free.
  - Fittings - The flexibility of HDPE allows the pipe to be installed without fittings to some extent, as it has a cold-bending radius of 30 times the nominal diameter or less depending on wall thickness. Where fittings are needed to meet a more constrained installation, HDPE fittings are available. Fittings can be thermoformed, fabricated, or injection-molded.
  - Thrust Restraint - High density polyethylene's (HDPE) fused joints are self-restraining.

- **Solar-Powered Flow Meter**. A flow meter will be installed in this pipeline segment to confirm flow rates and delivery to customers on the Ozark laterals. The flow meter will likely be about 48-inches in diameter and have the ability to measure accurately within a flow range of 12-120 cfs. The flow meter will likely be a spool piece magmeter; however, as the flow could vary between open channel and full pipe flow, some other technologies may be needed. Due to the remote nature of the site, the flow meter will

be powered by a solar panel with a battery back-up. Flow data will be transmitted to the District via a cellular system.

- **Access Manways**. Access to the pipeline will be needed for inspection and maintenance of the line. It is estimated that 11 30-inch manways will be needed and will be provided by the HDPE pipe manufacturer.

- **Air and Vacuum Valves.** The pipeline is expected to vary between open channel flow and full conduit flow. For this reason, air and vacuum valves will be required to let air into and out of the system.

- **Equipment**. The primary equipment that will be used includes the following which will be provided by the construction contractor:
  1) Trencher
  2) Crane
  3) Dozer
  4) Split Wheel Roller
  5) Backhoe
  6) Rammer
  7) Heat Fusion Welding Machine
  8) Trench Boxes

Evaluation Criterion B—Renewable Energy (20 points)

Subcriterion No. B.1: Implementing Renewable Energy Projects Related to Water Management and Delivery (20 points)

The project does not include any large scale renewable energy elements. The project's small-scale renewable energy elements are described below in B.2.

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management

- Use of Solar v. Electric. The project's primary energy component is a flow meter (the pipes will use gravity for water conveyance, so no water pumping is required). Due to the remote nature of the site, the flow meter will be powered by a solar panel with a battery back-up.

- Reduced Vehicle Miles Traveled. Flow data will be transmitted to the District via a cellular system, thus eliminating manual readings requiring District staff to drive to the meter's remote location. Assuming the District drives 20 miles per day to the location during the irrigation season which is estimated at 70 days per year, the project will

eliminate 24,939 pounds of CO_2 emissions over the next 20 years (i.e., 404 grams of CO_2/mile x 20 miles per day x 70 days per season x 20 years).[1] Light-duty vehicles, including sedans, SUVs, and pickup trucks, are currently responsible for 58% of U.S. transportation sector greenhouse gas emissions.[2]

Evaluation Criterion C—Sustainability Benefits (20 points)

C.1 Enhancing Drought Resiliency.

As described in detail earlier, the Southern Great Plains region, including southwest Oklahoma, is particularly vulnerable to drought because the area lacks the topography and climate needed to generate snowmelt that can feed streams that flow into reservoirs where it is stored for beneficial use. Lugert-Altus Reservoir, the source of the District's water, is particularly vulnerable because it depends almost entirely on rainfall, and is thus directly impacted by drought. Cyclical drought is the norm in southwestern Oklahoma, and the region is again in the midst of drought. The Oklahoma Mesonet released data on July 11, 2022 illustrating that the last 30 days in the State have been the driest it has been for the last 100 years. For southwest Oklahoma it is the second driest it has been in the last 100 years with current precipitation only 10% of normal. The proposed project will enhance drought resiliency by keeping more of the District's water in the system which will benefit multiple stakeholders.

Improving Ecological Resiliency by Keeping Water in the System.

- The ability of Lugert-Altus Reservoir to absorb, persist, and adapt to the effects of drought is directly tied to the Reservoir's water supply. Keeping more water in the Reservoir will support its ability to withstand short- and longer-term drought periods and other types of unpredictable change associated with climate change.

Benefit to Fish and Wildlife.

- The project will benefit the fish and wildlife that live in and near Lugert-Altus Reservoir. The Reservoir is the source of the District's irrigation water. The more water that remains in the Reservoir due to increased irrigation efficiencies, the better for the surrounding fish and wildlife and their habitat.
- There are potentially two threatened species (birds) in the project area: Piping Plover and Red Knot, and one endangered species (bird): Whooping Crane. If these species are present, the health and resiliency of the Reservoir will provide a direct benefit. The District does not anticipate that the project will have any negative impact on these bird species, if they are present.

[1] The average passenger vehicle emits about 404 grams of CO_2 per mile; US EPA (2018). Greenhouse Gas Emissions from a Typical Passenger Vehicle, EPA-420-F-18-008.
[2] University of Michigan (2022). https://news.umich.edu/study-greater-greenhouse-gas-reductions-for-pickup-truck-electrification-than-for-other-light-duty-vehicles/

More Efficient Management of the District's Water Supply.

- Converting the open canal to buried pipeline will eliminate the 20-mile roundtrip (sometimes daily trips) to this remote part of the District to monitor canal breaks, leaks, seepage, and other issues. Eliminating the need for daily monitoring provides District staff with more time to focus on other water management issues.
- The conversion will also result in more efficient use of the District's water supply. The targeted segment of the canal loses an estimated 1,130 AFY of water each year to seepage, evaporation, and operational spills.

C.2 Addressing a Specific Water Sustainability Concern.

Specific Water Sustainability Concern: Shortages due to Drought and/or Climate Change.

Description: Lugert-Altus Reservoir, the source of the District's water, is particularly vulnerable to drought because it depends almost entirely on rainfall. Currently, precipitation in southwest Oklahoma is only 10% of normal. The Upper Red River Basin Study (2022, in press) reports climate projections of air temperature and precipitation. A total of 231 projections of average annual temperature and precipitation for the area encompassing the years 2045 to 2074 were compared to average annual historical ("baseline") temperature and precipitation conditions encompassing the years 1950 to 1999. All projections showed future warming, ranging from a 1% to 15% increase in average annual temperature from baseline conditions. Future precipitation was projected to be more variable, ranging from a 24% decrease (drier) to a 22% increase (wetter) in average annual precipitation relative to baseline conditions. This variability in precipitation projections is aligned with the area's history of cyclical drought. The four most recent droughts of records are interspersed with periods of normal and even above normal precipitation, see Fig. 4 on p. 6, above.

The Basin Study also detailed even more troubling scenarios related to the resiliency of the groundwater and the impact of climate change. The North Fork Red River (NFRR) aquifer contributes base flow to the NFRR which flows into the Reservoir. Two of the three climate change scenarios described in the Basin Study showed a significant reduction in annual base flow to the NFRR compared to the baseline climate scenario, including 15.9% reduction under the Hot-Dry (worst) scenario and 10.8% reduction under the Median scenario. Clearly, the District is racing against the clock to find ways to protect the water it has, and prepare for the unpredictability of climate change.

How the Project Addresses the Concern: The proposed project is the District's first effort to convert their 52 miles of open canals to buried pipe. The open canals are subject to evaporation, and where the canals are not lined, also vulnerable to seepage. Moving the water from open canal to pipe eliminates water loss due to seepage and evaporation (and in the District's case, also due to operational inefficiencies). The project will keep more water in the system (an estimated 1,130 AFY), reduce demand on the Reservoir, and thus support the

resiliency and sustainability of the Reservoir. A more healthy and robust Reservoir supports the sustainability of irrigation water for the District's 547 farms, M&I water for the City of Altus, and confers significant benefits for fish and wildlife, and recreation.

How Will the Conserved Water be Used: The District estimates that the proposed Phase 1 project, which will convert 21,120 LF of open earthen canal to buried HDPE pipe, will result in 1,130 AFY in water savings. The conserved water will stay in the Reservoir, and will be available for irrigation, as needed.

C.3 Other Project Benefits.

(1) Combating the Climate Crisis:

Addressing Impacts of Climate Change by Strengthening Supply Sustainability. As described above, the Upper Red River Basin Study (2022, in press) included climate projections that showed warming trends, variable precipitation including significant dry periods, and troubling impacts on the aquifer that feeds Lugert-Altus Reservoir. Protecting the resiliency of the Reservoir, the source of all of the District's water, is paramount. The proposed project will eliminate water losses from seepage, evaporation, and operational inefficiencies in the targeted canal segment, and this water will remain in the Reservoir (or shared as irrigation water, as needed). The conversion from open canal to buried pipe is a long-term solution to the losses that are estimated at 1,130 AFY. The water savings in any year could mean the difference between farms receiving irrigation water or not. The proposed HDPE pipe has a life span of 100 years. The potential water savings over 100 years (113,000 AF) could provide protection for all of the District's beneficiaries during the climate change that is here and predicted to worsen.

Using Renewable Energy. The project's primary energy component is a flow meter (the pipes will use gravity for water conveyance, so no water pumping is required). The District has opted to use solar panels to power the flow meter with a battery back-up.

Lowering Greenhouse Gas Emissions. Data from the flow meter will be transmitted to the District via a cellular system, thus eliminating manual readings requiring District staff to drive to the meter's remote location. Staff also must travel to the site regularly to monitor for canal breaks, seepage issue, overtopping, etc. The District estimates that it drives 20 miles per day to the location during the irrigation season. Converting the open canal to buried pipe will all but eliminate the need for these daily trips, which will eliminate 24,939 pounds of CO_2 emissions over the next 20 years (see calculations on p. 25-26).

(2) Disadvantaged or Underserved Communities:

The project will benefit a low-income population by providing increased resiliency for their water supply. The District supplies 4,800 AFY of permitted M&I water to the City of Altus (population 18,729), home to Altus Air Force Base, the United States Air Force training base for C-5, C-17, KC-46 and KC-135 aircrews. The City is located in the far southwestern part of the State, and is an isolated community with nearest large city (Lawton, OK) located 63 miles away. The City is classified as low-income with a median household income of $47,990, which is lower than the State ($53,840) and the U.S. ($64,994) (U.S. Census Bureau, Community Profiles). The U.S. EPA's Environmental Justice Screening and Mapping Tool, see Fig. 13 below, identifies four Census Tracts (shaded in dark red) as ranking amongst the 95-100 national percentile for low income communities, and three Census Tracts ranking in the 90-95 percentile. Fifty-six percent of children in Altus schools are classified as "low-income" by the Oklahoma Department of Education, but the figure is as high as 73-77% for three of the City's seven schools. By enhancing efficiency of the irrigation system and eliminating water losses, the project will increase the resilience of the District's water supplies, which will support the short- and long-term resilience of the District's M&I water deliveries to the City.

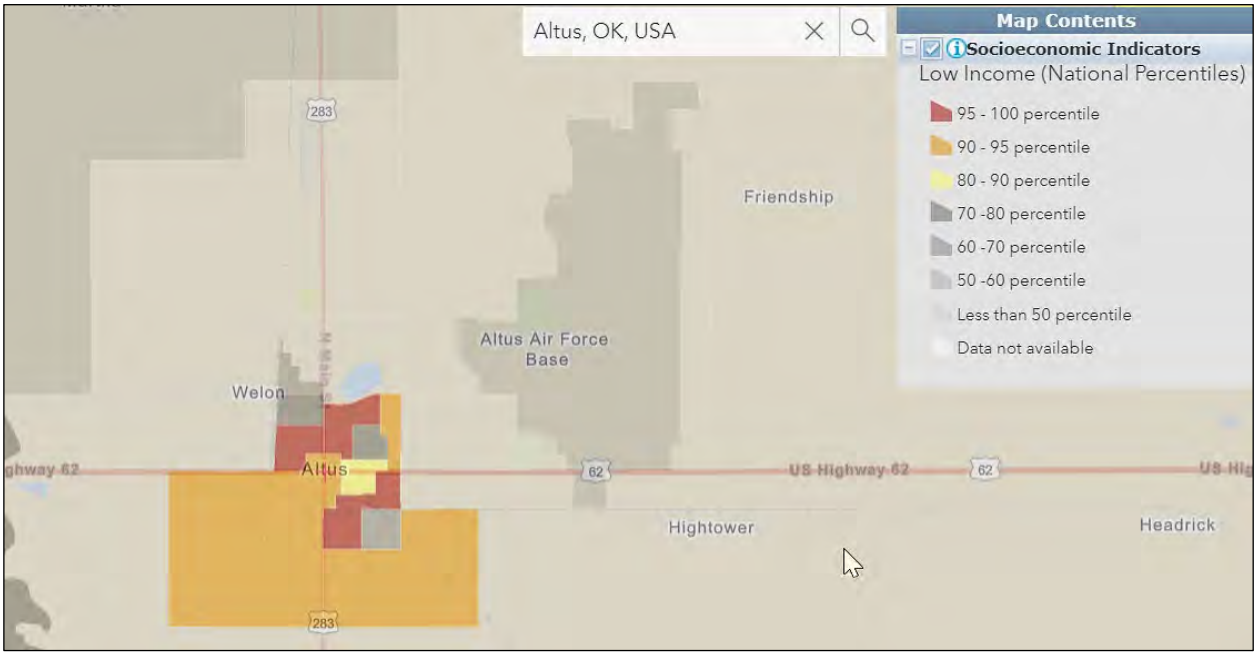


***Fig. 13**: Low income communities in Altus, OK. Source: US EPA Environmental Justice Screening and Mapping Tool.*

(3) Tribal Benefits: There are no tribes in the project area, and thus the project does not convey tribal benefits.

(4) Other Benefits:

Benefit to Multiple Sectors. As described above, the project will support:

- The District's 547 farms. Enhanced efficiencies in any part of the system provide a benefit to all. Water savings from the project will help ensure maximum water deliveries in future years.
- The City of Altus which is permitted for 4,800 AFY of M&I water from the District. The sustainability of the District's supplies directly benefits the City's businesses and residents.
- Altus Air Force Base, the City's largest employer, plays a key role in the defense of the nation by training 3,000 Air Force pilots and maintenance technicians each year. Sustainable water supplies directly support their critical mission.
- Fish and wildlife that live in and near the Lugert-Altus Reservoir. The Reservoir is the source of the District's irrigation water. The more water that remains in the Reservoir due to increased irrigation efficiencies, the better for the surrounding fish and wildlife and their habitat.
- Recreation facilities are located around Lugert-Altus Reservoir, and are the primary recreation destination in southwestern Oklahoma. This includes the adjacent 4,545-acre Quartz Mountain State Park which relies on robust water levels in the Reservoir to attract visitors for boating, swimming, fishing, hiking, and more.

Benefit to Ongoing Water Conflicts. The District and other local stakeholders have been strong proponents of limiting upstream and downstream diversions and pumping to ensure the long-term reliability of the groundwater for <u>all</u> users. It is important that the District and other stakeholders also commit to do their part to ensure the long-term reliability of the groundwater. The proposed project and the associated financial commitment represents the District doing their part and having 'skin in the game' of water resources protection, and not just dictating the actions of other stakeholders. This project will cement the District's commitment among local water stakeholders.

Evaluation Criterion D—Complementing On-Farm Irrigation Improvements (10 points)

There are no farm turnouts on the targeted segment of the Ozark Canal so the project will not directly support on-farm irrigation improvements. However, the District's broader plan to modernize the system's canals – including areas where farm turnouts are located – will benefit on-farm irrigation improvements. Three letters of support from District farms are included in the application, see p. 55. The pipe conversion in those segments would directly facilitate a conversion to more efficient subsurface drip irrigation from flood irrigation, as well as other on-farm efficiency improvements. Currently, flood irrigation is the most prominent type of irrigation application among District farmers, but it also is the most wasteful. Of the 46,000 irrigated acres, only about 11,500 acres (25%) currently use drip irrigation. The District's farms are moving toward converting to drip irrigation, which can significantly improve application efficiency, and the number is expected to increase by 1,000 acres per year. Irrigation pipelines are one of the numerous conservation practices specified by the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP)[3]. The proposed Phase 1 project is the first step towards modernizing the District's irrigation system, and supporting on-farm irrigation improvements in the future.

Evaluation Criterion E—Planning and Implementation (8 points)

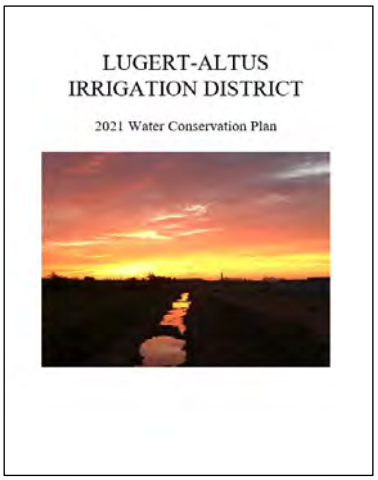
Subcriterion E.1— Project Planning

Three recent planning documents detail the District's water reliability and sustainability challenges, current water losses, and possible strategies to support water savings (including the proposed project):

1) Lugert-Altus Irrigation District – 2021 Water Conservation Plan (draft)
2) Upper Red River Basin Study (Bureau of Reclamation, 2022 in press)
3) Southwest Oklahoma Water Supply Action Plan (2014 and 2018 update)

[3] *Natural Resources Conservation Service*. NRCS. (n.d.). https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/cp/ncps/?cid=nrcs143_026849.

2021 Water Conservation Plan (WCP)

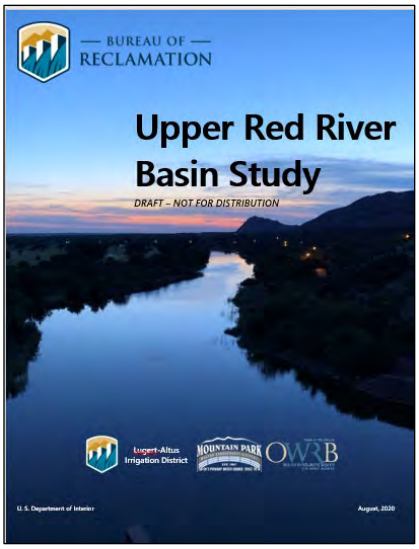


The WCP provides a description of the District's current conditions, problems and needs, a seepage analysis and detailed data on water loss, areas of potential infrastructure and operations improvement, and a roadmap of funding opportunities that would address needs listed in the WCP. The WCP is also the first step in understanding the best locations for improvements, as the seepage analysis provides data by Ditch Rider District (DRD) and by lateral segment within each DRDs.

The water loss/savings data that are described above in Evaluation Criteria A were sourced directly from the WCP. The proposed project is specifically called out in the WCP as a recommended infrastructure improvement (p. 63):

> *By **converting some of the open canals and laterals to pipes** the Lugert-Altus ID would see a reduction in seepage, evaporation, and sedimentation…They would also be able to reduce weeds, trash, and vegetation in the canals and laterals, while maintaining a constant pressure and supply for delivery. A constant pressure and supply for delivery would be a direct benefit to farmers and the local agricultural economy. The pipe conversion would directly facilitate a conversion to drip irrigation and other on-farm efficiency improvements. Irrigation pipelines are one of the numerous conservation practices specified by the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP). Projects like open canal to pipe conversion also help the Lugert-Altus ID ensure the continued water right from the Lugert-Altus Reservoir to the City of Altus while also not cutting off irrigation deliveries.*

2022 Upper Red River Basin Study (in press)



Reclamation's Upper Red River Basin Study (Study) analyzed solutions to water resource management needs on a basin-wide scale with a focus on supply reliability and drought resiliency of Lugert-Altus and Tom Steed Reservoirs, both located in southwestern Oklahoma. The Study's objectives were tailored to address local needs:

1. Characterize and quantify existing and future water supplies and demands of Lugert-Altus Reservoir and Tom Steed Reservoir;
2. Conduct investigations to determine the amount of groundwater available for future appropriations in areas that could impact Lugert-Altus Reservoir and Tom Steed Reservoir;
3. Develop a surface water allocation model to evaluate how ground and surface water management options affect the water supplies of Lugert-Altus Reservoir and Tom Steed Reservoir;
4. Assess the current and future capability of existing infrastructure and operations to meet demands, including risks and reliability of Lugert-Altus Reservoir and Tom Steed water supplies; and
5. Evaluate strategies to address infrastructure and water supply issues facing Lugert-Altus and Tom Steed Reservoirs, both now and in the future.

This application includes information from the Study including climate change projections, background information about the area's drought history, the Lugert-Altus Reservoir and its water sources, the District, and benefits of the Reservoir for agricultural irrigation, recreation, fish and wildlife, and M&I water for the City of Altus. The Study and the proposed adaptation strategies are focused on Lugert-Altus Reservoir (not the District or the irrigation system), however the study reported that common recommended solutions for efficiency losses (such as seepage and evaporation) include ***infrastructure improvements such as canal lining and piping***, among other strategies.

Southwest Oklahoma Water Supply Action Plan (2014/2018). In the midst of the 2010s Drought of Record, local water users representing diverse interests formed an Advisory Committee that launched the development of a Southwest Oklahoma Water Action Plan The Advisory Committee, comprised primarily of users of Lugert-Altus and Tom Steed Reservoirs (including the District), identified several near-, mid-, and long-term strategies to address a variety of water supply issues and vulnerabilities in the region. A number of the proposed strategies are reflected in the proposed project including:

- Near-term strategies focused on enhanced drought contingency planning, water conservation, and on improving the treatment and delivery of local M&I and agricultural water supplies.
- Mid-term strategies focused on enhancing existing supplies through the rehabilitation and operations of existing infrastructure.

Subcriterion E.2— Readiness to Proceed

The project is estimated to take 32 months with an assumed project start date of May 2023. Preliminary design work began in June 2022. Environmental and permitting work will begin in December 2022 and will be conducted concurrently with final design, with these tasks concluding by March 2024. The construction work will go out to bid in January 2024 with procurement lasting three months. The Contractor will start in April 2024 focusing on materials procurement so the construction can begin as soon as the irrigation season ends. Construction will last nine months starting in July 2024 and ending in March 2025, and will be initiated upon receiving Notice to Proceed (NTP) from Reclamation. Due to concerns about shipping and supply chain delays, the District has added several months of buffer at the end of the project schedule, for a total project length of 32 months – from May 2023 to December 2025. All work will be complete (including the final progress report and final payment request) by December 2025 (month 32). Each of the project's major tasks are outlined below.

PRE-AWARD TASKS
The pre-award work is being conducted by the District's engineering consultant. This work has begun, and the costs are not included in this grant application's cost estimate.

Pre-Award Task 1 – Preliminary Design (16 months)
The preliminary design will confirm the project layout and include preliminary field work, as follows:

Alternatives Analysis. The engineering consultant will conduct the analysis of the alternative design. Upon conclusion of the analysis, the District and Reclamation will make the final decision on design. It is anticipated that the analysis will require 2-3 months with one additional month for the key stakeholders to review the analysis and make a final decision.

Project Scope and Details. The engineering consultant will prepare standard details for the project. This will include trench details, crossing details for roads and utilities, tunnel details for the crossing of SH 62 and BNSF Railroad, and details for other appurtenances. The consultant will coordinate with Jackson County, Oklahoma Department of Transportation, and BNSF Railroad to determine crossing requirements and permitting needs.

Land Surveying. Upon final determination of the pipeline route, a surveyor will perform landownership research to confirm that the pipeline will be in current ROW and determine if additional easements are required for the project. Field work will be required to determine property corners and a land survey will be needed to prepare contours for the proposed route.

Geotechnical Investigation. A geotechnical driller will be utilized to take borings along the pipeline route. Borings will be required at the SH 62 Highway crossing and at the BNSF Railroad crossing. Additional borings are recommended at approximately 2,000-foot spacing.

Contact Utility Owners and Easement Acquisition. The engineering consultant will determine what utilities are in the area and coordinate with utility owners, and conduct easement acquisition if required.

Pre-Award Task 2 – Environmental/Cultural Compliance and Permitting (16 months)

***Environmental and Cultural Compliance*.** The District's engineering consultant conducted a desktop analysis in July 2022 to determine the likely requirements. It is expected that a small-scope environmental assessment (EA) will be required with an anticipated Finding of No Significant Impacts (FONSI). The only possible mitigation that is expected is related to cultural resources. The District itself is eligible for listing on the National Register of Historic Places, as its infrastructure dates back to the 1940s. See additional details on p. 55.

***Permitting*.** Known permits that will be sought include the following and the District will adhere to the requirement for additional permits, if needed:

1. Clean Water Act (CWA) Section 404 Nationwide Permit 58 from the U.S. Army Corps of Engineers;
2. Oklahoma Department of Transportation (ODOT) for the tunneled pipeline crossing at State Highway 62 near Station 680+76;
3. BNSF Railroad for the tunneled pipeline crossing at Station 736+72; and
4. Jackson County for pipeline crossing at four county roads which may require traffic control plans and temporary and/or permanent road improvements to ensure access of heavy equipment such as backhoes and cranes.

POST AWARD TASKS

Post-Award Task 1 – Project and Grant Management (32 months) – conducted by the District's Project Manager and Office Manager. Grant management will include executing the grant agreement with Reclamation and all administrative work during the course of the project. The District's Office Manager (Allen Ensley) will develop and submit requests for reimbursements and all progress and financial reports that are required, including the final project report and payment request. Project management will include regularly-scheduled meetings between the District's Project Manager (Tom Buchanan) and the Contractor to monitor action items, the

budget, schedule, and conduct problem-solving to overcome implementation barriers.

Post-Award Task 2 – Final Design (9 months) – not included in grant cost estimate – conducted by the District's engineering consultant:

60% Design. This package will include:

- Plan and profile sheets showing line and grade for the pipeline;
- Outlet structure for the end of the pipeline where the flow will transition from the pipeline to the existing canal;
- Details sheets for the tunneled crossing of SH 62 and the BNSF Railroad including details for the installation of the tunneled casing pipe and HDPE carrier pipe within the tunnel;
- Standard project details including pipe trench, connection details, crossing details and restoration requirements; and
- Draft project specifications with Division 01 General Requirements and Technical Specifications for installation of the pipe, tunnels, and concrete structures.

90% Design. After District and Reclamation review the 60% design package, the engineering consultant will develop the 90% design package. Approximately three months will be needed to move the project from 60% design to 90% design, and it will be submitted to the District and Reclamation for review and approval before moving to 100% design.

100% Design. It will take one month to incorporate comments from the 90% design and finalize the design package in preparation for competitive bidding for the construction contractor.

Post-Award Task 3 – Competitive Bidding for Construction Contractor (3 months) – not included in grant cost estimate – conducted by the District's engineering consultant.

Advertising for Bids. Advertising is estimated to take 4-5 weeks with one pre-proposal meeting or webinar held for prospective applicants.

Bid Opening and Review Applications. The District and the engineering consultant will develop and issue the bid package, review prospective contractors' qualifications, and prepare a recommendation of award letter.

Award, Contract, and Notice to Proceed. The selected contractor will be formally awarded by the District's Board of Directors. The engineering consultant will prepare the contract documents and coordinate execution with the selected contractor. The Notice to Proceed will allow the contractor to mobilize and start ordering pipeline and other materials, equipment, and supplies needed for construction; however, no earthwork or construction will

begin until environmental and cultural compliance is in place and official NTP is received from Reclamation.

Post-Award Task 4 – Construction (14 months) – conducted by the District's construction contractor and managed by the District's Project Manager.

Materials Procurement (9 months). The construction contractor will order the pipe, and other equipment and supplies needed for construction. The time for this task includes ordering, manufacturing, and delivery.

Construction (9 months). No earthwork or construction will begin until environmental and cultural compliance is in place and official NTP is received from Reclamation. Construction tasks will include:

- Mobilization. In addition, to setting up the job trailer, the local roads (mostly dirt) may need temporary or permanent improvements to allow flatbed trucks and backhoes to access the canal ROW. Also, the pipe will be strung along the pipeline ROW in anticipation of installation.

- Tunnel Construction at Pipeline Crossings. Construction will require two bored crossings. The Contractor will start bore pit excavation so that the casing pipe is nearing completion by the time pipe laying is scheduled, i.e., after the irrigation season. The crossings include:
  1) A tunneled crossing of the BNSF Railroad. The railroad will require a casing pipe that the 60-inch carrier pipe will be pushed through. This will require an 84-inch casing utilizing steel pipe or liner plate.
  2) A tunneled crossing of SH 62 will require an 84-inch casing utilizing steel pipe or liner plate.

Construction will also require crossing four county roads and several creeks and drainage ways. It is anticipated that the roads can be open cut during pipeline construction. The pipeline can be backfilled and the road repaired within a day or two. The canal currently crosses the creeks and drainage ways by cast-in-place siphons. If the condition of the siphons is adequate, the new pipe will be connected to the existing siphons. The engineering consultant will determine the best option during preliminary design.

- Pipeline Construction.
  1) A concrete headwall will be required at the end of the pipeline to transition back to the canal segment that feeds the canal laterals.
  2) Trenching operations will be required to excavate the pipeline trench.
  3) Pipe bedding will be placed using a good granular bedding material.
  4) Cranes will be used to lay the pipe in the trench.
  5) The HDPE pipe joints will be welded together with a heat fusion welding machine.

6) Pre-cast concrete manholes will be placed over the manways and air valve assemblies.
7) Granular material will be used to backfill the pipe trench, past the springline of the pipe, or approximately 70% of the pipe depth.
8) The remainder of the pipe trench will be backfilled with trench excavated material or existing canal embankment material. The backfill will be compacted to reduce trench settlement.

ROW Restoration. After the pipeline is installed, the two canal embankments will be leveled and smoothed over, and a native grass will be planted.

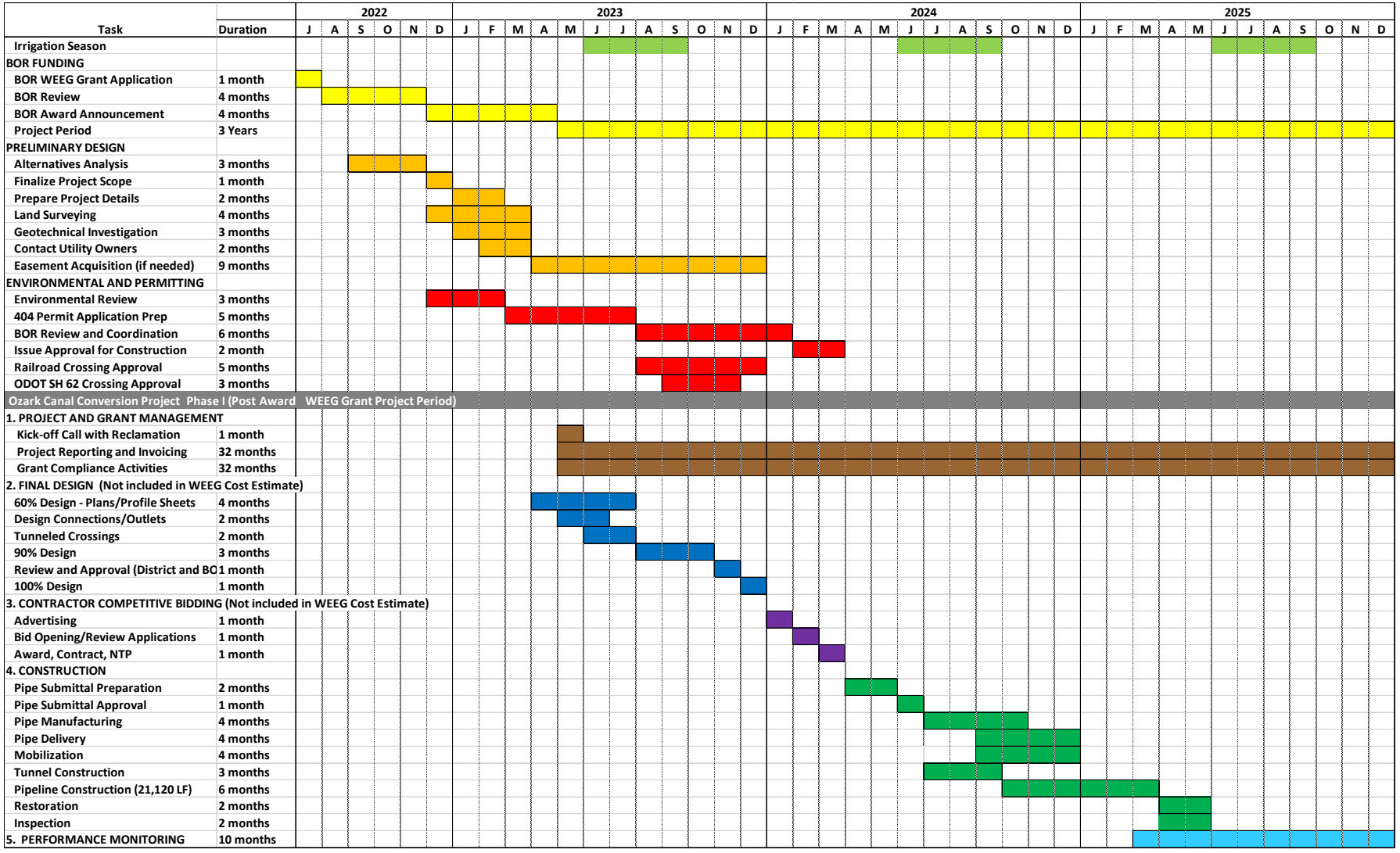
Inspection. A full-time inspector will be on-site during pipe installation to confirm that heat fusion, pipe embedment and backfill compaction, casing installation and pipe installation is proceeding in accordance with the plans, specifications, and manufacturer's recommendations. The inspector will complete the project punchlist as part of the final closeout activities.

Post-Award Task 5 – Performance Monitoring (10 months) – conducted by District staff and overseen by the District's Project Manager. The Project Manager will coordinate the ongoing collection of performance data to demonstrate water savings, and will ensure that findings are included in interim and final progress reports to Reclamation. Performance measures are discussed in detail in Section 5.

NEW REQUIRED POLICIES OR ADMINISTRATIVE ACTIONS. There are no known new policies or administrative actions that will be required as a result of the proposed project.

PROJECT SCHEDULE. The District estimates that the project will take 32 months, and the schedule is outlined below in Fig. 14. The District consulted with Reclamation's Oklahoma-Texas Area Office staff (including the Environmental Protections Specialist) on June 29, 2022, to discuss the project design and schedule, and the timeline for environmental and cultural compliance. The schedule below reflects that guidance.

Fig. 14: *Project Schedule*



Evaluation Criterion F—Collaboration (6 points)

Promoting Collaboration.

- The District and other local stakeholders have been strong proponents of limiting upstream and downstream diversions and pumping to ensure the long-term reliability of the groundwater for all users. It is important that the District and other stakeholders also commit to do their part to ensure the long-term reliability of the groundwater. The proposed project and the associated financial commitment represents the District doing their part and having 'skin in the game' of water resources protection, and not just dictating the actions of other stakeholders. This project will cement the District's commitment among local water stakeholders.
- The District met with Reclamation officials in June and July 2022 to discuss the various facets of the proposed project. This collaboration has solidified the project, and the preliminary and final design will reflect and benefit from this collaboration.
- The District has participated in numerous local and regional collaborations to share information and provide support to area stakeholders in support of water supply reliability and sustainability. One example is the District's participation in the Southwest Oklahoma Water Supply Action Plan Advisory Committee (see letter of support). This stakeholder-led initiative was formed in the midst of the historic 2010-2015 drought in southwest Oklahoma. The Committee drove the development of the *Southwest Oklahoma Water Supply Action Plan* (2014, and updated in 2018) through a detailed review of past studies and reports, coupled with a series of meetings with key water stakeholders in the region that represent a diverse set of water interests and uses. The Action Plan provides a phased, targeted approach to addressing near and long-term water supply improvements and provides an implementable plan to firm up the reliability of supplies for all water users in the region.

Letters of Support. The project has robust support from local, regional, and state-level stakeholders. Letters of support are included for:

1. Local Farm: Abernathy Farms
2. Local Farm: Dan Vinyard
3. Local Farm: Worrell Farms
4. City of Altus
5. Southwest Oklahoma Water Supply Action Plan Advisory Committee
6. Congressman Frank Lucas (OK-03)
7. United States Senator Jim Inhofe
8. Oklahoma Tourism and Recreation Department (OTRD)
9. Oklahoma Department of Wildlife Conservation (ODWC)
10. Oklahoma Water Resources Board (OWRB)

EVALUATION CRITERION G— ADDITIONAL NON-FEDERAL FUNDING (4 POINTS)

The District's proposed $14.9 million non-federal match represents **75%** of total project costs.

$$\frac{\text{Non-Federal Funding: } \$14{,}901{,}321}{\text{Total Project Cost: } \$19{,}901{,}321} = 75\%$$

EVALUATION CRITERION H— NEXUS TO RECLAMATION (4 POINTS)

The proposed canal conversion project is on a Federal facility, the W.C. Austin Project, which is owned by the Bureau of Reclamation. The W.C. Austin Project was designed to provide water for irrigation to approximately 46,000 acres of privately owned land in southwestern Oklahoma, flood control on the North Fork of the Red River, an augmented municipal water supply for the City of Altus, fish and wildlife conservation benefits, and recreation facilities. The W.C. Austin Project includes Lugert-Altus Reservoir; Altus Dam; 52 miles of canals (i.e., the Main, Altus, West, and Ozark); a 221-mile lateral distribution system; and 26 miles of drains. The Bureau of Reclamation transferred operation and maintenance responsibility of the W.C. Austin Project to the Lugert-Altus Irrigation District via contract number I1r-1375, see Attachment 1. The District paid off their portion of the original construction debt in 1990, and the District is now self-supporting.

Performance Measures

The proposed performance measure is water savings in AFY realized by converting 21,120 LF of open canal to buried HDPE pipe. The estimated water savings data described above in Evaluation A – Quantifiable Water Savings – estimates potential water savings in the targeted portion of DRD #8 using higher order calculations (see Fig. 10 on p. 19) that analyze soil permeability, flow rates, evaporation data for the Reservoir, canal discharge data, etc.

After the project is complete, the District will verify water savings by analyzing "reported losses" which is the difference between water released by the District v. water sold. The District will compare "reported losses" for DRD #8 (which includes the targeted segment) from 2015-2019 and compare these losses to post-project losses for DRD #8. The difference will be water savings as a result of the Phase 1 project.

****End of Technical Proposal (must not exceed 50 pages)****

PROJECT BUDGET

1) Budget Proposal

The District will commit $14,901,321 in non-federal funding towards the $19,901,321 total project cost for the Phase 1 conversion of the targeted segment of the Ozark Canal to buried HDPE pipeline. The District's cost share commitment is approximately 75% of total project costs. The source of the District's cost share is Oklahoma Senate Bill (SB) 0429, signed May 22, 2022 (see Attachment 2), which authorized funding to the District for the specific purpose of converting the canal to buried pipeline (see additional details below). This funding will be available by the end of calendar year 2022. There are no time constraints on the availability of funds, nor any other contingencies associated with the funding commitment.

- Project funding will not include: third-party in-kind costs or cash requested or received from other non-Federal entities.
- Project funding will not include third-party sources, and as such, there are no required Letters of Commitment.
- The District will assume all necessary costs for project management and grant management. These staffing costs are not included in the proposed cost estimate to simplify the project.
- The District is not seeking reimbursement for any of the preliminary design activities that are currently underway, and are covered under an existing engineering consulting agreement. The activities will include 60%, 90%, and final design, environmental and cultural compliance, permitting, and procurement of the construction contractor.

Table 1: *Summary of Non-Federal and Federal Funding Sources*

FUNDING SOURCES	AMOUNT
Non-Federal Entities	
Lugert-Altus Irrigation District	$14,901,321
Non-Federal Subtotal	$14,901,321
REQUESTED RECLAMATION FUNDING	$5,000,000

Table 2: *Total Project Costs*

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal funding	$5,000,000
Costs to be paid by the applicant	$14,901,321
Value of third-party contributions	0
TOTAL PROJECT COST	**$19,901,321**

***Table 3**: Line Item Cost Estimate (Baseline Design, Phase 1)*

Budget Item Description	Computation		Quantity Type	Total Cost
	$/Unit	Quantity		
Salaries and Wages				
NOT APPLICABLE	0	0	0	$0
Fringe Benefits				
NOT APPLICABLE	0	0	0	$0
Travel				
NOT APPLICABLE	0	0	0	$0
Equipment				
NOT APPLICABLE	0	0	0	$0
Supplies				
NOT APPLICABLE	0	0	0	$0
Contractual				
NOT APPLICABLE	0	0	0	0
Construction				
0. Environmental/Design/Permitting (currently ongoing under an existing consulting agreement)	0	N/A	0	0
1. Trench Excavation	50,054	CY	20.00	$ 1,001,080
2. HDPE Pipe - 65-inch OD, DR-32.5	21,120	LF	406.00	$ 8,574,720
3. Trench Excavation Protection	21,120	LF	5.00	$ 105,600
4. Trench Backfill (imported gravel)	34,426	CY	25.00	$ 860,650
5. Canal Backfill (In-Situ)	52,166	CY	12.00	$ 625,992
6. Compaction of Trench and Canal Backfill	86,592	CY	0.50	$ 43,296
7. BNSF 84-inch Tunnel Casing	100	LF	3,000.00	$ 300,000
8. SH 62 84-inch Tunnel Casing	200	LF	3,000.00	$ 600,000
9. Concrete Headwalls	2	EA	450,000.00	$ 900,000
10. 30-inch Manways and Manholes	11	EA	18,000.00	$ 198,000
11. 6-inch Air and Vacuum Valve Assemblies	6	EA	16,000.00	$ 96,000
12. Solar-Powered Flow Meter	1	EA	80,000	$ 80,000
13. Contingency (20% of subtotal)	1	EA	2,677,068	$ 2,677,068
14. Mobilization (5% of subtotal)	1	EA	803,120	$ 803,120
15. OH&P (18% of subtotal)	1	EA	3,035,795	$ 3,035,795
Other				
NOT APPLICABLE	0	0	0	$0
			TOTAL DIRECT COSTS	$19,901,321
Indirect Costs				$0
			TOTAL ESTIMATED PROJECT COSTS	**$19,901,321**

***Pre-Award Costs*.** The proposed budget does not include pre-award costs. The District is currently working with an engineering consultant who will provide interim and final design documents, and initiate permitting and environmental/cultural compliance, all of which will be complete by January 2024 when the competitive bid for the construction contractor will be issued (and well after Reclamation's requested earliest start date of May 2023).

2) Budget Narrative

a. Personnel

Not applicable. All construction labor will be contracted. District staff time needed for project and grant management will be provided outside of the proposed project to simplify project monitoring for the District's small office. The Project Manager for the proposed project will be Tom Buchanan, who has served as the General Manger for the District for the last 19 years. He will be assisted by Allen Ensley, who has served as the District's Officer Manger for the last 22 years.

b. Fringe Benefits

Not applicable.

c. Travel

Not applicable.

d. Equipment

Not applicable.

e. Supplies

Not applicable.

f. Contractual

Not applicable.

g. Construction

0. Environmental/Design/Permitting/Construction Contractor Procurement. These tasks are included under an existing contract with an engineering consultant, and the costs are not included in this grant application. Preliminary design is underway and the details informed the content of this application. It is expected that the Environmental and Cultural Compliance document will be a simple Environmental Assessment with a Finding of No Significant Impact. The project schedule includes sufficient time for Reclamation's review and approval of the environmental and cultural compliance documents, and no construction will take place until Notice to Proceed is received from Reclamation. Four permits are expected:

- Clean Water Act (CWA) Section 404 Nationwide Permit 58 from the U.S. Army Corps of Engineers;
- Oklahoma Department of Transportation (ODOT) for the tunneled pipeline crossing at State Highway 62 near Station 680+76;
- BNSF Railroad for the tunneled pipeline crossing at Station 736+72; and
- Jackson County for pipeline crossing at four county roads which may require traffic control plans and temporary and/or permanent road improvements to ensure access of heavy equipment such as backhoes and cranes.

Final design is expected by December 2023, followed immediately by competitive procurement for the construction contractor.

1. Trench Excavation
An 8’ deep by 8’ wide trench excavation has a cross sectional area of 2.37 CY per linear foot of pipe. The cost of the trench excavation was estimated at $20/CY. The excavation costs include the work for the small creek crossings.

2. HDPE Pipe - 65-inch OD, DR-32.5
An HDPE pipe manufacturer provided a quote of $282 per linear foot of pipe delivered to the job site. Labor and equipment to install and fuse the HDPE was added to bring the total pipe cost to $406 per LF.

3. Trench Excavation Protection. Trench boxes will be used to stabilize the canal during excavation. The cost is estimated at $5/LF for the entire 21,120 LF length of the targeted segment of the canal.

4. Trench Backfill (Imported Gravel)
Trench backfill was assumed to be an imported granular material costing approximately $25/LF. The amount of material was estimated by taking the trench excavation and reducing the amount by the OD of the pipe, requiring approximately 1.63 CY of gravel per LF.

5. Canal Backfill (In-Situ)
The canal backfill quantity was estimated by excavating the top 2.5 feet of each canal berm and using this to fill the bottom of the canal, resulting in approximately 2.47 CY per linear feet of pipe in the canal. The cost of the on-site fill material was estimated at $12/CY.

6. Compaction of Trench and Canal Backfill
Compaction of the trench embedment and canal backfill was estimated at $0.50 per linear foot

NOTE: The total combined installation cost of the pipeline is roughly $500 per linear foot.

7. BNSF 84-inch Tunnel Casing *AND*
8. SH 62 84-inch Tunnel Casing
An 84-inch casing pipe will be required at the SH-62 crossing (200 LF) and the BNSF Railroad crossing (100 LF). Tunnel installation of the casing pipe was estimated at $3,000 per LF at both sites.

9. Concrete Headwalls
A concrete headwall will be required at both ends of the pipeline to transition from canal flow to pipe flow. These cast-in-place concrete structures are estimated at $450,000 each which includes rebar, forms, concrete, and compaction.

10. 30-inch Manways and Manholes
Approximately 11 manways will be needed consisting of a 30" flanged outlet on the top of the pipe, a flanged cover and a pre-cast concrete manhole to protect the outlet. These were estimated at $18,000 for each manway.

11. 6-inch Air and Vacuum Valve Assemblies
Approximately six air and vacuum valve assemblies will be needed consisting of a 30" flanged outlet on the top of the pipe, a flanged cover with a 6" outlet, a 6" gate valve and a 6" air and vacuum valve with a pre-cast concrete manhole to protect the outlet. These were estimated at $16,000 for each assembly.

12. Solar-Powered Flow Meter
A flow meter will be installed to confirm flow rates and delivery to customers on the Ozark laterals. The flow meter will likely be about 48-inches in diameter and have the ability to measure accurately within a flow range of 12-120 cfs. The flow meter would likely be a spool piece magmeter; however, as the flow could vary between open channel and full pipe flow, some other technologies may be needed. Due to the remote nature of the site, the flow meter will be powered by a solar panel with a battery back-up. The flow meter with solar panel, battery backup, other technologies (still to be determined), and installation is estimated at $80,000.

13. Contingency (20% of subtotal)
A 20% contingency was utilized for the estimate as the project is still in the preliminary stages. The contingency is also included due to concerns about ongoing supply chain issues throughout the world.

14. Mobilization (5% of subtotal)
A 5% factor was used for mobilization which will cover the job trailer, staging the pipe along the canal, and temporary/permanent road improvements to allow heavy equipment to access the site, if needed.

15. OH&P (18% of subtotal)
18% was used for the construction contractor for construction management, equipment, insurance, profit, and overhead.

h. Other
Not applicable.

i. Total Direct Charges: $19,901,321

j. Indirect Charges
Not applicable.

k. TOTAL: $19,901,321

3) Funding Plan and Documentation

Source of Non-Federal Funds: Lugert-Altus Irrigation District. Oklahoma Senate Bill (SB) 0429, signed May 22, 2022 (see Attachment 2), authorized $25 million in funding to the District for the specific purpose of converting the canal to buried pipeline. Section 7 states that the funding purpose is:

> *"…to promote water conservation, encourage economic longevity, and ensure reliable food supply by converting portions of an open ditch irrigation system to pipe within the Lugert-Altus Irrigation District"*

The source of the State's funds is the Statewide Recovery Fund formed from the U.S. Treasury's State and Local Fiscal Recovery Funds.

The appropriated funds will support the entire master plan for conversion of the Ozark Canal to buried pipeline, i.e., Phases I and 2, together which will cost an estimated $38 million (in 2022 Dollars).

On June 10, 2022, the District sent a copy of SB 0429 to Reclamation for review to confirm the eligibility of the funds for use as the project's non-federal funds. In addition to SB 0429, the District included the following language from the American Rescue Plan Act of 2021, which further authorizes uses of these funds as non-federal match for Reclamation projects, see below:

> Section 40909 of PL117-58 says:
> SEC. 40909. CLARIFICATION OF AUTHORITY TO USE CORONAVIRUS FISCAL RECOVERY
> FUNDS TO MEET A NON-FEDERAL MATCHING REQUIREMENT FOR

```
AUTHORIZED BUREAU OF RECLAMATION WATER PROJECTS.
(a) Coronavirus State Fiscal Recovery Fund.--Section 602(c) of
the Social Security Act (42 U.S.C. 802(c)) is amended by
adding at the end the following:
4) Use of funds to satisfy non-federal matching requirements
for authorized bureau of reclamation water projects.--Funds
provided under this section for an authorized Bureau of
Reclamation project may be used for purposes of satisfying any
non-Federal matching requirement required for the project.''.
(b) Coronavirus Local Fiscal Recovery Fund.--Section 603(c) of
the Social Security Act (42 U.S.C. 803(c)) is amended by
adding at the end the following:
(5) Use of funds to satisfy non-federal matching, maintenance
of effort, or other expenditure requirement.--Funds provided
under this section for an authorized Bureau of Reclamation
project may be used for purposes of satisfying any non-Federal
matching requirement required for the project.
(c) Effective Date.--The amendments made by this section shall
take effect as if included in the enactment of section 9901 of
the American Rescue Plan Act of 2021 (Public Law 117-2; 135
Stat. 223).
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Reclamation officials confirmed that the that SB 0429 documentation was sufficient (see email correspondence in Attachment 2).

The amount of funding commitment: $14,901,321 of the authorized appropriation will go toward the proposed Phase 1 project. The remainder of the appropriation will go towards the completion of Phase 2 of the Ozark Canal conversion.

The date the funds will be available to the applicant: End of calendar year 2022

Time constraints on the availability of funds: There are no known time constraints on the appropriation.

Any other contingencies associated with the funding commitment: There are no known contingencies associated with the appropriation.

Pre-Award Costs
The proposed cost estimate does not include pre-award costs.

Environmental and Cultural Resources Compliance

The District and its design engineers consulted with Reclamation's Oklahoma-Texas Area Office on several occasions during June and July 2022, to discuss the project's design, permitting, and anticipated environmental and cultural compliance requirements. The District's engineering consultant conducted a desktop analysis, and advised that the NEPA process will require a field investigation. It is expected that a small-scope environmental assessment (EA) will be required with an anticipated Finding of No Significant Impacts (FONSI), as all of the work will take place in the existing canal's alignment. The timeline for the environmental and cultural compliance work is estimated at 16 months. The only possible mitigation that is expected is related to cultural resources. The District itself is eligible for listing on the National Register of Historic Places, as its infrastructure dates back to the 1940s. Reclamation officials recommended that the District conduct the EA for the entire master plan for the canal conversion (i.e., Phases 1-2). The District's engineering consultant will be responsible for conducting the EA, and Reclamation will conduct interim and final reviews of the EA. The District's Project Manager will participate in meetings with the engineering consultant and Reclamation, and also review drafts of the EA.

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

The project will include trenching approximately 5-8 feet in the floor of the existing canal where the new pipeline will be placed and covered with backfill. The environmental impact is expected to be minimal as the work will be limited to the existing right-of-way of the canal. The District's contractor will minimize construction impacts and limit the construction footprint whenever and wherever possible. During construction, dust may be generated but is expected to be minimal and temporary, and dust control measures will be implemented when necessary. Impacts to the surrounding animal habitat will be minimal and limited to insects and small animals that live in the area (the only endangered or threatened species in the area are birds, which are not expected to be impacted by the proposed work). The work is not expected to affect water quality. The canals will be dry when the work takes place, and there will be no impacts to the Reservoir, located more than 10 miles away to the North. The pipeline will cross several creeks and drainage ways, where they currently cross by cast-in-place siphons. If the condition of the siphons is adequate, the new pipe will be connected to the existing siphons to minimize disturbance of the creek. If other alternatives are required, appropriate mitigation measures will be taken to protect water quality.

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

The District consulted the U.S. Fish and Wildlife Service's Information and Planning for

Consultation (IPaC) online system. There are no critical habitats in the project area. There are potentially two threatened species in the project area: Piping Plover and Red Knot, and one endangered species: Whooping Crane. The District does not anticipate that the project will have any negative impact on these bird species, if they are present. The construction will occur in the footprint of the existing canal, and will be limited to trenching, laying pipeline, and backfilling.

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

The District consulted the U.S. Fish and Wildlife Service's National Wetlands Inventory and found that there are no wetlands in the immediate project area; however, there are wetlands in the general vicinity. The location of these will be explored during the field investigation and appropriate mitigation measures will be taken, if necessary.

The project area includes Lugert-Altus Reservoir, which provides irrigation water for the District's agricultural deliveries. There are no known negative impacts to the Reservoir; in fact, the known impacts are all positive. Eliminating waste/loss of the water drawn from the Reservoir for irrigation purposes will support an increased amount of water that remains in the Reservoir. Increased and sustainable Reservoir supplies enhance the short- and long-term resiliency of the fish and wildlife that live in and around the Reservoir. The Reservoir was devastated by the last Drought of Record which resulted in a complete fish kill in the winter of 2012-2013, and a nearly complete fish kill in 2014. The 2012-2013 event killed an estimated 350,000 fish; both events were caused by toxic Golden Algae which had bloomed after the low storage volume increased the concentration of salts and nutrients in the Reservoir. The Reservoir was not healthy enough to restock with fish until 2017. A number of other wildlife were equally impacted such birds (including the seven migratory species that travel across the area), mammals, amphibians, and insects, all of which rely on this important surface water.

The project's benefit to the Reservoir will also support the significant recreation benefit that the Reservoir provides. During the last Drought of Record, Reservoir levels were as much as 20 feet below normal, and the numbers of visitors to Quartz Mountain State Park, located on the shores of the Reservoir, dwindled. Visitors come to the area for fishing, swimming, boating, camping, hiking, and more. Low Reservoir levels impacts the area's natural beauty, and expose the Reservoir's docks, thus severely restricting access to water recreation.

When was the water delivery system constructed?
The irrigation system is part of the W.C. Austin Project, which was constructed by the Bureau of Reclamation in 1941 but was halted due to World War II. Construction resumed in 1944 and continued until the completion of the distribution system in 1949. The W.C. Austin Project includes Altus Dam, Lugert-Altus Reservoir, and the irrigation distribution system. The W.C. Austin Project is owned by Reclamation. Operation and maintenance (O&M) responsibility was transferred to the Lugert-Altus Irrigation District in 1942 via contract number I1r-1375.

Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.
The proposed Phase 1 project will convert four miles of the 14.5-mile Ozark Canal to buried pipeline. The earthen canals were constructed in the 1940s as described above. No other extensive alterations or modifications have been conducted.

Other efficiency improvements have been made to the District's infrastructure.

1. The District received a Water 2025 Grant from Reclamation in 2005 for irrigation efficiency improvements. These included upgrades to existing structures for flow measurement, construction of structures (long-crested weirs) to maintain constant elevations for more precise deliveries to laterals and farm turnouts, and SCADA and telemetry expansions. The Water 2025 Grant improvements were completed in 2009. Table 4 below shows the improvements that were made and the location of each improvement. Eight improvements were made to the Ozark Canal.

Table 4: *Previous Improvements Funded by a Reclamation Water 2025 Grant (yellow highlights are for improvements on the Ozark Canal).*

Flow Measurement Structures	Check Structure Modernization (Long Crested Weir)	Telemetry System Expansion
Main Canal Bench Flume	Altus-4.6	Main Canal Bench Flume
Zen Check	Altus -6.8	Blair Turnout flume
Altus-17.6	Altus-9.9	Zen Check
West-10.6	Ozark Check	Altus 17.6
West Canal Wasteway	Altus-17.9	Altus 19.0
Ozark-4.6	Altus-19.0	Altus 21.5
Ozark Canal Bench Flume	West-11.3	Altus 21.7
Ozark-15.2	Ozark-4.6	West 10.6
Ozark Canal Wasteway		West Canal Wasteway
		Ozark Canal Bench Flume
		Ozark Canal Wasteway

2. In addition, the District has converted several laterals to pipe and are utilizing pumps to supply farm turnouts in certain areas to keep the flow elevation in the canals to a minimum and thereby reducing seepage. The District has also constructed regulating

reservoirs at the wasteways of the West and Altus Canal systems. The water from operational spills at these locations is pumped back into the system.

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

The targeted four-mile canal segment is in a rural location and there are no buildings. The District itself is eligible for listing on the National Register of Historic Places, as its infrastructure dates back to the 1940s. During the District's consultation with Reclamation officials it was recommended that, at a minimum, the District should budget for and anticipate photographing and documenting the targeted sections of the canal. The engineering consultant will complete this work (costs are not included in this grant project). The District will undertake any additional actions recommended by the State Historical Preservation Office (SHPO).

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

There are no known archeological sites in the project area. If any sites or artifacts are discovered during trenching, work will be halted and the District will immediately consult with SHPO officials to ensure that the appropriate processes are followed.

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

The District is located in a rural area, and the targeted section of canal conversion for Phase 1 has no farm turnouts, i.e., the targeted section of the canal moves water to other locations in the system where farm turnouts are located. Thus, there are no populations located in the immediate project area. However, the project will positively impact a low-income population. The District supplies a portion of M&I water to the City of Altus (population 18,729), home to Altus Air Force Base, the United States Air Force training base for C-5, C-17, KC-46 and KC-135 aircrews. The District's irrigation system surrounds the City (see the project location map in Fig. 2, p. 4, above). The City is classified as low-income with a median household income of $47,990, which is lower than the State ($53,840) and the U.S. ($64,994) (U.S. Census Bureau, Community Profiles). Fifty-six percent of children in Altus schools are classified as "low-income" by the Oklahoma Department of Education, but the figure is as high as 73-77% for three of the City's seven schools. The project will not have any negative effects on the City, but will, in fact, have a positive effect. By enhancing efficiency of the irrigation system and eliminating water losses, the project will increase the resilience of the District's water supplies, which will support the short- and long-term resilience of M&I water deliveries to the City.

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

There are no known Tribal sites in the project area.

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

The project will not contribute to the introduction or spread of noxious weeds or invasive species, but will, in fact, support the elimination of invasive or noxious weeds. Currently, the open earthen canal supports the growth and proliferation of brush, shrubs, and weeds via the seepage that occurs all along the canal. Conversion of the open canal to buried pipe will eliminate seepage, and thus eliminate the source of water that supports weeds, brush, and shrubs.

Required Permits or Approvals

The entire project will be conducted on land and infrastructure owned by the Bureau of Reclamation, i.e., the W.C. Austin Project, which includes the District's irrigation distribution system, the Reservoir, and Altus Dam. The District is responsible for operations and maintenance of the irrigation system, and has the right, by contract, to undertake system and infrastructure improvements in consultation with Reclamation. The District and its contractor will consult closely with Reclamation and the U.S. Army Corps of Engineers throughout the project as required.

Known permits that will be sought include the following and the District will adhere to the requirement for additional permits, if needed.

1. Clean Water Act (CWA) Section 404 Nationwide Permit 58 from the U.S. Army Corps of Engineers which will authorize the project due to its anticipated "minimal adverse environmental effects when performed separately, and will have only minimal cumulative adverse effects on the environment."
2. Oklahoma Department of Transportation (ODOT) for the tunneled pipeline crossing at State Highway 62 near Station 680+76. ODOT does not typically require a fee and approval should take 2-3 months.
3. BNSF Railroad for the tunneled pipeline crossing at Station 736+72. The Railroad may require a flagger be present on-site during construction of the project. An application with design details will submitted and an application fee will likely be required. Railroad approval should take 4-6 months so the application will be submitted shortly after the 60% design is complete.
4. Jackson County for pipeline crossing at four county roads which may require traffic control plans and temporary and/or permanent road improvements to ensure access of heavy equipment such as backhoes and cranes.

Letters of Support

The project has robust support from local, regional, and state-level stakeholders. Letters of support are included for:

1. Local Farm: Abernathy Farms
2. Local Farm: Dan Vinyard
3. Local Farm: Worrell Farms
4. City of Altus
5. Southwest Oklahoma Water Supply Action Plan Advisory Committee
6. Congressman Frank Lucas (OK-03)
7. United States Senator Jim Inhofe
8. Oklahoma Tourism and Recreation Department (OTRD)
9. Oklahoma Department of Wildlife Conservation (ODWC)
10. Oklahoma Water Resources Board (OWRB)

Dear Commissioner Touton,

Abernathy Farms is a multi generation family farming operation consisting of Clint, Justin, and Jarod along with their respective families. We are very supportive of the WATER Smart Grant request of Lugert/Altus Irrigation District. With South West Oklahoma being identified as a Hot Spot (demand is out pacing supply) in the most recent Oklahoma comprehensive Water Plan, we believe it is imperative that any and all attempts to conserve water should be pursued. By converting open canals to buried pipe significant water savings will be realized. Our family has made major investment in on farm irrigation practice improvements, subsurface/drip, we applaud the efforts of the District to pursue conservation efforts and join us in saving and maximizing the use of water.

Sincerely

Clint Abernathy

Justin Abernathy

Jarod Abernathy

Dear Commissioner Touton,

This letter is written to support the Water Smart Grant request of Lugert/Altus Irrigation District. The proposed project would convert open canals to buried pipe, resulting in significant water savings along with increased management/control of the water. Vinyard Farms is a family farm, and as we look to the future, more efficient delivery of water by the Irrigation District to the farm gate is a must. As crop input costs continue to escalate securing adequate water to produce an irrigated crop becomes more and more imperative. Our family has invested significant resources in an effort to conserve what is a very limited resource in S.W. Oklahoma, water. Thru the installation of tail water recovery pits, we have seen a savings of 20% or more by capturing and recycling runoff. Additionally we have converted many fields that were previously flood to subsurface/drip irrigation. We have seen the efficiency of water application improve dramatically as a result of these irrigation practice improvements. The project proposed by Lugert/Altus Irrigation District will greatly enhance these efforts. We are very hopefully that this project is awarded and both the Irrigation District and the farmers can continue to improve on the delivery and application of irrigation water.

Sincerely

Dan Vinyard

Dan Vinyard

Dear Commissioner Touton,

As Worrell Farms enters its fourth generation, we are well aware of the need to modernize the 1940s infrastructure of Lugert/Altus Irrigation District. We and many of our neighbor farmers are converting our farms from flood irrigation to subsurface/drip irrigation in an effort to be more effective and efficient with the application of irrigation water. Worrell Farms is very supportive of the request of Lugert/Altus Irrigation District for a Water Smart Grant to convert open canals to buried pipe. This conversion will greatly compliment the on farm efforts and result in even more savings of irrigation water. When the landowners and the District both pursue modernization efforts the overall goal of conservation/savings of water will be maximized.

Sincerely,

Mitch Worrell

Chance Worrell

A PROUD HERITAGE
A PROMISING FUTURE TO SHARE!

City of
ALTUS

Altus, OK 73521 (580) 477-1950

MAYOR
Robert Garrison

CITY MANAGER
Gary Jones

CITY COUNCIL
John Womack
Matt Rester
Doyle Jencks
Patricia Blackman
Roberta Brady-Lee
Terrence Filer
Ron Osterhout
Dillon Feazel

July 26, 2022

Camille Calimlim Touton
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Subj: Letter of Support for BOR Water and Energy Grant Program Application Lugert-Altus Irrigation District

Dear Commissioner Touton:

The City of Altus strongly supports the Lugert-Altus Irrigation District's grant request to convert a portion of their irrigation system's open canals to buried pipelines. The City (population 18,729) holds water rights of 4800 acre feet for municipal and industrial water which is delivered by the District via their irrigation canals. Our water security is directly tied to the reliability and resiliency of the District's water supplies.

The drought conditions which has persisted since 2010 have been a powerful teacher for southwest Oklahoma. No region of Oklahoma suffered as much or for so long from the statewide drought as the southwest. Beginning in the summer of 2010, lack of rainfall and runoff, rapid evaporation and increasing demand slowly and deliberately consumed our surface water supplies. In Altus, the ripple effect of the drought on the economy hit hard due to the failure of crops and loss of jobs, tax receipts and property taxes, which in turn impacted retail businesses, schools, health care, and the crucial maintenance of roads and other infrastructure. The City and its residents already know, first-hand, the devastating impact of drought and the urgency of identifying approaches to reduce water loss and ensure the resiliency of out water for the long-term. We are grateful to learn that the District is taking this bold step to secure our collective water future. We hope you understand the urgency of the project, and the significant benefit it will bring to the region.

Sincerely,
Roberta Brady-Lee
Vice Mayor
Robert Garrison
Mayor

LETTER OF SUPPORT
For Lugert-Altus Irrigation District's Grant Application to the
Federal Bureau of Reclamation's FY23 Water and Energy Grant Program

July 8, 2022

Camille Calimlim Touton
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

Re: Letter of Support for Lugert-Altus Irrigation District

Dear Commissioner Touton:

On behalf of the Southwest Oklahoma Water Supply Action Plan Advisory Committee, please accept our letter of support for the Lugert-Altus Irrigation District's funding request to convert a portion of their irrigation system's open ditch canals to buried pipelines. The Committee was initiated by a proactive group of local water stakeholders under enormous pressure in the midst of the historic 2010-2015 drought in southwest Oklahoma. The Committee is comprised largely of public water suppliers, Altus Air Force Base representatives, agricultural producers, and involved members of the public and local economies. The Committee drove the development of the *Southwest Oklahoma Water Supply Action Plan* (2014, and updated in 2018) through a detailed review of past studies and reports, coupled with a series of meetings with key water stakeholders in the region that represent a diverse set of water interests and uses. The Action Plan provides a phased, targeted approach to addressing near and long-term water supply improvements and provides an implementable plan to firm up the reliability of supplies for all water users in the region.

The Lugert-Altus Irrigation District's proposed project is directly aligned with the goals and objectives of our Action Plan, specifically: *Water Supply Strategy 1. Near-term Implementation - Increase Efficiency/Local Supplies (Additional Water Conservation).* The Action Plan calls for the District to address water loss from seepage and evaporation with approaches such as canal lining. The project's plan to convert to buried pipelines exceeds the proposed objective as water losses will be nearly eliminated.

The Committee's work has taught us that water and its availability is an essential factor in our economy. Without it, we can no longer support agriculture which is a significant economic driver in the region. We urge you to fund the District proposed project, and we thank you for your consideration.

Sincerely,

Jed Winters, Chairman SW Water Action Com.

FRANK D. LUCAS
3RD DISTRICT, OKLAHOMA

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DIVERSITY AND INCLUSION

Congress of the United States
House of Representatives
Washington, DC 20515–3603

July 8, 2022

Camille Calimlim Touton
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

RE: Support for Lugert-Altus Irrigation District's USBR Grant Application

Dear Commissioner Touton:

I am happy to share my support for the Lugert-Altus Irrigation District's application to BOR's Water and Energy Grant Program. In the face of the ongoing drought in southwest Oklahoma, their request is urgent and critically important. The District provides irrigation to approximately 48,000 acres of agricultural land south of Lugert-Altus Reservoir. The irrigated land produces cotton with an annual crop value of $210 million, and the irrigation system's canals also provide supplemental potable water to the City of Altus.

The District seeks funding to convert the open canals of the current irrigation system to buried pipelines. The District estimates that the project will save upwards of 1,000 acre-feet of water per year, which is currently lost to seepage and evapotranspiration. The Oklahoma Water Resources Board forecasts that the current drought will persist, so the time to make the investment is now. Please join me in supporting a project that will protect the livelihood of southwestern Oklahoma's cotton farmers and residents who depend on the Lugert-Altus Irrigation District.

Respectfully,

Frank Lucas
Member of Congress

DISTRICT OFFICE:

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(405) 373-1958

JAMES M. INHOFE
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United States Senate

WASHINGTON, DC 20510-3603

COMMITTEES:
ARMED SERVICES
Ranking Member

ENVIRONMENT AND PUBLIC WORKS

SMALL BUSINESS AND ENTREPRENEURSHIP

INTELLIGENCE
Ex Officio

July 05, 2022

The Honorable Camille Calimlim Touton
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington, D.C. 20240

Dear Commissioner Touton,

I am pleased to submit this letter in support of the Lugert-Altus Irrigation District's (the District's) application for the WaterSMART Water and Energy Efficiency Grants Program to convert the open canals of the current irrigation system to buried pipelines across the W.C. Austin project area.

The W.C. Austin Project - comprised of the Altus Dam and distribution systems - is a critical component of agricultural and economic development in southwest Oklahoma as it provides irrigation to approximately 48,000 acres of land south **of** the Lugert-Altus Reservoir that produce cotton with an annual crop value of $210 million. By converting the open canals to buried pipelines, this project would save nearly 1,000 acre-feet of water per year, allowing the District to conserve and use water more efficiently during a period of persistent drought.

I thank you in advance for your consideration of the District's application for this WaterSMART Water and Energy Efficiency Grant as they work to promote water supply sustainability throughout the southwest Oklahoma region. Please contact Victor Sarmiento, on my staff, at victor_sarmiento@inhofe.senate.gov if you need any further assistance as you consider this important project.

Sincerely,

James M. Inhofe
United States Senator

http://inhofe.senate.gov

OKLAHOMA
Tourism & Recreation
123 Robert S Kerr Avenue
Oklahoma City, OK 73102

July 6, 2022

Camille Calimlim Touton
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

RE: Letter of Support for Lugert-Altus Irrigation District

Dear Commissioner Touton,

The Oklahoma Tourism and Recreation Department (OTRD) is pleased to provide this letter of support for the Lugert-Altus Irrigation District and for their proposed project. As Oklahoma's third largest industry, tourism is vital to the state's economy. The state Tourism and Recreation Department markets Oklahoma as a travel destination as well as manages state-owned parks and resorts.

It is our understanding that the District is launching a new initiative to convert their irrigation system's open ditch canals to buried pipes. Their project will reduce significant water that is lost through evaporation and seepage. This in turn will support the health and wellbeing of multiple recreation amenities in the area most significantly the Lugert-Altus Reservoir and the adjacent 4,545-acre Quartz Mountain State Park which benefit from the nearly 11,000 surface acres of water supplied by the District for public recreation and fish and wildlife conservation. The Reservoir and the State Park provide a major recreation spot in southwest Oklahoma offering a variety of recreational amenities and activities including hiking, rock climbing, hunting, boating, ATV riding area, picnic areas, five designated camping areas, a swimming beach, playgrounds, enclosed fishing dock, swimming pool, and much more.

The resiliency of our local tourist destinations is critical. Almost 11 percent of the jobs in Oklahoma are directly connected to the travel and tourism industry. For every $1 million spent in Oklahoma by domestic and international travelers, 10.6 jobs are created. The OTRD enthusiastically supports the Lugert-Altus Irrigation District, and we hope you will join us in our support of this important project.

Sincerely,

Ben Davis, AICP
Interim Executive Director

TravelOK.com

July 8, 2022

Camille Calimlim Touton Commissioner Bureau of Reclamation 1849 C Street NW Washington DC 20240-0001
RE: Letter of Support
Lugert-Altus Irrigation District – BOR Water and Energy Grant Application

Dear Commissioner Touton:

On behalf of the Oklahoma Department of Wildlife Conservation (ODWC), please accept our letter of support for the Lugert-Altus Irrigation District and their proposed project to significantly improve their irrigation system by converting open canals to buried pipe. The District provides 11,000 surface acres of water annually for public recreation and fish and wildlife conservation. The principal beneficiary is the 10-square mile Lugert-Altus Reservoir (i.e., Lake Altus) which is home to walleye, small and largemouth bass, sunfish, catfish, and crappie. As of the writing of this letter, the lake is 25-feet below normal. Lake levels are critically important. In 2013, ODWC announced that the lake was essentially dead as a fishery after conducting a four-day survey using electrofishing and gill netting. It was estimated that toxic golden algae had killed more than 350,000 fish over a three-month period. High levels of salinity, sulfate, and chloride have the greatest influence on golden algae distribution and bloom formation, and these can be caused and exacerbated by low water levels which affect their concentrations. The lake was largely depleted during the historic drought of 2010-2015. The Lake has since recovered and been restocked, but it (and the wildlife) remains vulnerable in the face of drought and unpredictable water levels. In addition to fish, the Lake supports deer, quail, turkey, rabbit, coyote, beaver, raccoon, and various waterfowl.

The District's efforts to minimize water losses and support the resilience of the reservoir also serves to support the area's wildlife. We strongly support their project and wish them the very best in their efforts to seek grant funding for this important project.

Sincerely,

J.D. Strong
Director

JULIE CUNNINGHAM
EXECUTIVE DIRECTOR

KEVIN STITT
GOVERNOR

OKLAHOMA
Water Resources Board

July 8, 2022

Camille Calimlim Touton
Commissioner
Bureau of Reclamation
1849 C Street NW
Washington DC 20240-0001

RE: Support for Lugert-Altus Irrigation District's BOR Grant Application

Dear Commissioner Touton:

The Oklahoma Water Resources Board (OWRB) is pleased to share our support for the Lugert-Altus Irrigation District's application to the Bureau of Reclamation's Water and Energy Efficiency Grant Program. OWRB's mission is to protect and enhance the quality of life for Oklahomans by managing and improving the state's water resources to ensure clean and reliable water supplies, a strong economy, and a safe and healthy environment.

The District seeks to convert their irrigation system from open canals to buried pipelines, and this grant request will provide the gap funding needed to initiate Phase I of the project. The system provides irrigation to 48,000 acres of agricultural land. The Bureau's own studies show that the District's open canal system has water losses of up to 20,455 AFY due to seepage and evapotranspiration. Buried pipelines will nearly eliminate these losses while supporting flows and turnouts impeded by vegetation. The District's project is directly aligned with OWRB's Water for 2060, a plan that establishes a statewide goal of consuming no more fresh water in 2060 than was consumed in 2010, and specifically with GOAL: Reducing water loss in transmission/ distribution systems. To achieve Water for 2060's goals, all stakeholders across the State have a role to play. The District has identified a bold approach to secure the reliability of water for their users, and OWRB strongly supports their project.

Sincerely,

Julie Cunningham

Executive Director

3800 N. CLASSEN BOULEVARD • OKLAHOMA CITY, OKLAHOMA 73118 • (405) 530-8800 • www.owrb.ok.gov
Jennifer Castillo • Charles Darby • Thomas A. Gorman • Ron Justice • Suzanne Landess • Bob Latham • Darren Cook • Matt Muller • Robert L. Stallings

Official Resolution

LUGERT-ALTUS IRRIGATION DISTRICT
P.O. BOX 520
1421 W. RIDGECREST
ALTUS, OK. 73522

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE LUGERT-ALTUS IRRIGATION DISTRICT AUTHORIZING THE SUBMISSION OF A GRANT APPLICATION TO THE UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, FOR THE WATER AND ENERGY EFFICIENCY GRANTS FOR FISCAL YEAR 2023

THE BOARD OF DIRECTORS FINDS:

1. The United States Department of the Interior, Bureau of Reclamation (USBR), released Funding Opportunity Number R23AS0008, Water and Energy Efficiency Grants for Fiscal Year 2023, in April 2022;

2. The Lugert-Altus Irrigation District (District) has operation and maintenance responsibility for the BOR-owned W.C. Austin Project, which includes an irrigation network of canals and laterals that serve approximately 46,000 acres of privately owned land;

3. The grant application requires the adoption of an authorizing resolution designating a representative to sign and file a financial assistance application and all necessary documents related to a financing agreement with the United States Department of the Interior, Bureau of Reclamation; and

4. The District, if selected, will enter into an agreement with the United States Department of the Interior, Bureau of Reclamation to conduct the first phase of a project to convert a portion of the irrigation network from open canal to buried pipeline for the purpose of water conservation.

THE BOARD OF DIRECTORS RESOLVES:

1. The District's General Manager is hereby authorized and directed to sign and file, for and on behalf of the District, an application for a grant agreement with the United States Department of the Interior, Bureau of Reclamation to convert a portion of the irrigation network from open canal to buried pipeline (Phase I).

2. The District's General Manager is designated to provide the assurances, certifications, and commitment required for the financial assistance application, including executing a financial assistance agreement with the United States Department of the Interior, Bureau of Reclamation, and any amendments or changes thereto.

3. The District is capable of providing the required matching funding specified in the grant application funding plan.

4. The Board of Directors has reviewed and supports the application to be submitted to the United States Department of the Interior, Bureau of Reclamation.

5. The District will work with the United States Department of the Interior, Bureau of Reclamation, to meet established deadlines for entering into a grant or cooperative agreement.

6. The District's General Manager is designated to represent the District in fulfilling the District's responsibilities under the financing agreement, including certifying disbursement requests on behalf of the District and compliance with applicable state and federal laws.

PASSED and ADOPTED this 29thday of June, 2022.

NAME
Chairman

Dan Vinyard
NAME
Member

NAME
Member

NAME
Member

NAME
Member

NAME
Member