PICACHO WHEN:

Water – Habitat – Energy Nexus

Multi-Objective Water Conservation
WaterSMART Grant Application

Elephant Butte Irrigation District
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Table of Contents

List of Figures

List of Tables

1. Technical Proposal

1.1. Executive Summary

May 9, 2018
Elephant Butte Irrigation District, Doña Ana and Sierra Counties, New Mexico
Main offices in Las Cruces, New Mexico

Elephant Butte Irrigation District proposes an integrated set of water conservation measures to stretch the limited resource available to EBID. The proposed practices strive to increase efficiency of water delivered to constituent farmers by reducing losses and improving delivery timeliness. The water conservation goals are also complimented by partially offsetting increased energy requirements and enabling the delivery of surface water to nearby habitat. The six major components of the project are:

1) Pipe 6,163 feet of the tail end of the Picacho Lateral, which is near the tail end of the Picacho branch of the Leasburg irrigation system, to reduce seepage and improve delivery to constituent farmers. The water saved by this projects conservation measures will benefit all EBID constituents equally, similar to any increase in efficiency. Funding is requested for the metal pipe and concrete structures, and other materials to pipe the lateral.

2) Pipe the entire Nusbaum Lateral, 2634 feet of the tail end of the Picacho Lateral, which is the very tail end of the Picacho branch of the Leasburg irrigation system, to reduce seepage and improve delivery to constituent farmers. The water saved by this projects conservation measures will benefit all EBID constituents equally, similar to any increase in efficiency. Funding is requested for the metal pipe and concrete structures, and other materials to pipe the lateral.

3) Install three high flow lift pumps from EBID's Wasteway 40 of the Picacho Lateral, which is connected hydraulically to the Rio Grande via an existing box culvert, into the Picacho Lateral to greatly improve delivery timing and reduce canal seepage. Seepage will be reduced by transporting this irrigation water within Rio Grande channel in conjunction with irrigation water being delivered to EBID's Mesilla Valley and other downstream constituents, rather than down the 19.5 miles of unlined earthen canal required to reach this important part of the Mesilla Valley. Water pumped at this location will be metered and will be accounted as part of the diversion for the Mesilla Valley at Leasburg Dam. Funding is requested for the low-lift, high-flow pumps, concrete structure required, and connection to the nearby power grid.

4) Improved metering will be installed at the beginning of the new pipeline of the Picacho Lateral and at the heading of the Nusbaum Lateral. Magnetic flow sensor technology will also be installed and incorporated with the pumps proposed within EBID's Wasteway 40. All collected data will be available on EBID's website and available to public and interested entities.

5) A photovoltaic solar panel array will be installed to partially offset the electricity required of the high flow lift pumps proposed by this project. The solar array will be installed within the existing right of way of the Picacho or Nusbaum Lateral after the laterals are piped. The electricity produced by the panels will be sold to the local electric utility, and the lift pumps will be powered with electricity purchased from the same utility.

6) Pipe a portion of ditch through Harris Farms LLC to the Picacho Drain to serve as a new wasteway and to also enable the delivery of surface water the to nearby and downstream Bosque State Park. The delivery of surface water, whether it is required to prevent over runs within the canal system, ordered for delivery by downstream water right owners, or stormwater which is deemed best to be released, will benefit downstream riparian habitat along the Picacho Drain.

All portions of the proposed projects are located on EBID property, which is held by EBID by title after transfer from the Bureau of Reclamation or on land which EBID will receive easement to construct, operate, and maintain the improvements which is being contributed to the project by EBID constituent farmers. A letters of commitment has been included for the easement being contributed.

The project will take three years to complete. If the project begins in October 2018, the anticipated completion date would be September 30, 2021.

1.2. Background Data

1.2.1. The Rio Grande Project:

Elephant Butte Irrigation District (EBID) is the New Mexico portion of the Rio Grande Project (RGP), which was authorized in 1905. The major features of the Rio Grande Project are:
Elephant Butte Dam, a large storage dam completed in 1916 with a capacity of about 2.1 million acre-feet;
Caballo Dam, a flood control and regulation dam completed in 1938 with a capacity of about 344 thousand acre-feet, but it is operated at much lower levels to re-regulate releases from Elephant Butte Dam to meet downstream demands;

- Elephant Butte Irrigation District in New Mexico, providing water to farmers on 90,640 acres of water-righted land in the Rincon and Mesilla Valleys;
- El Paso County Water Improvement District No. 1 (EPCWID) in Texas, providing water to 69,010 water-righted acres for irrigation in the Mesilla and El Paso-Juarez Valleys, including water supply to the City of El Paso;
- The Republic of Mexico receives its delivery of RGP water pursuant to the 1906 *Convention between the United States and Mexico - Equitable Distribution of the Waters of the Rio Grande* at the Acequia Madre diversion from the Rio Grande on the international border between El Paso and Ciudad Juarez.

EBID is a legislatively authorized political subdivision of the State of New Mexico. The district operates under New Mexico statutes §73-10-1 through §73-10-47, Irrigation District Cooperating with United States under Reclamation Laws; Formation and Management, and §73-11-1 through §73-11-55 Irrigation Districts Cooperating with United States under Reclamation Laws; Fiscal Affairs; Local Improvements and Special Powers. As defined by New Mexico statutes, irrigation districts cooperate with the federal government on Bureau of Reclamation projects. These statutes generally state that irrigation districts are to:

- Serve as a contracting agency for water users to arrange to repay construction obligations to the government and furnish funds for operation and maintenance; and in connection with other matters that must be agreed to, in contract for, between the government and water users. (§73-10-1 paraphrase)
- Serve as an agency for the assessment and collection of operation, maintenance and construction charges and the payment of same, to the government in accordance with contractual arrangements. (§73-11-28 paraphrase)
- Provide a water users' organization that might later be expanded for the purpose of assuming control of operation and maintenance upon transfer by the Bureau of Reclamation. (§73-10-45 paraphrase)

EBID is governed by a board of nine elected members drawn from the district's constituents. The board meets monthly and has broad powers to set policies, which are implemented by district personnel, who are overseen by the District Manager.

1.2.2. Physical facilities:

Elephant Butte Irrigation District's lands are served by three primary diversion points – Percha, Leasburg, and Mesilla Dams. Mesilla Dam also delivers water to EPCWID's Mesilla valley lands in

Texas. EBID has about 300 miles of canals and laterals, and the district is broken up into 13 operational units that are manned by ditch riders. Only about 28 miles of the laterals are currently in pipe. The district also has about 300 miles of drains that return subsurface drainage and storm water to the Rio Grande. Reclamation retains title to the diversion dams, and EBID operates and maintains them under contract with Reclamation. EBID owns the canal and drainage systems, along with associated land.

1.2.3. Hydrology and Water Supply:

Water for EBID, EPCWID, and Mexico is released from storage in Elephant Butte Reservoir and regulated through Caballo Reservoir. Orders for EBID, EPCWID, and Mexico are summed, and the release gates at Caballo Dam are adjusted to meet the specific demand, accounting for gains or losses in the system and lag times to the diversion points. Each district and Mexico has an allocation for diversion from the Rio Grande. The methodology for determining these diversions is described in the Operating Agreement and Operating Manual that the two districts and Reclamation negotiated and approved in 2008.

A "full allocation" for annual diversion to EBID is about 495,000 acre-feet. EBID has not had a full allocation since 2002 due to the persistent and increasingly severe drought in the area. The RCP experienced a similar drought cycle from 1951 through 1978, with very short years interspersed with an occasional wet year of full supply. From 1979 through 2002, both districts and Mexico had full allocation on January 1 of every year. Having occurred for 24 consecutive years, full supply came to be considered a normal year. It is not. The last twelve years have reminded us that drought and shortage is more normal than full supply, making water conservation all the more important.

Given its allocation for diversion, EBID's Board of Directors sets the allotment for delivery to constituents' farm gates by estimating the conveyance efficiency (delivery/diversion), and allotting water pro-rata to the district's 90,640 acres. During the full supply years of 1979-2002, with a three-foot allotment every year, the conveyance efficiency was about 65 percent. Of the 35 percent loss, about ten percent was attributed to losses in the main canal system and 25 percent was attributed to losses in the laterals.

In the twelve years since 2002, the allotment has only been full once, in 2005. In 2003 and 2004, the allotment was only eight inches. In 2011, it was four inches, and in 2012 it was ten inches. The year 2013 saw the worst water supply in the nearly 100 year history of the Rio Grande Project, with an allotment to farmers of only 3.5 inches. In 2014 EBID's members received seven and a half inches, in 2015 it was eleven inches, and in 2016 it was thirteen inches.

The 2017 allotment to EBID farmers was 24 inches, a level not seen since 2010, but a full allotment is 36 inches. The average for the period 2011-2016 was only eight inches and the average for the last fifteen years (2003-2017) was seventeen inches. While last year's improved supply has reduced aquifer decline, effects of the previous six years of hard drought are still

quite evident. 2018 has proven to be another year of poor snow pack, with an allotment to EBID farmers set at ten inches without any realistic hope for increase.

Since a significant portion of the losses are fixed, independent of flow rate, the conveyance efficiency gets lower in short supply years, and has generally been at or below 50 percent in the latest drought. The short supply compounded by higher relative losses makes drought particularly painful in EBID, and this has been much of the motivation for this project.

1.2.4. EBID Members:

EBID remains an agricultural water provider. About four percent of the district's water righted acreage is in parcels of less than two acres, known as small tract irrigators, operating on a fixed rotation that is scheduled based on available water. The other 96 percent is classified as farm rate, and those constituents schedule and order water on a demand basis.

The City of Las Cruces (CLC) holds about 1500 acres of EBID water rights. They acquired these water rights as a Special Water Users Association (SWUA). The statutory basis for the SWUA was jointly developed by EBID, CLC, and the New Mexico Office of the State Engineer to facilitate the transfer of agricultural surface water to municipal use. Unfortunately, the decade of drought has prevented CLC from developing the surface water treatment capacity to use the water, and until they do, the water allotted to CLC is leased on an annual basis to irrigators. Therefore, EBID has no current uses other than irrigation.

1.2.5. Past work with Reclamation:

EBID has worked on several projects with Reclamation, including three projects in the Water 2025 Challenge Grant program in 2004. One of those projects was in partnership with El Paso Water Utilities to improve monitoring water quality in the Rio Grande Project. Another was in partnership with the City of Las Cruces, to develop regulating retention capacity on one of the City's storm water ponds. The third implemented various water conservation pilot projects, including drip and sprinkler irrigation using surface water. A summary of previous work carried out by EBID with Reclamation funding is presented below in Table 1.

Program	Grant No.	Year started	Amount
Challenge Grant 2025-EBID	05-FC-40-2394	2004	$300,000
Challenge Grant 2025-EP	05-FC-40-2392	2004	$154,675
Energy and Water Development Appropriation Act	06-FC-40-2541	2006	$1,651,500
BOR Remote Sensing	08-FC-40-2799	2008	$239,354
BOR Irrigation Management System	R12AP40019	2012	$80,000
BOR WaterSMART – Rincon WHEN	R14ap00100	2014	$808,557.00

Table 1: Previous EBID grants from Reclamation.

EBID and Reclamation, along with EPCWID, are Co-Defendants in a Federal District Court lawsuit filed in Albuquerque by Plaintiff State of New Mexico. New Mexico's complaint alleges

that the Settlement Agreement entered into by EBID, EPCWID, and the United States includes an Operating Agreement for the Rio Grande Project that is inequitable to New Mexico. The Operating Agreement was developed by the two districts and Reclamation, and it offsets the impact of groundwater pumping in the New Mexico portion of the Rio Grande Project to protect downstream deliveries of Project water to EPCWID. New Mexico's lawsuit against the two districts and Reclamation led the State of Texas to file lawsuit against New Mexico in the US Supreme Court, where the United States has intervened on behalf of Plaintiff State of Texas.

The project proposed here will improve EBID's delivery efficiency, providing more Project water to EBID's farmers and reducing their need for groundwater. Maintaining control over Project water supply is critical to the farmers that constitute EBID and to the effective functioning of the Rio Grande Project.

1.3. Project Location

This project is located southwest of Las Cruces, New Mexico. More specifically this project is 1.75 miles west from the Town of Mesilla. This entire project lies within the boundaries of the Elephant Butte Irrigation District which provides surface water irrigation to the Mesilla and Rincon Valleys. This proposed project includes improvements to the Picacho and Nusbaum Laterals. The Picacho Lateral is branch of, and begins at the Leasburg Main Canal and terminates at Wasteway 40, which is also where the Nusbaum Lateral begins. Using this point as the center of the project, its coordinates are: 32.26816° N x 106.82975° W (WGS83).

Figure 1. Project Location Map

1.4. Technical Project Description

1.4.1. Nature of Problem:

Open channel irrigation conveyance is one of the key technological developments that led to the rise of human civilization, and it has been a key feature of our species for at least 5,000 years. Virtually all of the systems - ancient systems (and modern ones) in Egypt and Mesopotamia, the Warabandi systems of south Asia, and EBID in southern New Mexico - suffer from a common malady: the disparity in water supply between the head of the ditch and the tail of the ditch. This unfortunate feature of shared canal systems is well established, and has created stratified cultures, including the oppressive caste system of India, and much angst among farmers within EBID. The old saying that it is better to be upstream with a shovel than downstream with a water right is sadly true. Despite the well operated system EBID provides, downstream users must deal with the operations of upstream co-constituents, which induce unexpected fluctuations and limitations in the downstream water supply.

EBID is required by statute to allocate water to its constituents pro-rata. Each acre of water-righted land in the district must receive the same allotment of water. However, the delivery of allotted water to land at the tail end of this century old, dendritic canal system is both inefficient and operationally difficult. Long-distance conveyance of water in canals, particularly unlined ones, is inefficient due to bottlenecks, seepage, and evaporation losses, and any opportunity to move the point of diversion closer to the point of delivery will increase efficiency. Reduction in conveyance distances reduces conveyance losses proportionally, which can result in large water savings. The higher flows available near the head of a ditch also allow for much higher on-farm irrigation efficiencies. The District is, therefore, proposing to apply modern technology to tackle the oldest problem in canal irrigation systems by bringing the ditch head to the tail.

EBID is a riparian irrigation system, diverting water from the main stem of the Rio Grande at three principal diversion points: Percha Dam just below the release point of Caballo Dam and at the head of and irrigating the entire the Rincon Valley; Leasburg Dam, at the head of the Mesilla Valley and irrigating the upper third of the valley, and Mesilla Dam, just south of Las Cruces, and irrigation the lower two thirds of the Mesilla Valley.

The southern end of any system, including the Leasburg system is particularly problematic. The system connected to the Leasburg Dam, beginning with the Leasburg Canal, has very long reaches of lateral sub systems. The Picacho Lateral, a branch off of the Leasburg system is long but continues to be a very active delivery system. Its tail-endedness is exacerbated by the constriction of its conveyance system, much like a blocked coronary artery, by the road culverts and other development that has taken place in the areas surrounding Las Cruces, Dona Ana, and Mesilla during the century since the canal system was built. Bypass surgery is the logical solution.

In 2013, EBID first implemented a proof-of-concept project for this approach, placing water from the head of the Mesilla Dam's Eastside Canal into the tail end of the Leasburg Canal system. The pump installation on the Eastside Canal is shown below in Figure 2. The tail-enders

of the Mesilla branch of the Leasburg system are very close to the heading of the Mesilla Dam diversions. By installing connectivity, by both pumped and gravity flow, between the heading of the Mesilla system and the tail end of the Leasburg system, the tail-enders in the project area of the Leasburg system functionally became head enders, and the equity of EBID's delivery system increased substantially. Farmers participating in the project received improved flow rate and scheduling reliability. While the allocation and allotment were at record lows in 2013, the conveyance for water to the project area increased from the 45 percent in the canal system to the Project average of 65 percent. The savings due to improved efficiency in this project was small compared to the entire district's water use but the improved delivery timing to the directly benefited farms was a major improvement. The water thus conserved water was distributed through the allocation/allotment system to all of the constituents of EBID.

Figure 2: Lift pump on the Eastside Canal conveying water from the head of the Mesilla Dam diversion to the tail end of the Leasburg system.

In 2016, as second proof of concept of this approach was implemented when pumps were installed within the Rincon Lateral Wasteway 18 shown in Figure 3. This connection of the tail end of the Rincon system to the river has drastically improved irrigation timing and effectiveness of irrigation deliveries to the last 2200 acres at the tail Rincon Lateral. Those within the directly benefited area of the Rincon WHEN project, partially funded by the BOR WaterSMART program beginning in 2014, are now at the head of the ditch and have drastically improved delivery timing. This improvement has rippled throughout the Rincon Valley as expected, allowing for the entire valley to benefit from improved delivery timing on top of the slightly increased per acre allotment due to the water savings.

Figure 3. Pumps installed at the Rincon Wasteway 18

The efficiency of conveyance to, and on-farm irrigation on the historically tail-end land will be dramatically improved with the proposed work. More productive and efficient water use will reduce overall system losses while providing a more reliable water supply for the tail-enders to give them the dependability they need to grow more productive and valuable crops. The reduction in system losses will benefit all constituents of EBID, as the allotment of surface water is calculated by multiplying the diversion allocation by the conveyance efficiency. As the conveyance efficiency increases, the surface water allotted to farmers increases in direct proportion.

Figure 4: The Kerr Lateral, which has been placed in pipe.

1.4.2. Pipeline Project:

6,163 feet of EBID's Picacho Lateral and 2,634 feet of EBID's Nusbaum Lateral (1.66 miles total) will be converted from an open, unlined earthen channel to an aluminized corrugated steel pipeline with concrete check and diversion boxes. The Picacho Lateral is strategically targeted because it is located at the tail end of the Picacho branch of the Leasburg system and has both major operational difficulties and great potential water delivery and efficiency improvements. This lateral also serves some of the most active and profitable vegetable production of the Mesilla Valley. Pipeline projects benefit EBID and its farmers in various ways including reduced seepage, reduced hydraulic roughness allowing for less head loss along each canal, reduced weed problems, reduced maintenance, improved safety and improved transmission of groundwater. These improvements to the tail end of our system also benefit the upstream farmer whose water order delivery will be less tied up by those downstream.

The tail end of the Picacho Lateral operating area suffers because it is difficult and inefficient to deliver surface water from its river diversion which is 19.5 miles upstream at Leasburg Dam, causing greater system losses that affect the available on-farm water supply for all of EBID's members. By piping the lateral, the seepage and other operating losses are virtually eliminated and the chance of breaches in the canal banks eliminated. Farmers in the project service area

also benefit when conveying groundwater that they pump into the system. The virtual elimination of seepage reduces the amount of water they need to pump for a given farm delivery and increase the delivery flow rate. These improvements reduce the amount of water pumped, and reduce the energy consumed by that pumping. Improved metering equipment will be installed at the beginning of the pipeline, at the heading of the Nusbaum Lateral, immediately downstream of Wasteway 40 where pumps are proposed to be installed, and at the end of the proposed pipeline downstream of the last farm diversion and upstream of the wasteway which will all water to be diverted to the Picacho Drain.

Public safety is also improved by piping canals. In those areas with homes and subdivisions, the public is less likely to trespass and participate in unsafe activities along EBID's laterals. For the portion of the Picacho Lateral which is adjacent to Fairacres Road, a notoriously dangerous semi-rural road near Mesilla, the canal and its bank are a limiting factor for widening the road. Once piped, EBID can work with the Dona Ana County Roads Department through a Memorandum of Understanding (in development) to allow for this road to be widened. EBID will also design this pipeline to be shifted a few additional feet from the road while still within EBID's property to allow for the road to widened and safety amenities installed.

Figures 5 and 6 show the extents of the project and pipeline, the location of project features, examples of pipeline components, and water righted areas directly benefited by the project.

Full scale PDFs of Figure 5 and 6 are included within the Appendix.

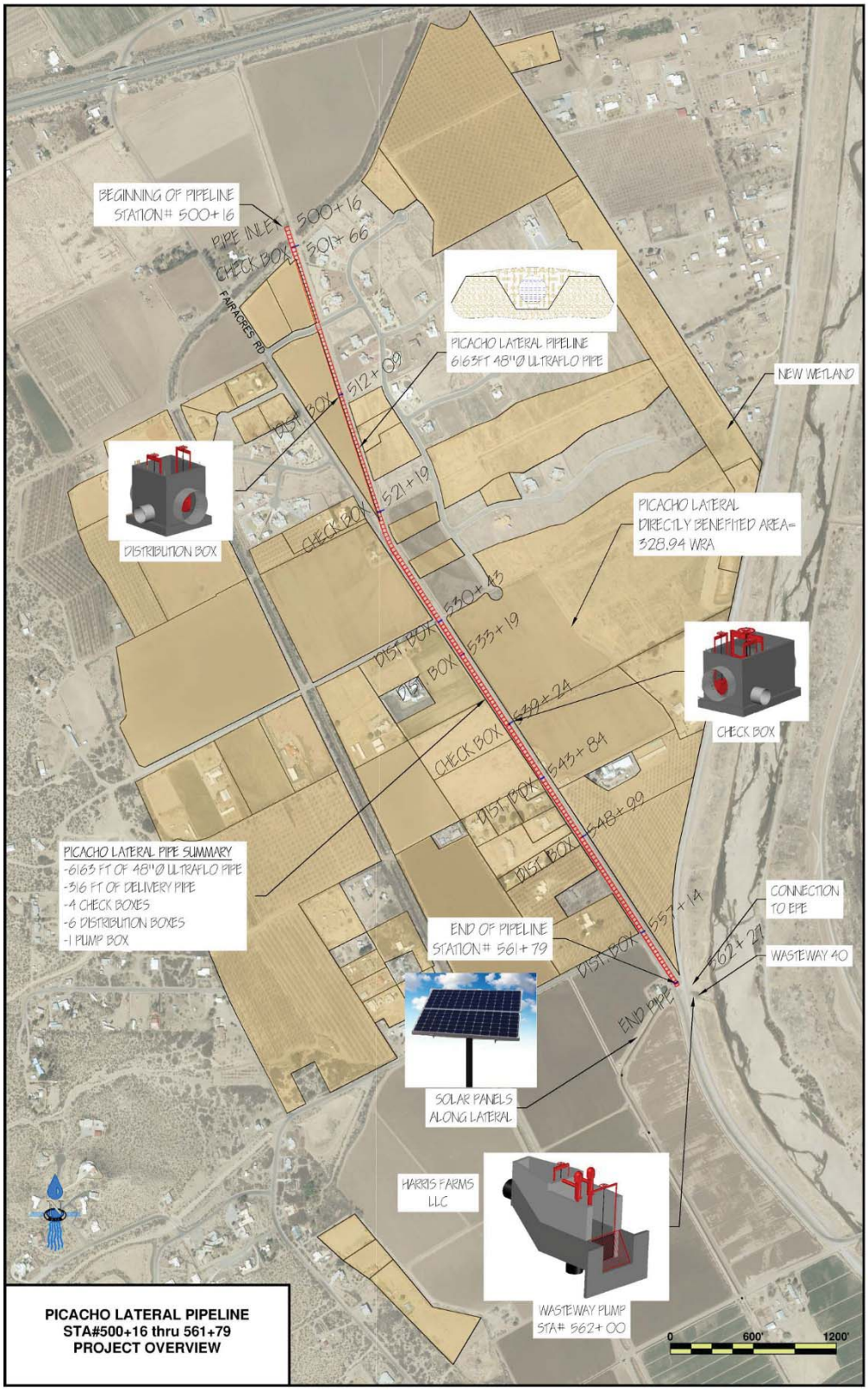


Figure 5. Project overview - Picacho Lateral Pipeline

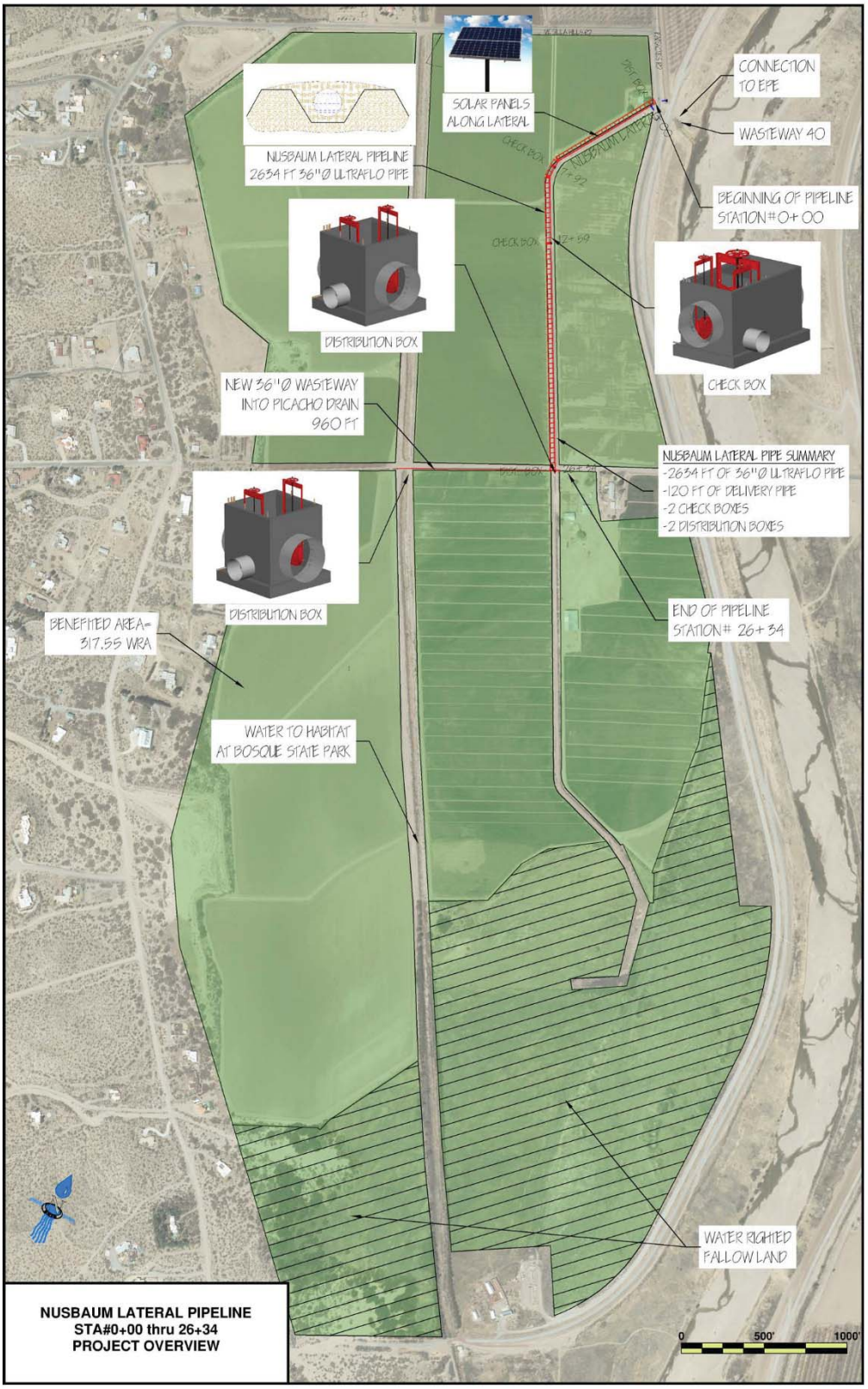


Figure 6. Project overview – Nusbaum Lateral

1.4.3. River Pumps:

Three high-volume, low-lift pumps delivering water from the Rio Grande at EBID's Picacho Lateral Wasteway 40 will greatly improve the timeliness, reliability, and efficiency of farm deliveries of water orders for the users along the tail end of the Picacho Lateral system. Both those along the portion of the Picacho Lateral proposed to be pipe and the entire Nusbaum lateral will be delivered surface water via these pumps when that is the most effective method of delivery. By supplying the demand of the Picacho and Nusbaum Laterals directly from the Rio Grande, less water will be lost to the inefficiencies of the canal system (approximately 50%) by avoiding the 19.5 miles of unlined canal required to transport the water from the Leasburg Dam diversion. With this plan, more water will remain in the Rio Grande between Leasburg Dam and the new supply point at Wasteway 40, and the decrease in losses will be shared as part of a larger allocation for all EBID members. Improved delivery timeliness will improve EBID cooperation with farmer irrigation scheduling and therefore improved on-farm irrigation efficiencies and ultimately crop production. The improved delivery timeliness from the proposed pumps will not only be felt by the users on the tail end of the Picacho Lateral system but by all users throughout the Mesilla Valley's Leasburg Main Canal operating system because the canal capacities upstream will be less tied up trying to deliver water to the tail end users. Higher delivery flow rates will be available to farmers upstream of the project area as main canal capacity is freed up, and farmers in the project area will also receive higher flow rates as their deliveries do not have to run the gauntlet of the upper system. Increased delivery flow rate is key to on-farm efficiency using improved surface irrigation methods. Figure 7 and 8 show the area and acres of farm land which will directly benefit from the improved delivery timing of the proposed pumps.

Although the electrical power grid includes distribution lines in immediate vicinity to the proposed pumps, three phase powerlines with adequate capacity are roughly three miles away. El Paso Electric, the power provider of the area has expressed interest in extending the appropriate 3 phase lines to connect to the pumps. These costs associated with extending these lines are unavoidable to be able to power 20 hp pumps.

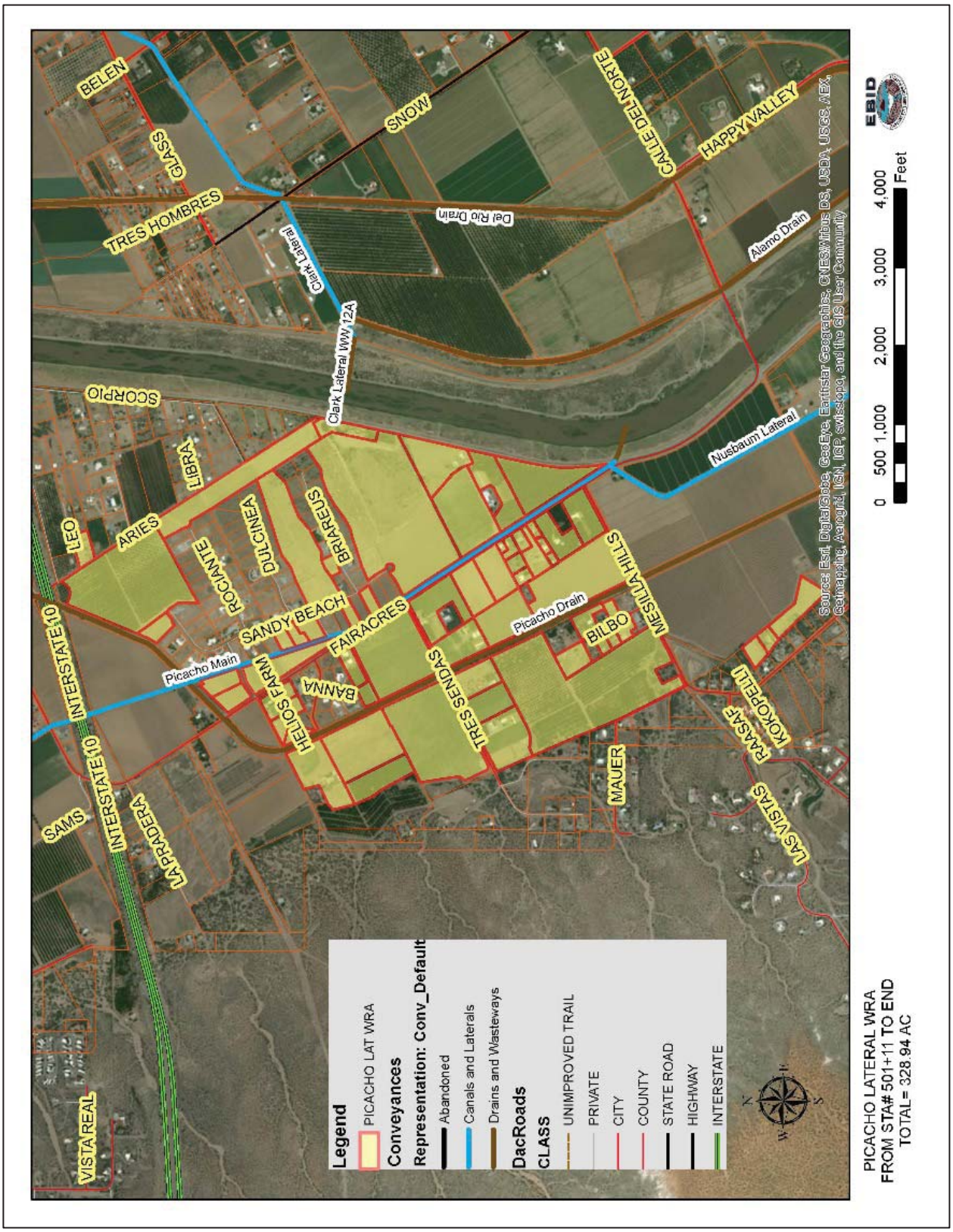


Figure 7. Water righted land of the Picacho Lateral Directly benefited from supplemental delivery from Wasteway 40 pumps

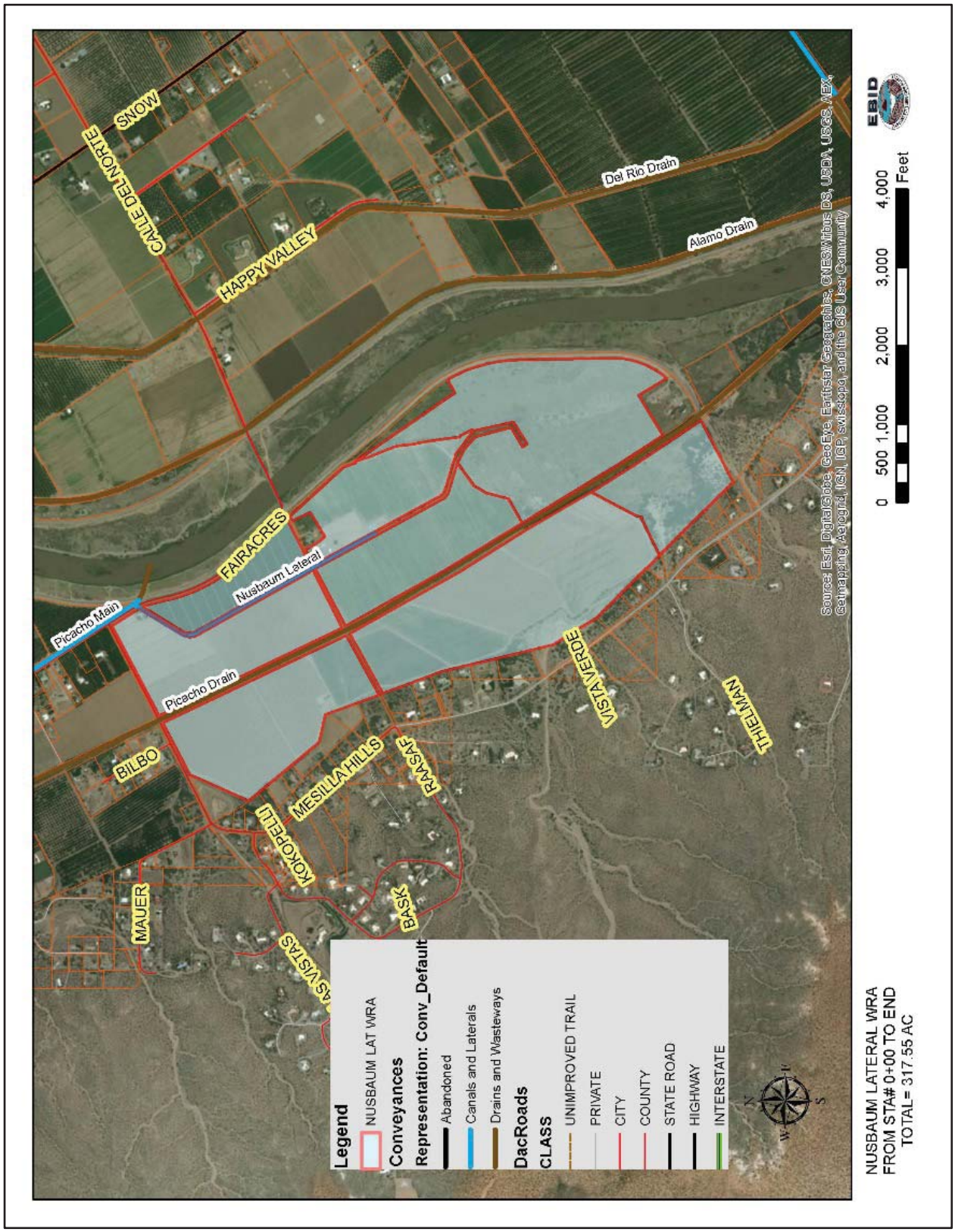


Figure 8. Water righted land of the Nusbaum Lateral Directly benefited from supplemental delivery from Wasteway 40 pumps

Once a canal or lateral is piped, various options become available to EBID for allowing uses of EBID property not previously possible. For example, in some areas a trail for recreation becomes feasible and safer than when it was an open canal. Space is also freed up for a solar panel array along one side of a piped portion of a lateral. Various potential uses are shown by Figure 9.

Figure 9. Artist rendition of the potential for multiple uses of a piped lateral

1.4.4. Energy Nexus - Solar Panels:

Once the Picacho and Nusbaum Laterals are placed in pipe, the land formerly occupied by the unlined ditch, ditch banks, maintenance roads, and other right-of-way is available for other use. EBID proposes to install photovoltaic panels on the covered lateral to produce clean, renewable energy to partially offset the electrical demand for lift pumping from the other project components, turning the freed-up area into a small solar farm. Approximately 20 kW of solar electric capacity will be installed. These solar panels will be connected to El Paso Electric's grid as will the required lift pumps on the river. El Paso Electric grid power poles are in the immediate vicinity of the proposed location for the solar panels. Three phase power will be extended to power the proposed pumps and the proposed solar array will be connected to that more efficient grid if possible. The objectives of the solar array are to offset the energy cost of

the river lift pump operation with revenue from the sale of the solar electricity, and to minimize the carbon footprint of the project. The preliminary results of an ongoing feasibility study as part of EBID's Rincon WHEN project funded by BOR WaterSMART program concluding soon is expected to show that a 10kW array pilot project will help offset power costs and ease of installation and connection to the power grid will serves as a proof-of-concept for this further expansion. The approach is to turn the freed-up right-of-way into a solar farm to reduce the net fossil energy requirements of the lift pumps. The solar panels will generate electricity for the grid, and the lift pumps will take their required energy from the grid.

1.4.5. *Improved Metering –Quantifying the flows and deliveries:*

Installation of Doppler flow measurement technology within the pipeline connected to a Radio Telemetry Unit (RTU) will allow for real time quantification of flows and improved verification of delivered volumes. EBID has experience with SonTek-IQ Pipe sensors which measure flow, total volume, level, and velocity and will be ideal for measuring flow within these pipelines. Collection of real time data will both allow for short term and long term analysis of water savings due to the approaches proposed. These metering techniques are also required for the Performance Measures described in Section 2 of this proposal.

1.4.6. *Habitat Nexus - Delivery of surface water to nearby Riparian Habitat:*

Delivery to the nearby Bosque State Park will be possible by piping a farm conveyance ditch owned by Harris Farms LLC and adding a wasteway to this ditch into the Picacho Drain. This State Park is a popular area for the public to observe various wildlife and birds. By adding the ability to irrigation this restoration area to the tail end of this Picacho system, any operational spills or orders for water delivery, future projects and improvements to riparian habitat will be possible. This area has great potential as habitat for endangered species. This Bosque State Park can be designed to be a very beneficial wetland that increases and improves the habitat available for endangered or threatened species known to nest in the area. In future projects centered around the Bosque State Park, EBID will bring consultants specializing in hydraulics engineering, surface water-groundwater interaction, environmental engineering and environmental landscape design. Conventional flood control and channelization projects have inadvertently depleted the cottonwood and willow trees that the endangered or threatened avian species prefer for nesting. Bell's vireo (Vireo bellii), which is listed as threatened in NM, and Yellow warbler (Dendroica petechia) require upper canopy habitat for nesting. Brand et al. 2009 found substantially higher species richness in cottonwood sites than in salt cedar or grassland sites. Thus native cottonwood and willow trees – a vital, defining part of the region's riparian ecosystems – require periodic flooding to reproduce naturally. The proposed water conservation and adding ability to deliver surface water to restoration sites follows an innovative approach to ecosystem restoration that EBID has developed in coordination with the New Mexico Environment Department and the US Section of the International Boundary and Water Commission, who will likely both be partners in eventual improvements to the Bosque State Park.

This portion of this project enables EBID to deliver surface water, an essential element in ecosystem restoration and maintenance, via the Picacho Drain to help maintain favorable

habitat along the Picacho Drain and within the Bosque State Park. By manipulating the base drain flows and episodic flood flows, EBID is uniquely able to provide controlled pulses of water to the site to mimic the natural hydrograph to which the native vegetation is adapted. It is also conceivable that with careful ecosystem management we will be able to expand the nesting grounds of the Southwestern Willow Flycatcher (Empidonax traillii extimus), a bird listed under the Endangered Species Act, to Bosque State Park. This expectation, though ambitious, is not unrealistic, considering that Broad Canyon (located approximately 20 miles to the North) is a favored nesting ground for this endangered bird.

Figure 10: Southwestern willow flycatcher (Empidonax traillii extimus). From Wikimedia Commons.

To compliment this delivery of surface water to the Bosque State Park, EBID will clean roughly 18,000 feet of the Picacho Drain, from just upstream of where the Picacho Lateral crosses the Picacho Drain at Station #178+31 (beginning of the project pipeline as shown by Figure 5) down to its beginning at the River. By cleaning this drain for water conveyance rather than how it is normally cleaned during regular maintenance, improvements to the downstream current habitat and future restoration will be possible.

1.5. Evaluation Criteria

1.5.1. Evaluation Criteria A: Quantifiable Water Conservation:

The proposed work will conserve a substantial and quantifiable amount of water. Due to the ongoing drought, the hydrology of water conservation gets complicated. The annual allotment to EBID farmers for the past fifteen years (2003-2017) is 1.43 feet. Shared Pro-rata over 90,640 water-righted acres, the basis of allotment in EBID, this amounts to a volume of about 129,600 acre-feet.

The water lost between release from reservoir storage and crop consumptive use goes to:

- Evaporation from the water surface in the Rio Grande, EBID canals, and incidental on-farm losses;
- Canal seepage (the largest loss term) which returns to the shallow alluvial groundwater system where it either is collected in the drain system and returned to the Rio Grande or pumped out of the ground by irrigators, municipal/industrial water providers, or domestic wells;
- Deep percolation during on-farm irrigation, which flows to the groundwater system.

There is minimal tail water as EBID farmers almost exclusively use closed basins.

The water conserved by this project will be shared pro rata/evenly allotted to all EBID constituents, the same as any efficiency improvements and conservation measures, who can then either a) use it on their crops and reduce the amount of groundwater pumping necessary to maintain production or increase crop yield, quality, and revenue if they do not have adequate access to groundwater; b) lease the water to another farmer or, when the City of Las Cruces begins using surface water, to CLC; c) there is a developing environmental restoration option developing with the Water Transactions Program with the IBWC that would allow for marketing or donating water to environmental restoration efforts on an annual basis.

Evaluation Criteria A: (1) Canal Lining/Piping:

Based on research at New Mexico State University published by Haddad, 2005, it is calculated that piping 6,163 feet of the Picacho Lateral and 2,634 feet of the Nusbaum Lateral will result in a reduction of seepage associated with EBID surface water deliveries of 641 acre-feet per year. This translates into an equivalent increase in water supply for all water righted acres within EBID.

The three water savings components – lateral seepage, on-farm deep percolation, and conveyance from the piping component and the storm water capture and reuse or recharge are analyzed based on best available information. Calculation sources are included in the right-hand column, with the letters in the formulas referring to the line letters on the right hand side. Methodology and seepage rates were determined from seepage tests as part of a NMSU student's Master's thesis (Haddad, 2005).

Aluminized Corrugated Metal Pipe will be used to pipe the Picacho Lateral and concrete check and diversion boxes will be constructed where necessary. These materials virtually eliminate

water lost from seepage and evaporation. The preliminary drawings are attached within the appendix. Reduction in canal losses will be done with the proposed improved metering.

Significantly, the estimates shown in Table 2 that 2,362 acre-feet per year can be saved, nearly 2 percent of the average allotment of the past decade and that the cost of conserving water is about $847 per acre-foot per year, below the marginal value of water on most crops in the study area.

Var	Lateral seepage reduction		Source
A	8,797	feet	Project Plan
B	1.67	miles	A x 5,280
C	385	AF/mile/year	Haddad, 2005
D	641	AF seepage reduct./year	B x C
	Main On-farm deep percolation reduction		Source
E	647	Water righted acres	Project Plan
F	3.5	ft/year Consumptive Irig. Req't	Est. SS 101
G	2,263	AF/year Consumptive Irig. Req't	E x F
H	55%	irrigation eff	Typical AEN 478
J	4,114	Farm Delivery Req't	G/H
K	65%	irrig eff	Planned
L	3,481	Farm Delivery Requirement	G/K
M	633	AF FDR reduction/year	J - L
	Conveyance Loss reduction		Source
N	25%	main loss	Est.
O	1,088	AF main loss reduction/year	N x (1+N) x L
	Total Water Conserved		Source
S	2,362	Total water conserved/year	D + M + O + R
T	$2,028,394	Project Cost	Budget
U	$858.67	/AF conserved/year	T/S
V	1.43	ft 15 year avg allotment	EBID records
W	129,615	AF avg allotted water	V x 90,640 ac
X	1.82%	of avg allotted water conserved	S/W

Table 2: Water savings estimates for EBID's Picacho WHEN proposal

The benefits of the pipelines are expected to arise from three effects of the work: seepage reduction in the piped laterals, seepage reduction from reduced conveyance distance and tail-to-head re-plumbing, and reduced on-farm deep percolation losses resulting from higher delivery flow rates. Performance measures for each of these follow.

1.5.2. Seepage reduction in piped laterals:

EBID has significant experience in installing and evaluating the performance of pipe laterals. In the last ten years, EBID has placed approximately 29 miles of laterals in pipe. When the previous piping project began, a Masters candidate in Civil Engineering at New Mexico State University did his thesis on the water savings from reduced lateral seepage (Haddad, 2005). He performed ponded seepage tests before and after installation of pipe. One important conclusion he reached is that piping saves, on average, about 385 acre-feet of water per mile of piped lateral. He also developed a model for estimating seepage from a lateral to be piped based on Vedernikov's method, and it included consideration of channel geometry, soil type, and operating schedule. We will use Haddad's model to estimate the savings from reduced lateral seepage.

More recently, staff used records from EBID's Hydrology Department to assess losses based on measured inflows and deliveries for unimproved and piped laterals. The results, summarized below, are consistent with Haddad's findings. The measured conveyance efficiency in the laterals averaged 58 percent in unimproved laterals compared to 92 percent for pipeline laterals.

Pipeline Laterals	**Measured Inflow, AF**	**Charges, AF**	**No. Deliveries**	**Avg Charge (in)**	**Efficiency**
Palmer Lateral	297	307	29	3.55	103%
Kerr Lateral	274	255	35	4.91	93%
Vega Lateral	406	364	34	5.87	90%
Jimenez Lateral	301	259	10	6.95	86%
S-1 Lateral	89	76	10	6.74	85%
Pipeline Totals	1,367	1,261	118	5.06	92%

Unimproved Laterals	**Measured Inflow, AF**	**Charges, AF**	**No. Deliveries**	**Avg Charge (in)**	**Efficiency**
Kilgore Lateral	1,165	822	24	6.08	71%
American Bend Lateral (+Hare, Arrington)	1,179	775	113	4.67	66%
Dona Ana Lateral (+Etajo,Barrio,Kelso)	1,834	912	285	5.03	50%
Brazito Lateral	431	212	52	4.07	49%
Anthony Lateral (Used 3 Irrigation Runs)	390	163	17	6.29	42%
Open Channel Totals	4,999	2,884	491	5.15	58%

Table 3: Conveyance loss evaluation for unimproved and piped EBID laterals during the 2012 water season

1.5.3. Seepage reduction due to shortened conveyance and tail-to-head:

EBID tracks its conveyance efficiencies on a unit-by-unit basis, and has done so for more than a decade. The effects of shortened conveyance distance and changing delivery from the river instead of the lengthy canal system are not separable, so they will be evaluated in combination. The problems with the units that are targeted for improvement manifest themselves quantitatively as low conveyance efficiencies – often below 40 percent. The conveyance efficiencies measured after improvement will be compared with historical efficiencies at similar levels of water supply to quantify, both on efficiency and a water saving bases.

1.5.4. On-farm deep percolation reduction due to higher delivery rates:

EBID will use its close working relationship with New Mexico State University to evaluate the improvement in on-farm efficiency due to the proposed improvements. The senior level design class Agricultural Engineering 478, Irrigation and Drainage Engineering, performs laboratory assignments on EBID constituents' farms. Using standard methods, the student measure soil infiltration parameters, water holding capacity and antecedent moisture conditions before an irrigation. During the irrigation, students measure the inflow, advance times to stations along the field, and recession times. They then calculate the irrigation application efficiency (irrigation water stored in the root zone divided by applied water) and the deep percolation percentage (water deep percolating past the root zone divided by applied water). A volume balance model is developed and calibrated from these data that allows students to determine what the application efficiency would have been at the historical delivery rate, which will be determined from the district's delivery database.

1.5.5. Evaluation Criterion B—Water Supply Reliability:

The proposed work makes more surface water available to farmers at their head gates, and allows them to convey groundwater more efficiently when they utilize EBID facilities to do so. Both effects reduce the farmer's dependence on groundwater, which in the current drought is in decline. EBID has been sustainable in the long term because of the ready access to groundwater in drought that is replenished in wetter times. The objective hear is to reduce the reliance on groundwater, thus reducing the amount of pumping and energy required in agriculture.

1.5.6. Evaluation Criterion D—Complementing On-Farm Irrigation Improvements:

The proposed project directly ties to significant farms with significant potential for on farm improvements. Specifically Harris Farm, LLC which encompasses and is the only user of the Nusbaum Lateral could significantly benefit from more efficient ditches. Mr. Harris' $20,000 contribution towards the project shows his willingness to invest into his farm's infrastructure. He has also indicated his interest in NRCS-EQUIP funding for ditch lining and other on-farm improvements.

1.5.7. Evaluation Criterion E—Department of the Interior Priorities:

To address a true comprehensive conservation stewardship legacy, we would be remiss to not notice that the new pumps to be installed will require significant energy resources. Addressing

this nexus is a worthy component of this project and it also addresses the Department of Interior Priority of *Utilizing natural resources*.

EBID's system has always been open channel and gravity based until recent conservation measures have required low lift, high flow axial flows pumps. The proposed work will require energy to power pumps to lift water from the Rio Grande to the Picacho Lateral. EBID therefore will use land made available by burying laterals in pipe to pilot a solar array to keep the project as energy neutral as possible.

The water conservation - energy nexus created by lifting water to improve irrigation timing and reduced demand on the upstream canal for the tail end users is proposed to be offset by installing a solar panel array along the piped lateral which will offset 52% of the power required for a 6 month surface water delivery season if the pumps are run roughly 2 weeks per month, or about 25% of the power required for running the pumps constantly for a 6 month delivery season.

20 kW of solar electric capacity will be installed. These solar panels will be connected to El Paso Electric's grid as will the required lift pumps on the river. El Paso Electric grid power poles are in the immediate vicinity of the proposed location for the solar panels. The objectives of the solar array are to offset the energy cost of the river lift pump operation with revenue from the sale of the solar electricity, and to minimize the carbon footprint of the project. The feasibility study will include a technical and economic analysis and a design for the pilot project. No water will be required for this renewable energy system. Calculations for annual energy production (36,500 kWh), consumption by river pumps for an estimated usage (70,503 kWh), and production as a fraction of consumption (52%) are shown below in Table 4.

Var	Solar System Production		Source
A	20	kW solar array	Project Plan
B	5	Effective hours per day over the year	Average
C	36,500	kWh per year from a 10kW system	A x B
	Pump Power Requirements		Source
D	10,000	gpm	Project Plan
E	13	ft lift	Project Plan
F	32.8	HP	D x E/3960
G	46.9	BHP (@70% efficiency)	F / 70%
H	34.97	kW for both pumps	G x .7457
I	12	weeks per year estimated (2 weeks per month for 6 months)	Est.
J	70,503	kWh for both pumps if run for 12 weeks per year	H x I x 7 x 24
	Offset of Pump Power Requirement		Source
L	52%	fraction of energy required by pumps offset by solar array	C/J

Table 4: Energy production calculations for 20 kW solar array and consumption by pumps

1.5.8. Evaluation Criterion F: Implementation and Results:

The proposed pipeline work was envisioned in the Lower Rio Grande Regional Water Plan, which was composed by the Lower Rio Grande Water Users Organization (LRGWUO, of which EBID is an active member) and accepted by the New Mexico Interstate Stream Commission in 2004. The type of system efficiency improvement project was also included within the 2017 Regional Water Plan as a Strategy to Preserve Agriculture.

EBID is prepared to begin work immediately on notice to proceed. NEPA compliance and Environmental Assessment preparation is slated for the majority of the first year to allow for adequate time.

1.5.9. Evaluation Criterion G: Nexus to Reclamation Project Activities:

The Rio Grande Project is a Reclamation Project, and Reclamation continues to perform the central operation functions. All water delivered by EBID is Project Water. EBID coordinates operations on a daily basis with Reclamation. This project will certainly contribute to this basin and help to maintain productive agriculture in the face of drought and climate change.

The project proposed here will improve EBID's delivery efficiency, providing more Project water to EBID's farmers and reducing their need for groundwater. Maintaining control over Project water supply is critical to the farmers that constitute EBID and to the effective functioning of the Rio Grande Project.

1.5.10. Evaluation Criterion H: Additional Non-Federal Funding

This proposal provides for a 50%-50% match of Federal to non-federal funding.

2. Performance Measures

The performance of the and Ditch rider Unit 3B of EBID and specifically the laterals to be piped and supplemented by pumps as proposed by this project will be evaluated for losses and delivery efficiency based on measured inflows and delivery charges during the 2017 and 2018 seasons and after the pipe and pumps are installed using the Performance methods described below.

Performance measures for the proposed work will be carried out by EBID staff, consultants, and collaborators. The benefits of the pipelines are expected to arise from three effects of the work:
1) seepage reduction in the piped laterals,
2) seepage reduction from reduced conveyance distance and tai-to-head re-plumbing
3) reduced on-farm deep percolation losses resulting from higher delivery flow rates.

2.1. Seepage reduction in piped laterals:

EBID has significant experience evaluating the performance of piped laterals similar to those proposed and described above within the Evaluation Criteria A: (1) Canal Lining/Piping. In the last ten years, EBID has placed approximately 29 miles of laterals in pipe. When the previous piping project began, a Masters candidate in Civil Engineering at New Mexico State University did his research and thesis on the water savings from reduced lateral seepage (Haddad, 2005). Haddad performed ponded seepage tests before and after installation of pipe. One important conclusion he reached is that piping saves, on average, about 385 acre-feet of water per mile of piped lateral. He also developed a model for estimating seepage from a lateral to be piped based on Vedernikov's method, and it included consideration of channel geometry, soil type, and operating schedule. We will use Haddad's model to estimate the savings from reduced lateral seepage and attempt to develop other methodologies for estimating reduction in seepage.

EBID's Hydrology Department constantly meters and records canal flows both with real time measurements, and with instream measurement techniques. EBID's Ditch riders measure and determine delivery volumes and record these within EBID's computer system. Combining these two sets of measurement records has proven reliable and staff uses these measurements daily, monthly, and annually to evaluate losses and canal delivery efficiencies. Losses based on measured inflows and deliveries for unimproved and piped laterals will be analyzed and summarized for comparison with with Haddad's findings.

2.2. Seepage reduction due to shortened conveyance and tail-to-head:

EBID tracks its conveyance efficiencies on a unit-by-unit basis, and has done so for more than a decade. The effects of shortened conveyance distance and changing delivery from the river instead of the lengthy canal system are not separable, so they will be evaluated in combination. The problems with the units that are targeted for improvement manifest themselves quantitatively as low conveyance efficiencies – often below 40 percent. The conveyance efficiencies measured after improvement will be compared with historical efficiencies at similar levels of water supply to quantify, both on efficiency and a water saving bases.

2.3. On-farm deep percolation reduction due to higher delivery rates:

EBID will use its close working relationship with New Mexico State University to evaluate the improvement in on-farm efficiency due to the proposed improvements. The senior level design class Agricultural Engineering 478, Irrigation and Drainage Engineering, performs laboratory assignments on EBID constituents' farms. Using standard methods, the student measure soil infiltration parameters, water holding capacity and antecedent moisture conditions before an irrigation. During the irrigation, students measure the inflow, advance times to stations along the field, and recession times. They then calculate the irrigation application efficiency (irrigation water stored in the root zone divided by applied water) and the deep percolation percentage (water deep percolating past the root zone divided by applied water). A volume balance model is developed and calibrated from these data that allows students to determine what the application efficiency would have been at the historical delivery rate, which will be determined from the district's delivery database. A report will be provided by these students, via EBID's consultant Hydrologist to compare farms with and without these improvements.

3. Project Budget

3.1. Funding Plan

EBID's plan for funding includes a guaranteed minimum 50% cost match from EBID as budgeted capital improvements. Each year EBID's Board of Directors establishes a budget which includes system improvement projects. EBID's annual budget and funding available for this project comes from annual assessment of EBID's member's water righter acreage. EBID's Board of Directors has committed to a minimum of 50% cost share throughout this project if funding is awarded as shown within the attached signed and notarized board of directors resolution. EBID cost share funding will be available each year at the time of funding in forms of labor, equipment, and purchasing of materials.

Harris Farms LLC, one of the EBID members in the area directly benefiting from improved delivery timing has committed to showing their support through a cost share contributions towards the project. Harris Farms has committed to contributing $20,000 towards the project. has obligated to contribute this during the first month after the project is funded as described within the attached agreement.

Funding Sources		Funding amount
Non-Federal entities		
	EBID	$1,010,212.03
	EBID members-farmers	$20,000.00
Non-Federal subtotal:		$1,030,212,03
Other Federal entities:		None
Requested Reclamation funding:		$998,181.78
Total project funding:		$2,028,393.81

Table 5: Summary of non-Federal and Federal funding sources

Funding Group II request			
	Year 1 (FY2019)	Year 2 (FY2020)	Year 3 (FY2021)
Funding requested	0	$252,530	$745,652

Table 6: Funding Group II Funding Request

3.2. Commitment Letters

EBID is providing the majority of non-federal funding, which is committed to and supported by the official Board Resolution 2018-05 attached to this proposal. The resolution is attached to this application. The letter of support and commitment to contribute $20,000 towards the cost share by Harris Farm, LLC is also attached.

3.3. Budget Proposal

Object Class Category (a.): PERSONNEL				
A	B	C	D	E
Position	**% of Time**	**Monthly Salary/ Wage**	**# of Months**	**Applicant Cost**
1. Leo Barrett-Maintenance Project Director	100.00%	$ 7,687.00	1.25	$ 9,608.75
2. Zachary Libbin-P.E., District Engineer	100.00%	$ 8,114.00	1.55	$ 12,576.70
3. Jesus Morales	100.00%	$ 3,553.00	1.25	$ 4,441.25
4. Armando Jacquez	100.00%	$ 4,515.00	1.25	$ 5,643.75
5. Sergio Salinas	100.00%	$ 2,583.00	1.25	$ 3,228.75
6. Danny Lujan	100.00%	$ 2,929.00	1.25	$ 3,661.25
7. Manuel Andrade	100.00%	$ 1,916.00	1.25	$ 2,395.00
8. Christopher Holguin	100.00%	$ 3,831.00	4.50	$ 17,239.50
9. Juan Jimenez	100.00%	$ 2,773.00	3.13	$ 8,665.63
10. Roman S Ramos	100.00%	$ 4,576.00	3.25	$ 14,872.00
11. Luis Cortez	100.00%	$ 3,311.00	3.25	$ 10,760.75
12. Arturo Cortez	100.00%	$ 3,207.00	3.25	$ 10,422.75
13. Joe F Felix	100.00%	$ 2,349.00	3.25	$ 7,634.25
14. Ramon Amezola	100.00%	$ 3,207.00	3.25	$ 10,422.75
15. Juan V Rodriguez	100.00%	$ 2,557.00	3.25	$ 8,310.25
16. Pedro Ortiz	100.00%	$ 2,141.00	3.25	$ 6,958.25
17. Danny Galaz	100.00%	$ 2,340.00	3.75	$ 8,775.00
18. Jesse Armijo	100.00%	$ 2,487.00	3.75	$ 9,326.25
19. Lupe Hernandez	100.00%	$ 3,241.00	6.75	$ 21,876.75
20. David Alba	100.00%	$ 2,687.00	3.75	$ 10,076.25
21. Miguel Jimenez	100.00%	$ 1,820.00	3.75	$ 6,825.00
22. Willie Herrera Jr.	100.00%	$ 1,820.00	4.41	$ 8,026.20
23. Cristobal Cisneroz	100.00%	$ 1,820.00	3.75	$ 6,825.00
24. Jose Pando	100.00%	$ 2,011.00	3.75	$ 7,541.25
25. Martin Guerro	100.00%	$ 1,820.00	3.75	$ 6,825.00
26. Justin Harper	100.00%	$ 2,132.00	3.75	$ 7,995.00
27. Shelby Downs	100.00%	$ 2,487.00	3.55	$ 8,828.85
28. Brandon Haynes	100.00%	$ 1,872.00	3.00	$ 5,616.00
29. Casey McGuire	100.00%	$ 4,610.00	0.38	$ 1,728.75
30. David Hernandez	100.00%	$ 2,869.00	0.66	$ 1,882.78
31. Ernesto Garcia	100.00%	$ 2,773.00	0.66	$ 1,830.18
32. Fernando Sanchez	100.00%	$ 1,820.00	0.38	$ 682.50
33. Jaime Lopez	100.00%	$ 1,820.00	0.44	$ 796.25
34. Jeffrey Castillo	100.00%	$ 1,820.00	0.66	$ 1,201.20
TOTAL PERSONNEL				$ 253,499.79

All labor required for the execution of this project will be carried out by EBID staff, middle managers and EBID labor force. The total cost of labor is derived from the current pay scales of EBID employees. The project personnel consists of the Maintenance Project Director, EBID District Engineer, along with EBID field foremen and EBID labor force. The Davis-Bacon Wage determinations do not apply to this grant, as no contracted labor is used on this project.

Object Class Category (b.): FRINGE BENEFITS				
A	B	C	D	E
Position/s	**Benefit/s**	**Rate**	**Unit**	**Applicant Cost**
1. Leo Barrett-Maintenance Project Director	Full Package	40.00%	$ 9,608.75	$ 3,843.50
2. Zachary Libbin, P.E. – District Engineer	Full Package	40.00%	$ 12,576.70	$ 5,030.68
3. Jesus Morales	Full Package	40.00%	$ 4,441.25	$ 1,776.50
4. Armando Jacquez	Full Package	40.00%	$ 5,643.75	$ 2,257.50
5. Sergio Salinas	Full Package	40.00%	$ 3,228.75	$ 1,291.50
6. Danny Lujan	Full Package	40.00%	$ 3,661.25	$ 1,464.50
7. Manuel Andrade	Full Package	40.00%	$ 2,395.00	$ 958.00
8. Christopher Holguin	Full Package	40.00%	$ 17,239.50	$ 6,895.80
9. Juan Jimenez	Full Package	40.00%	$ 8,665.63	$ 3,466.25
10. Roman S Ramos	Full Package	40.00%	$ 14,872.00	$ 5,948.80
11. Luis Cortez	Full Package	40.00%	$ 10,760.75	$ 4,304.30
12. Arturo Cortez	Full Package	40.00%	$ 10,422.75	$ 4,169.10
13. Joe F Felix	Full Package	40.00%	$ 7,634.25	$ 3,053.70
14. Ramon Amezola	Full Package	40.00%	$ 10,422.75	$ 4,169.10
15. Juan V Rodriguez	Full Package	40.00%	$ 8,310.25	$ 3,324.10
16. Pedro Ortiz	Full Package	40.00%	$ 6,958.25	$ 2,783.30
17. Danny Galaz	Full Package	40.00%	$ 8,775.00	$ 3,510.00
18. Jesse Armijo	Full Package	40.00%	$ 9,326.25	$ 3,730.50
19. Lupe Hernandez	Full Package	40.00%	$ 21,876.75	$ 8,750.70
20. David Alba	Full Package	40.00%	$ 10,076.25	$ 4,030.50
21. Miguel Jimenez	Full Package	40.00%	$ 6,825.00	$ 2,730.00
22. Willie Herrera Jr.	Full Package	40.00%	$ 8,026.20	$ 3,210.48
23. Cristobal Cisneroz	Full Package	40.00%	$ 6,825.00	$ 2,730.00
24. Jose Pando	Full Package	40.00%	$ 7,541.25	$ 3,016.50
25. Martin Guerro	Full Package	40.00%	$ 6,825.00	$ 2,730.00
26. Justin Harper	Full Package	40.00%	$ 7,995.00	$ 3,198.00
27. Shelby Downs	Full Package	40.00%	$ 8,828.85	$ 3,531.54
28. Brandon Haynes	Full Package	40.00%	$ 5,616.00	$ 2,246.40
29. Casey McGuire	Full Package	40.00%	$ 1,728.75	$ 691.50
30. David Hernandez	Full Package	40.00%	$ 1,882.78	$ 753.11

31. Ernesto Garcia	Full Package	40.00%	$ 1,830.18	$ 732.07
32. Fernando Sanchez	Full Package	40.00%	$ 682.50	$ 273.00
33. Jaime Lopez	Full Package	40.00%	$ 796.25	$ 318.50
34. Jeffrey Castillo	Full Package	40.00%	$ 1,201.20	$ 480.48
	TOTAL FRINGE BENEFITS			$ 101,399.91

Fringe benefits for the employees assigned to this project are 40% of wages. This fringe is derived from the actual costs for personnel at EBID. The fringe benefit package includes medical, dental, vision, short and long term disability, life insurance retirement, annual, sick and holiday leave as well as FICA, workmen's compensation and unemployment insurance.

EQUIPMENT USED				
A		B	C	D
Equipment		**Rate**	**Quantity/ Hours**	**Applicant Cost**
7300187	2001 Dodge Ram 1500 1/2 Ton	$ 9.12	65.00	$ 592.80
7300178	DODGE RAM 1500 PICKUP	$ 9.12	65.00	$ 592.80
7300149	DODGE RAM 4 X 4 PICKUP-1998	$ 9.12	105.00	$ 957.60
7300119	IT 4 X 2 FORD CREW CAB	$ 9.44	50.00	$ 472.00
7300182	1994 CHEVROLET C3500 1 T DUALLY	$ 14.36	105.00	$ 1,507.80
7300166	CHEVY 3/4 T. EXT. CAB UTIL BED	$ 9.13	105.00	$ 958.65
7300139	FORD F-350 2006 WELDER/SPRAYER	$ 15.97	105.00	$ 1,676.85
7300137	1998 CHEVY 1500 LONG BED	$ 10.27	105.00	$ 1,078.35
7100189	BACKHOE, JD 410E	$ 31.24	205.00	$ 6,404.20
7100224	CATERPILLAR MOTOR GRADER 130G	$ 49.40	205.00	$ 10,127.00
7100221	CATERPILLAR FORKLIFT MODEL TH560B	$ 21.68	105.00	$ 2,276.40
7100212	VOLVO EXCAVATOR EC160CL	$ 48.02	305.00	$ 14,646.10
7100199	VOLVO 360 EXCAVATOR	$ 123.43	765.00	$ 94,423.95
7100210	CASE LOADER Mod CA621DBA	$ 47.13	205.00	$ 9,661.65
7100208	INTERNATIONAL DUMP TRUCK-2001	$ 28.22	375.00	$ 10,582.50
7100201	TANDEM DUMP TRUCK	$ 49.36	446.00	$ 22,014.56
7100237	2006 INTL 4200 WATER TRUCK 2,000 GAL	$ 19.58	285.00	$ 5,580.30
7300147	FORD CREW CAB	$ 14.60	205.00	$ 2,993.00
7100232	CAT D5GXL DOZER	$ 45.59	410.00	$ 18,691.90
7100203	JD BACKHOE 710G-E	$ 38.62	410.00	$ 15,834.20
7240185	DIESEL REVERSIBLE COMPACTOR	$ 8.75	205.00	$ 1,793.75
7100185	TANDEM DUMP	$ 49.36	410.00	$ 20,237.60
7240186	WACKER MODEL REVERSIBLE PLATE DIESEL COMPACTOR DPU4545He	$ 21.50	240.00	$ 5,160.00
7240201	RAMMER LARGE JUMPING JACK	$ -	165.00	$ -
7240202	RAMMER LARGE JUMPING JACK	$ -	100.00	$ -
7100245	USED RIDE ON ROLLER COMPACTOR	$ 66.00	180.00	$ 11,880.00

7100209	CASE LOADER Mod CA621DBA	$ 60.64	80.00	$ 4,851.20
7100233	CAT 621F WATER BUFFALO	$ 125.16	288.00	$ 36,046.08
7100183	DUMP TRUCK INTERNATIONAL	$ 15.00	288.00	$ 4,320.00
7100215	VOLVO 330 EXCAVATOR	$ 123.43	840.00	$ 103,681.20
7100211	VOLVO EXCAVATOR EC160CL	$ 65.05	400.00	$ 26,020.00
Total Equipment Used				$ 435,062.44

Heavy equipment and vehicles used to complete this project are owned by EBID. Equipment hourly rates are derived from EBID rental rates.

Equipment / Property Acquisition				
A	B	C	D	E
	Rate	**Quantity / Each**	**Applicant Cost**	**Federal Share**
Low Head River Pumps	$ 33,438.37	3	$ 100,315.11	$ -
Total Equipment / Property Acquisitions			$ 100,315.11	$ -

Three high flow, low lift axial flow pumps and associated motors are required to pump surface water from the wasteway into the piped lateral. The costs are determined by quotes from applicable vendors providing these materials.

Supplies and Materials				
A	B	C	D	E
	Rate	**Quantity / Each**	**Applicant Cost**	**Federal Share**
CD110-B-4S DI RTU with LCD display	$ 1,677.90	4.00	$ 6,711.60	$ -
NEMA 4 Enclosure SNG-3731	$ 48.03	4.00	$ 192.12	$ -
SP20 20 watt solar panel and bracket	$ 289.00	4.00	$ 1,156.00	$ -
Yagi Antenna. 5 element	$ 189.00	4.00	$ 756.00	$ -
Doppler Sensors	$ 9,000.00	4.00	$ -	$ 41,100.00
Pressure Transmitters 0-5 psi	$ 481.45	0.00	$ -	$ -
Metal Magmeters for River Pumps	$ 1,955.00	2.00	$ 3,910.00	$ -
Check Box	$ 5,234.00	5.00	$ 26,170.00	$ -
Distribution Box	$ 4,559.63	10.00	$ 45,596.30	$ -
Pump Box	$ 24,330.56	1.00	$ 24,330.56	$ -
48" gate	$ 3,826.80	4.00	$ -	$ 15,307.20
36" gate	$ 1,621.20	7.00	$ -	$ 11,348.40
30" gate	$ 1,493.00	3.00	$ -	$ 4,479.00
24" gate	$ 936.00	15.00	$ -	$ 14,040.00
Ultra Flo Pipe 24" x 24'	$ 457.09	321.00	$ -	$ 146,725.39

Ultra Flo Pipe 36" x 30'	$ 911.85	110.00	$ -	$ 100,303.44
Ultra Flo Pipe 48" x 30'	$ 1,060.13	311.00	$ -	$ 329,700.39
CSP BD 5-C RVTD 24" (pipe connectors)	$ 19.61	20.00	$ -	$ 392.24
CSP BD 5-C RVTD 36" (pipe connectors)	$ 32.10	134.00	$ -	$ 4,301.54
CSP BD 5-C RVTD 48" (pipe connectors)	$ 38.12	208.00	$ -	$ 7,989.28
Band ACC Flat Gasket 24"	$ 19.61	20.00	$ -	$ 392.24
Band ACC Flat Gasket 36"	$ 32.10	134.00	$ -	$ 4,301.54
Band ACC Flat Gasket 48"	$ 38.12	208.00	$ -	$ 7,989.28
Trisers 48" x 30'	$ 1,122.44	33.00	$ -	$ 37,040.43
Trisers 36" x 30'	$ 1,432.55	7.00	$ -	$ 10,027.85
Steel Pipe 12"	$ 782.25	22.00	$ -	$ 17,209.50
Portland Cement	$ 9.89	54.00	$ -	$ 534.06
3/4" clean crushed gravel	$ 17.87	60.00	$ 1,072.20	$ -
Ready Mix Concrete w/plasticizer	$ 112.00	45.00	$ 5,040.00	$ -
Total Supplies and Materials			$ 114,934.78	$ 753,181.78

The materials and supplies that will be used for this project are required to pipe the laterals and improve conservation and metering of the pipeline flows. The costs are determined by quotes received from applicable vendors providing these materials.

Contractual/Construction			
A	B	C	D
	Quantity / Each	**Applicant Cost**	**Federal Share**
Solar Panel Project	$ 1.00	$ -	$ 95,000.00
EPE connections	$ 1.00	$ -	$ 150,000.00
Total Contractual/Construction		$ -	$ 245,000.00

A 20 kW solar panel array and associated electrical hardware including inverters and wiring and mounting hardware will supplied by a licensed installer. The prices are based on are determined by quotes received from applicable vendors providing these materials and recent purchases of similar equipment.

The required connection to the El Paso Electric power grid and required extension of 3-phase power is budgeted based on a written estimate provided by an El Paso Electric service planner. The extension of this line is not avoidable to be able to power the proposed large pumps.

Other				
A	C	D	E	E
	Rate	**Quantity / Each**	**Applicant Cost**	**Federal Share**
Environmental compliance	$ 25,000.00	$ 1.00	$ 25,000.00	$ -
			$ 25,000.00	$ -

Expected costs of environmental compliance incurred in preparation of environmental compliance documentation and complying with environmental regulations applicable to the requested federal funding. This estimate is based on past agreement with BOR for a similar project and either requesting BOR prepare the environmental compliance documentation or having a consultant prepare this documentation and BOR review.

TOTAL PROJECT BUDGET	**Applicant Cost**	**Federal Share**
Salary/Wages	$ 253,499.79	$ -
Benefits	$ 101,399.91	$ -
Equipment	$ 435,062.44	$ -
Equipment / Property Acquisitions	$ 100,315.11	$ -
Supplies/Materials	$ 114,934.78	$ 753,181.78
Contractual/Construction Services	$ -	$ 245,000.00
Other	$ 25,000.00	$ -
	$ 1,030,212.03	$ 998,181.78
Percentage share of project cost	50.79%	49.21%
Total project cost	$ 2,028,393.81	

4. Environmental and Cultural Resources Compliance

EBID has extensive experience with all aspects of the project and surrounding areas except the solar energy production. The project will not be a detriment to the surrounding environment, but rather an enhancement. Earth disturbing activities include piping the Picacho and Nusbaum Laterals and installing solar panels within that newly available space. Efforts will be taken to reduce effects to air and water quality including water trucks constantly on site and suspending work on windy days. The areas surrounding the Nusbaum Lateral is entirely farmland or IBWC levee. The area surrounding the Picacho Lateral is mostly farmland, including the nearby subdivision which is still partially in farm land, specifically the portions adjacent to the lateral. The adjacent Dona Ana County owned and maintained Fairacres road will be avoided with equipment and any necessary signage will be contributed and performed by Dona Ana County Roads Department as part of EBID's agreement with the county to allow for the improvement of Fairacres road. Piping a portion of ditch within Harris Farms will be done within the easement that Mr. Harris has committed to. This ground disturbance will be limited to excavation, installation, and backfill of the pipeline. No detriment to the surrounding environment is expected.

EBID is not aware of any species listed or proposed to be listed as a federally threatened or endangered species, or designated critical habitat within the project area. This understanding was also verified by USFWS information available online. EBID is not aware of any wetlands or of other surface waters inside the project boundaries that qualify as "waters of the US." EBID is not aware of any archeological or Native American sacred sites within the project area. This project will not limit access to any sites, sacred or otherwise, and will not have any negative impact on low income or minority populations.

All of EBID's facilities are designated as a historically significant resource. As a result, EBID routinely works with the State Historical Preservation Officer (SHPO) before any action is taken. The laterals and drains are not sensitive, and EBID is not aware of any structures that are assigned historical significance. A search of the Archaeological Records Management Section at New Mexico Historical Preservation Division and a cultural resource survey for Picacho and Nusbaum Laterals, and the Harris ditch improvement will be contracted. Besides the Picacho and Nusbaum Laterals, and requisite coordination with New Mexico State Historical Preservation Office, no other sites, archaeological or otherwise, buildings or structures are anticipated which would require coordination with the Historical Cultural Property Inventory.

EBID's water delivery system was constructed as part of the Bureau of Reclamation Rio Grande Project. By piping the 6,163 feet of the Picacho Lateral, and 2634 feet of the Nusbaum Lateral, all structures will be replaced and the design will be modified in coordination with the farmers in the area.

5. Required Permits and Approvals

All construction work will take place within EBID's facilities and rights-of-way. An easement has been committed to by Harris Farms LLC which allow EBID the right to construct, operate, and maintain a ditch across his land. Mr. Harris' commitment to easement is documented within his letter or commitment. No federal, state, or local permitting will be required for the construction of this proposed project.

The solar power generated by this project will be marketed to El Paso Electric Co. (EPE), the regional provider in the EBID area. EBID has worked with EPE with small-scale hydroelectric power, and will build on that relationship to market the solar power produced here. The feasibility study will examine the permitting and contractual requirements for putting solar electricity on the grid through EPE. EPE will coordinate any permitting or easements required for connection of electrical power to the pumps proposed at Wasteway 40, which may include crossing USIBWC's levee.

The new river diversion via the proposed high-flow, low lift pumps will be coordinated with El Paso County Water Improvement District #1 and Bureau of Reclamation El Paso Office for accounting and measurement of diversions. The diversion of these pumps will be accounted for as part of EBID's total diversion at Leasburg Dam. EBID will request consultation with New Mexico Office of the State Engineer during the preparation of NEPA environmental assessment. A process has been worked out for notifying the Office of the State Engineer about supplemental pumps such as the one proposed and the one installed in 2016 at Wasteway 18.

6. Commitment Letter

Letter of Support and Contribution for Elephant Butte Irrigation District WaterSmart Grant Application 2018

Bufford Harris – Harris Farms, LLC

As a producer within and a member of the Elephant Butte Irrigation District (EBID) agree that we support the proposed project and BOR WaterSmart Grant Proposal titled "Picacho WHEN: Water-Habitat-Energy-Nexus."

We agree and commit to provide a portion of the cost-share of the proposed projects, specifically the contribution of $20,000.00 and an easement over my land for a new wasteway from the Nusbaum Lateral to the Picacho Drain, within Section 34 of Township 23 South Range 1 East, as shown approximately on the attached map. The 30 feet wide easement, upon which we own fee simple, will comprise a total acreage of roughly 0.58 acres plus or minus. The cash contribution and easement are to be contributed towards this conservation project administered by the Elephant Butte Irrigation District if selected for funding. We agree and commit that all match contributions will be transferred during the grant period, if the proposal is selected for funding. We agree and commit that all match contributions are currently available for transfer to EBID and will be transferred during the first year of the grant period, if selected. Easement documents and plat will be finalized within the first year following the date the project is funded.

We encourage the energy conscious water savings and habitat improvements proposed by EBID's WaterSmart grant application and request that the Bureau of Reclamation fund the collection of conservation projects proposed.

Business Name and Signatory Names	Address and Phone Number	Signature
HARRIS FARMS LLC	PO Drawer C Deming, NM	

7. Official Resolution

STATE OF NEW MEXICO

ELEPHANT BUTTE IRRIGATION DISTRICT
Resolution No. 2018-05

RE: Resolution Authorizing Grant Agreement with United States Bureau of Reclamation WaterSmart Grant 2018: Water and Energy Efficiency Grant BOR-DO-18-F006

WHEREAS, the Governing Body of the Elephant Butte Irrigation District, State of New Mexico shall enter into a Grant Agreement with the United States Bureau of Reclamation, and,

WHEREAS, the grant opportunity is United States Bureau of Reclamation WaterSmart Grant 2018: Water and Energy Efficiency Grant BOR-DO-18-F006, funding group II, which may take up to three years to complete.

NOW, THEREFORE, BE IT HEREBY RESOLVED that the Governing Body of the Elephant Butte Irrigation District, State of New Mexico hereby supports the application and is capable of providing the amount of funding and/or in-kind contributions specified in the grant program at 50% or more of the total project costs as required. Elephant Butte Irrigation District will work with the Bureau of Reclamation to meet established deadlines for entering into a grant or cooperative agreement

RESOLVED: In session this 18th day of April, 2018.

GOVERNING BODY OF ELEPHANT BUTTE IRRIGATION DISTRICT, NEW MEXICO.

Robert Faubion, Vice President

Michael McNamee, Vice President

Gail E. Norvell
Notary Public

Commission Expires: 12/9/2018

8. References

Al-Haddad, S., 2005. *Estimating Seepage from Irrigation Canals in the Elephant Butte Irrigation District, New Mexico*. Masters thesis, Civil Engineering, NMSU.

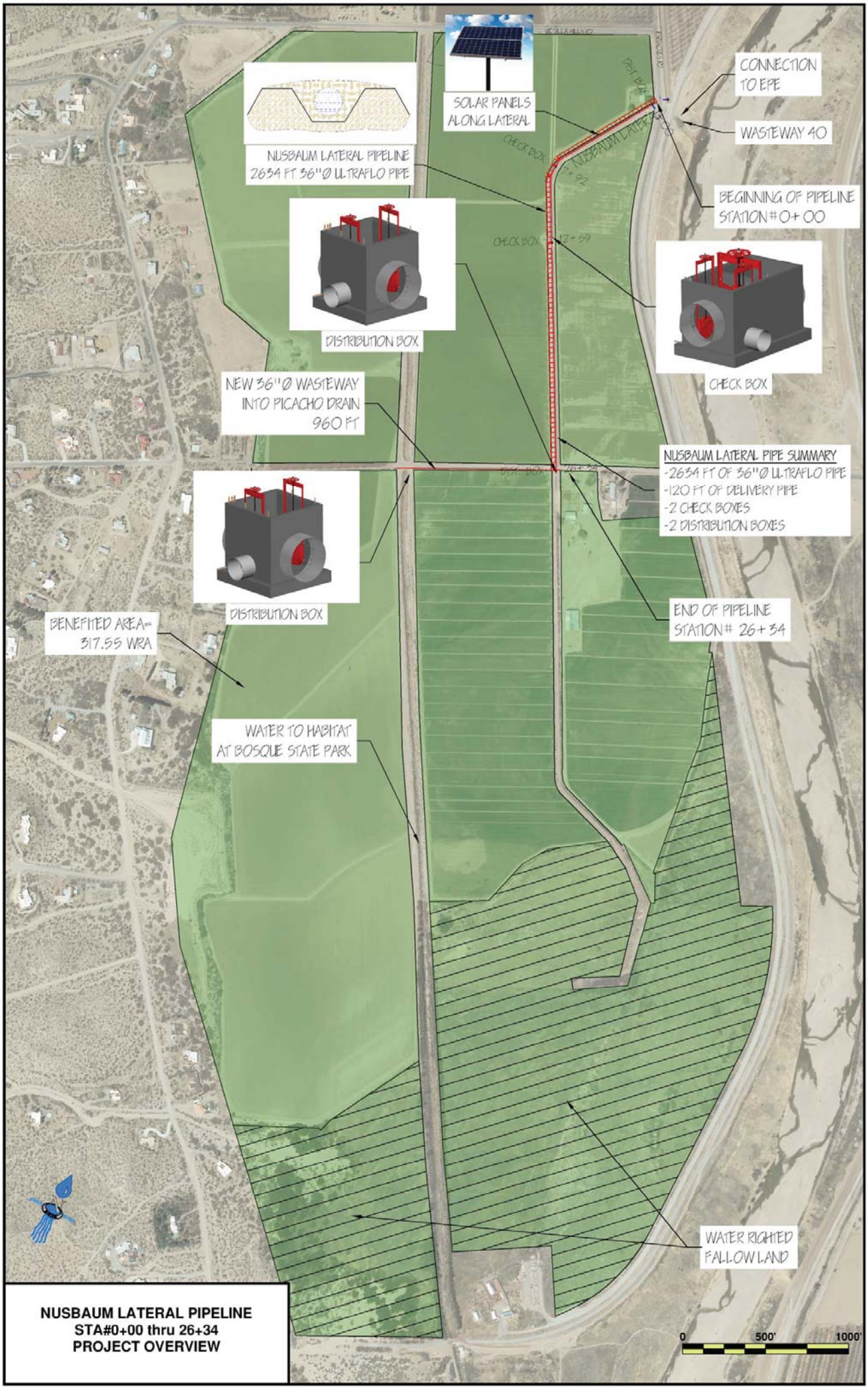
King, J. P. and J. Maitland, 2003. *Water for River Restoration: Potential for Collaboration between Agricultural and Environmental Water Users in the Rio Grande Project Area*. Prepared for the Chihuahuan Desert Program, World Wildlife Fund.

9. Appendices

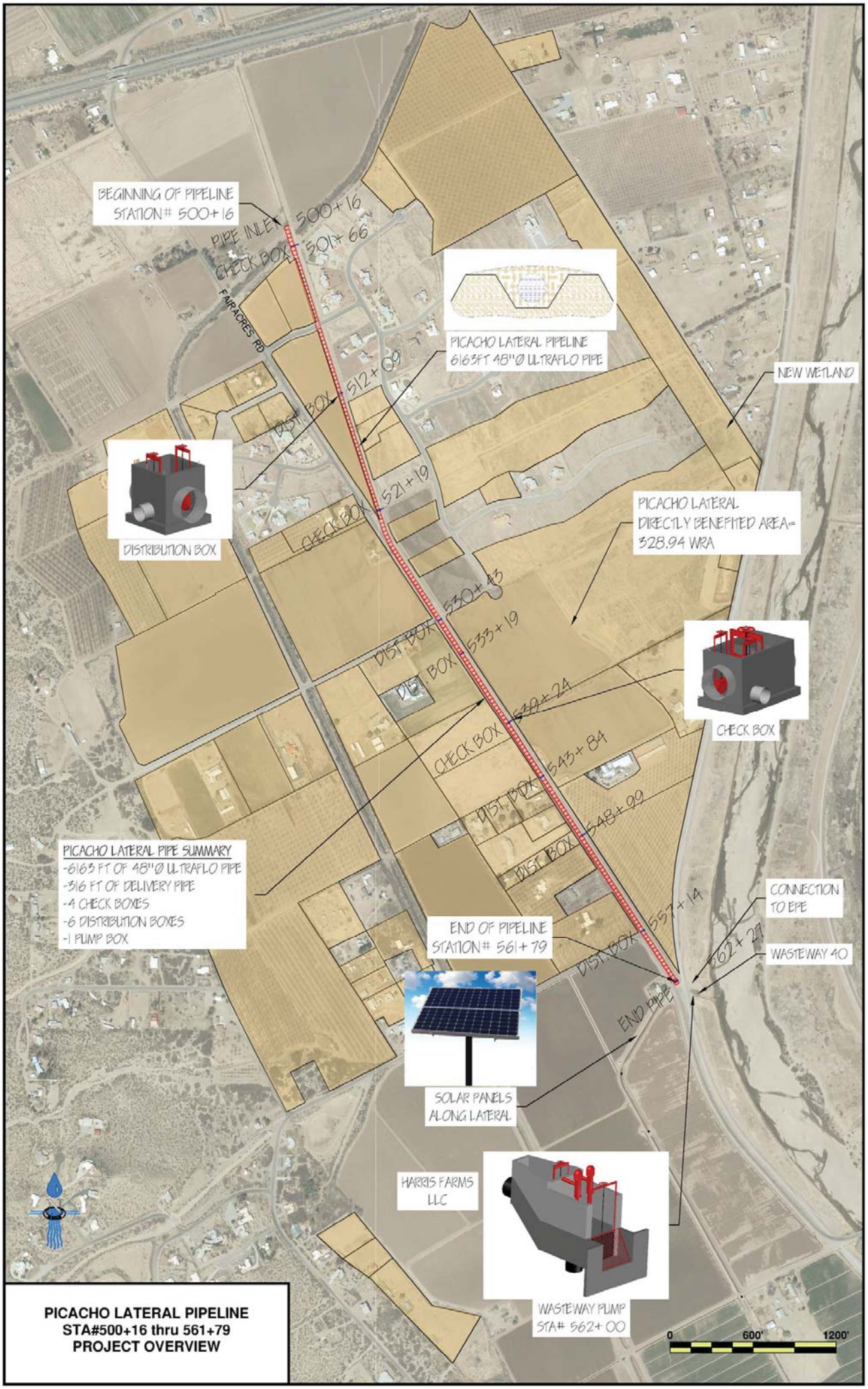
Drawings showing the extents of the project and pipeline, the location of project features, examples of pipeline components, and water righted areas directly benefited by the project. Full size version of Figures 5 and 6.

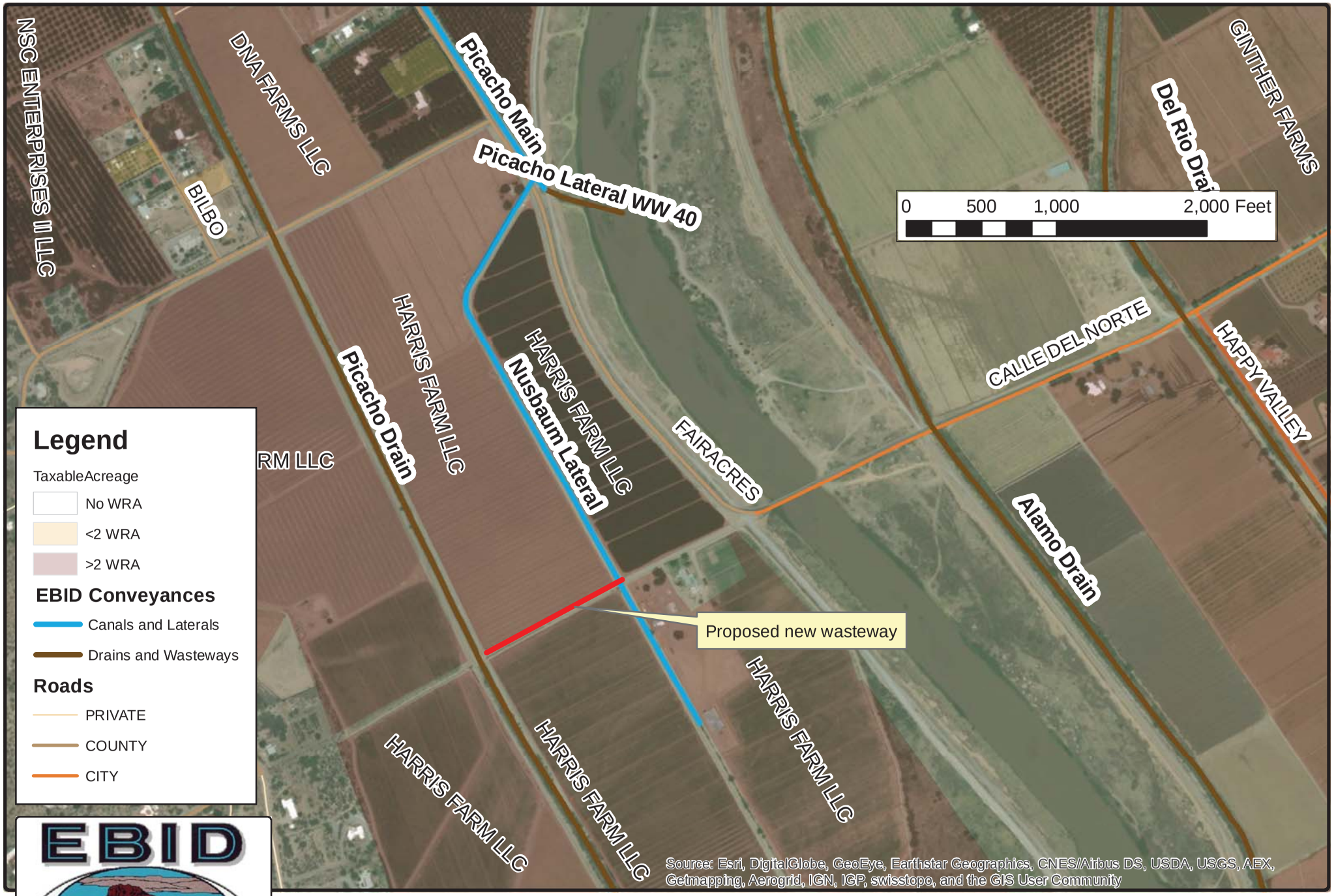
Map of the proposed new wasteway from the Nusbaum Lateral to the Picacho Drain.

Map of the proposed location of a 20kW solar panel array.



NUSBAUM LATERAL PIPELINE
STA#0+00 thru 26+34
PROJECT OVERVIEW


BEGINNING OF PIPELINE
STATION # 500+16
PIPE INLET
CHECK BOX
500+16
501+66
FAIRACRES RD
PICACHO LATERAL PIPELINE
6163FT 48"Ø ULTRAFLO PIPE
NEW WETLAND
DIST. BOX
512+09
DISTRIBUTION BOX
CHECK BOX
521+19
PICACHO LATERAL
DIRECTLY BENEFITED AREA=
328.94 WRA
530+43
DIST. BOX
533+19
DIST. BOX
539+24
CHECK BOX
CHECK BOX
543+84
DIST. BOX
548+99
DIST. BOX
PICACHO LATERAL PIPE SUMMARY
-6163 FT OF 48"Ø ULTRAFLO PIPE
-316 FT OF DELIVERY PIPE
-4 CHECK BOXES
-6 DISTRIBUTION BOXES
-1 PUMP BOX
END OF PIPELINE
STATION # 561+79
DIST. BOX
557+14
CONNECTION
TO EPE
562+27
WASTEWAY 40
END PIPE
SOLAR PANELS
ALONG LATERAL
HARRIS FARMS
LLC
WASTEWAY PUMP
STA# 562+00
0
600'
1200'
PICACHO LATERAL PIPELINE
STA#500+16 thru 561+79
PROJECT OVERVIEW

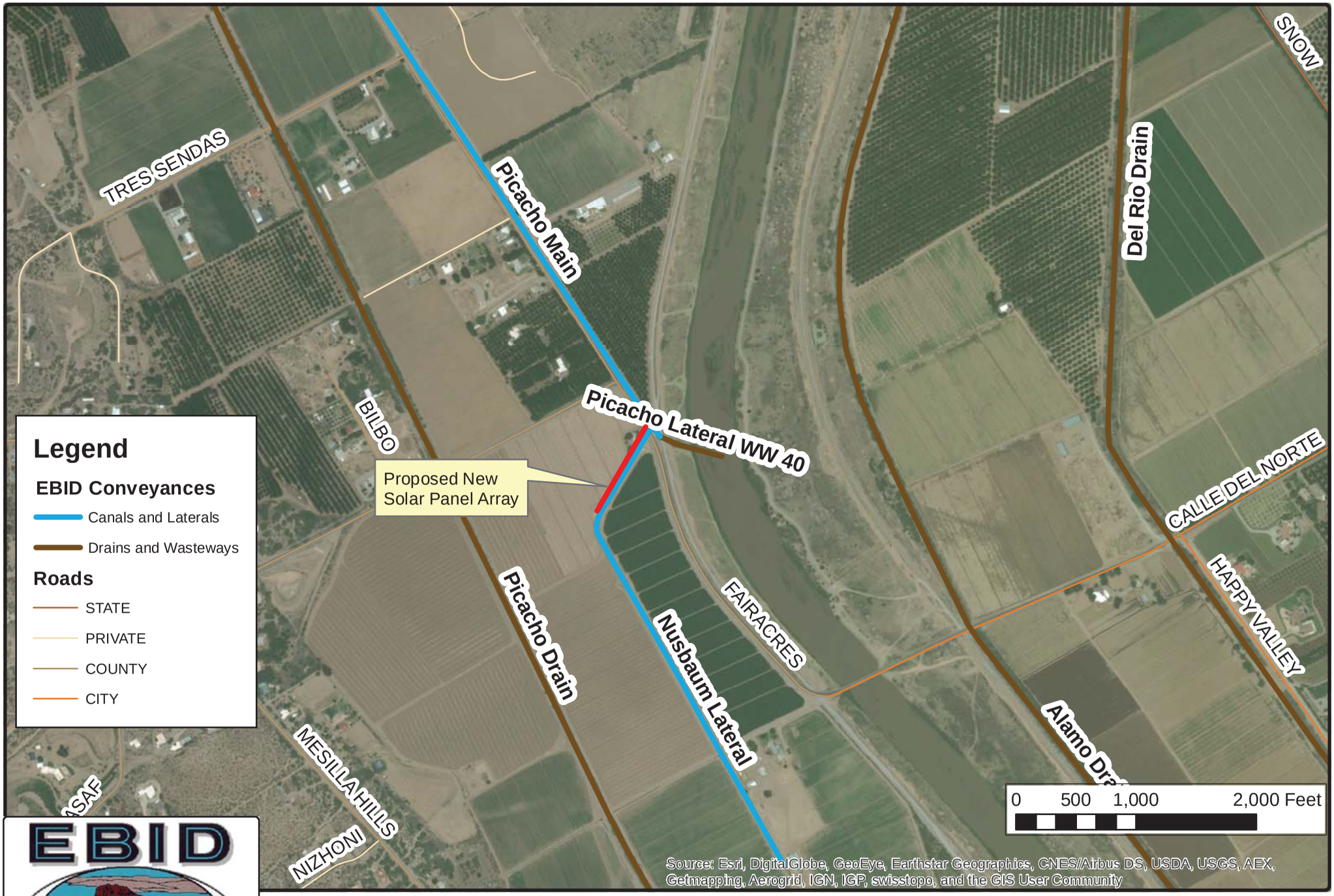


EBID

ELEPHANT BUTTE IRRIGATION DISTRICT

Proposed new wasteway from Nusbaum Lateral to Picacho Drain

N
W E
S



EBID

ELEPHANT BUTTE IRRIGATION DISTRICT

Location for
New 20kW Photo Voltaic Array
Picacho WHEN Grant Application

N
W E
S