WATERSMART: WATER AND ENERGY EFFICIENCY GRANTS FOR FISCAL YEAR 2022 – FUNDING GROUP II

DONNA IRRIGATION DISTRICT

LINING OF THE EAST MAIN CANAL AND NORTH CROSSOVER MAIN CANAL

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Technical Proposal:

(1) Executive Summary

Date: November 2, 2021
Applicant: Donna Irrigation District, Category A Applicant
Donna, Hidalgo County, Texas

Donna Irrigation District is located along the Lower Rio Grande Valley Region in Hidalgo County, Texas and provides irrigation water to about 32,000 acres of farmland within its boundaries and delivers irrigation water to the City of Donna, North Alamo Water Supply Corporation and Engelman Irrigation District. The District proposes a Funding Group II Project to line 12,255 linear feet of the East Main Canal and 10,050 linear feet of the North Crossover Main Canal with a geosynthetic composite canal liner protected with four inches of shotcrete to conserve 4,620 acre feet per year. The project will also include the installation of 2 solar monitoring stations at the Districts First Lift Pump Station and Second Lift Pump Station. These monitoring stations incorporate a renewable energy component to the project and are proposed to provide a more efficient, real-time, detection of problems to aid in minimizing loss of water resources. The project is consistent with the District's long term Water Conservation Plan, and canal lining is identified in the "2021 Rio Grande Regional Water Plan." The project will result in significant water and energy conservation while at the same time increasing water use efficiency and reliability through reduced seepage losses. The conserved water will remain in the Falcon and Amistad Reservoirs for eventual allocation to other users in the Rio Grande System, alleviating pressure on the over-allocated water resource shared with Mexico.

The project will be completed in two years. Based on an estimated start date of October 1, 2022, the project will be completed by September 30, 2024.

The proposed project is not located on a Federal Facility.

(2) Project Location

The Project is located in Hidalgo County, Texas, within the boundaries of Donna Irrigation District. Figures 1.1 and 1.2 provide the project location maps.

The project components are all within a few miles of downtown Donna, Texas, as shown in Figure 1.2. Figure 1.3 provides a more detailed location of the two canal lining projects. The latitude and longitude of the project components are as follows:

Component	Latitude	Longitude
Lining of 12,255 linear feet of the East Main Canal	26°9'09" N	98°03'17" W
Lining of 10,050 linear feet of the North Crossover Main Canal	26°12'06.80" N	98°04'59" W
Solar Powered Monitoring Station at 2nd Lift Pump Station	26°09'16" N	98°04'58" W
Solar Powered Monitoring Station at 1st Lift Pump Station	26°04'03" N	98°04'31" W

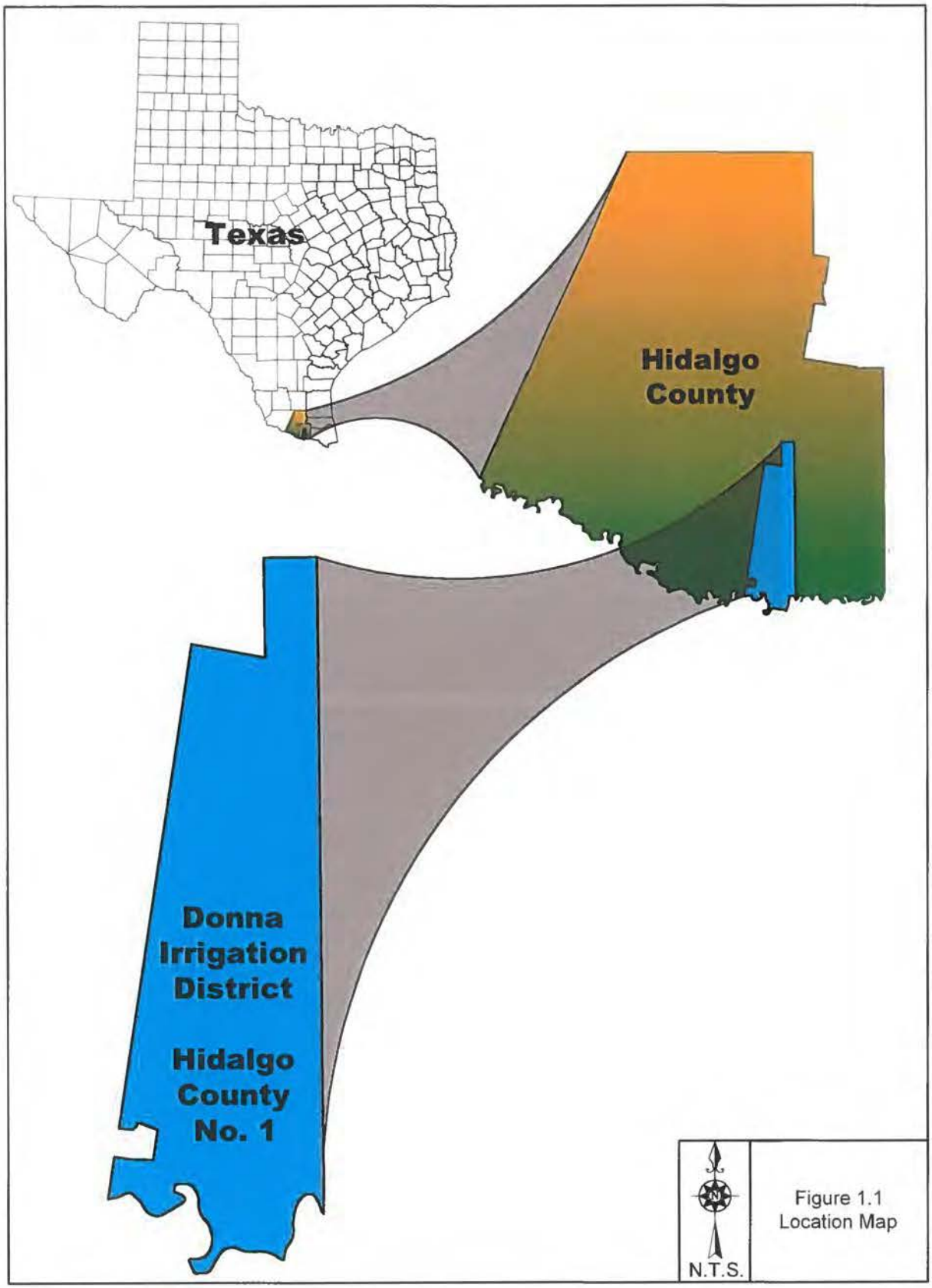


Figure 1.1
Location Map

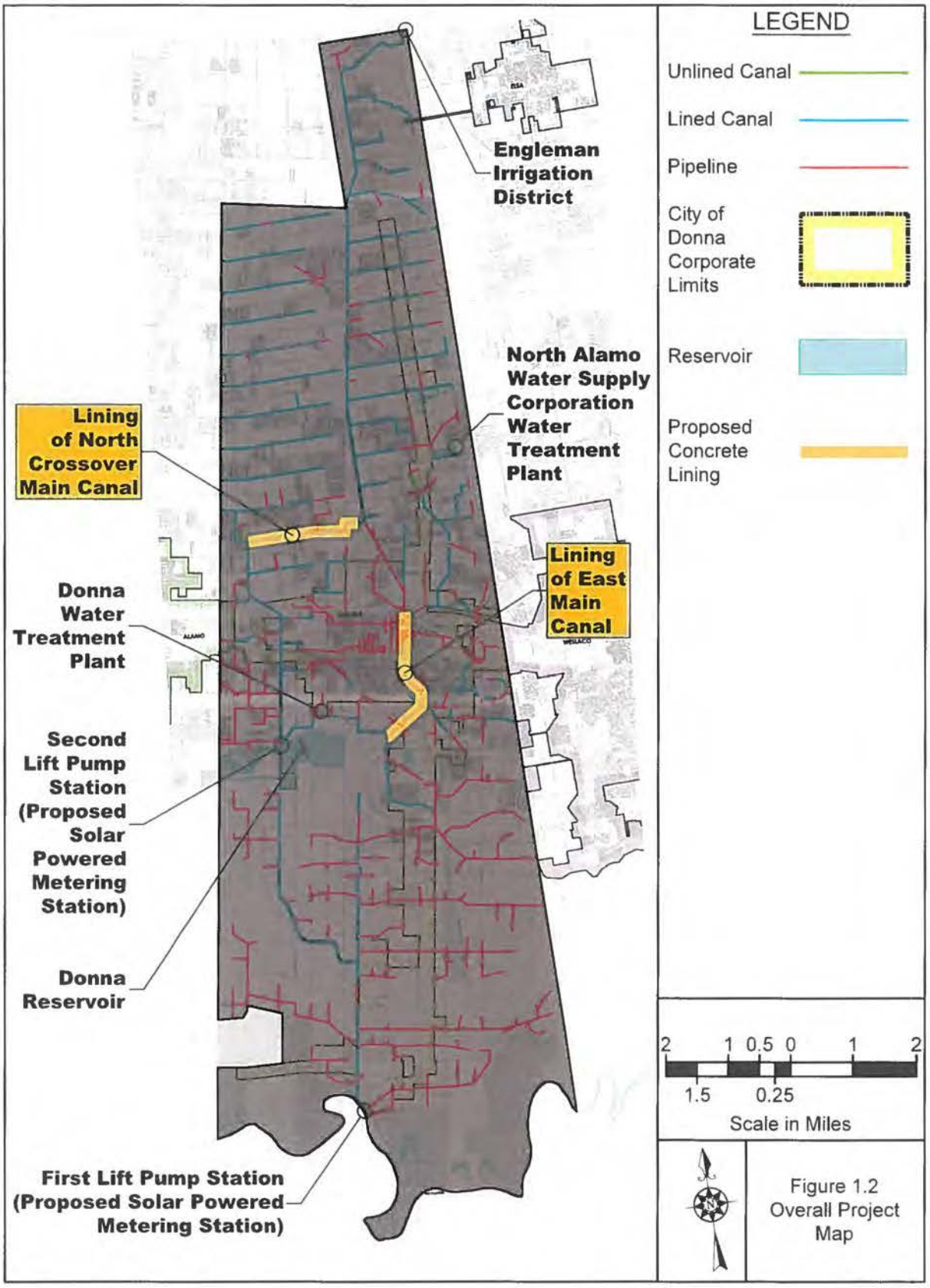


Figure 1.2
Overall Project Map

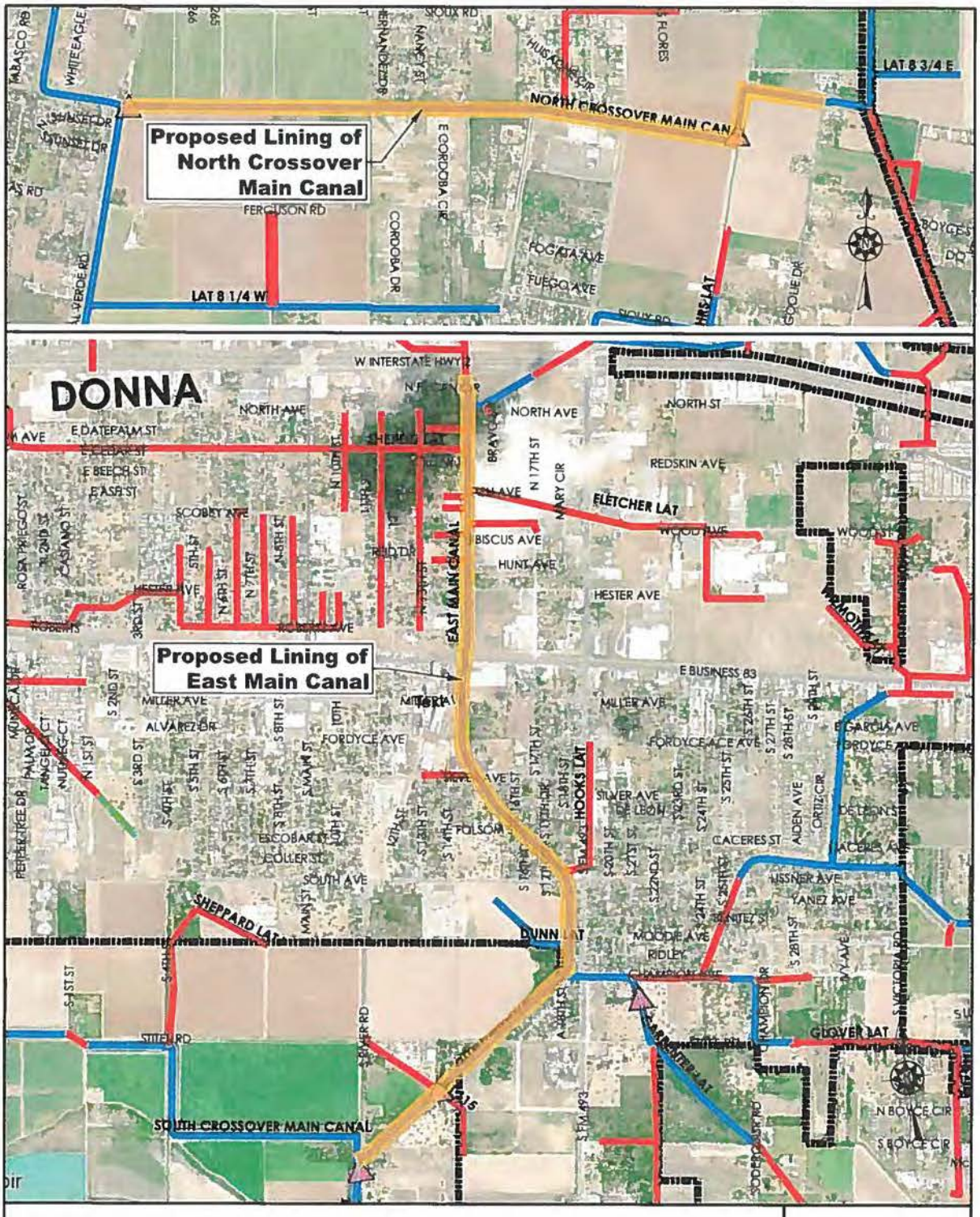


Figure 1.3
Project Map

(3) Technical Project Description

The Donna Irrigation District (the District) provides irrigation water to about 32,000 acres of farmland within its boundaries. The District delivers irrigation water to Engelman Irrigation District, the City of Donna (the City), and North Alamo Water Supply Corporation (NAWSC). The City and NAWSC are Public Water Systems (PWS) that treat the irrigation water provided by the District and deliver it to their respective potable water customers. The District holds 1,700 irrigation accounts. Cotton, grain, sugar cane, citrus, alfalfa, vegetable, and livestock farming are among some of the agriculture serviced by the District.

As part of the research and data collection/interpretation for this application, a 5-year water audit of Donna Irrigation District was performed by Ferris, Flinn & Medina LLC. The audit revealed to water managers the quantity of water being lost within the system and its overall efficiency. Table 1 provides the findings of the 5-year water audit which includes the history of water diverted by the District from 2016 through 2020. The audit revealed that the District diverts an average of 72,000 acre-feet per year, approximately 4,000 of which is for its two municipal customers. The District loses approximately 30,000 acre-feet per year, while delivering 42,000 acre-feet per year to its customers, an efficiency of only 58%.

The District proposes a canal lining project that will help increase the District efficiency and reliability by conserving water and energy. The proposed project includes the lining of the East Main Canal and North Crossover Main Canal with a geosynthetic composite canal liner protected with four inches of shotcrete to conserve 4,620 acre feet per year. The District also proposes to include the installation of 2 solar monitoring stations at the District's First Lift and Second Lift Pump Stations. This renewable energy component of the project will help reduce greenhouse gas emissions in the area. The metering stations will provided real-time information to the District Manager and District personnel to better manage the system and improve operation efficiency. The proposed improvements will create a foundation for further system improvements. The proposed project will also increase efficiency and reliability within the district with respect to the regular transportation of water to the City, NAWSC, and agricultural customers through the elimination of canal seepage losses.

The estimated quantity of water savings consists of a 4,150 acre-feet per year conserved through the East Main Canal improvements and 470 acre-feet per year conserved through the North Crossover Canal improvements (see Appendix B). These 4,620 acre-feet of water savings represent 4.91% of the total water rights available to the district per year. This percentage is based on authorized water right of 94,064 acre-feet per year. Additionally, any water not diverted is stored in the Falcon and Amistad reservoirs, so the reduction in diversion represents 6.42% of the average annual diversion of 71,917 acre-feet.

The proposed project results in an overall efficiency increase of 6.2% in District operation, from 58.2% to 64.4%, through a reduction of canal seepage losses. These water savings also reduce the pumping cost associated with delivery to result in the lowest possible

water rates to the two PWS and their customers. The District will save approximately $25,000 in energy costs annually per the calculations presented in Appendix H. In addition, the City and NAWSC supply 180,000 people, a population that is expected to increase to 400,000 by 2070. District reliability is of upmost importance to service the continuously growing population in the region.

The District will utilize a liner system that includes a geosynthetic membrane composite liner, designed for water containment, reinforced with shotcrete for protection and longevity. The liner, commercially known as Huesker Canal 3 liner, is an impermeable polyethylene liner layered between two non-woven geosynthetic layers (geocomposite liner). The District will cover the liner with a minimum of 3 inches (average of 4 inches) of shotcrete to protect the liner from physical damage and ultraviolet degradation. The proposed composite lining system will provide a new, impermeable liner with a life exceeding 50 years.

Figure 2.1 depicts a typical failure on a section of the North Crossover Main Canal with cracks as well as an area where the liner has completely failed. The District constantly repairs and upkeeps the canal, however holes and cracks in the existing liner are the source of seepage currently occurring in each of the proposed canals, as evidenced by the seepage testing detailed later in this application. The proposed geocomposite liner will eliminate these losses. In the failed areas, any loose existing concrete liner will be removed and the subgrade will be reconstructed with earth materials to support the new geocomposite liner. Figures 2.2 and 2.3 provide existing conditions of each canal.

The proposed improvements will create a foundation for further system improvements. The District looks forward to a long relationship with the Bureau to accomplish water and energy conservation projects in the future.

Figure 2.1: Typical Failure of Existing Canal Liner

Table 1
Water Diversions, Deliveries and Efficiency

All units in Acre Feet unless shown otherwise

Calendar Year	2016	2017	2018	2019	2020	Average
Water Pumped	68,028	72,359	80,434	67,677	71,086	71,917
Watermaster Charge	68,717	73,605	80,970	69,656	72,016	72,993
River Losses	689	1,246	536	1,979	930	1,076
River Losses as % of Water Charged	1.0%	1.7%	0.7%	2.8%	1.3%	1.5%
Annual Rainfall (inches)	14.5	19.8	21.3	19.8	29.1	20.9
In District Drip and Sprinklered Irrigation	1,174	1,207	2,250	3,049	2,150	1,966
In District Flood Irrigation	31,007	34,190	33,194	32,215	24,988	31,119
Engelman Irrigation District	3,885	4,822	6,643	5,279	5,243	5,175
Out of District Irrigation	66	181	171	65	157	128
City of Donna Municipal	1,897	2,086	1,991	2,053	2,179	2,041
North Alamo WSC Municipal	1,999	1,987	2,023	2,040	1,722	1,954
Total Water Delivered	40,027	44,471	46,272	44,701	36,439	42,382
System Losses	28,001	27,887	34,162	22,976	34,647	29,535
System Losses as a % of Water Charged	40.7%	37.9%	42.2%	33.0%	48.1%	40.4%
Overall System Efficiency	58.2%	60.4%	57.1%	64.2%	50.6%	58.1%

Figure 2.2: East Main Canal, North View

Figure 2.3: North Crossover Main Canal, East View

(4) Evaluation Criteria:

Evaluation Criterion A: Quantifiable Water Savings

The water savings as a result of the canal improvements project are projected to be 4,620 acre feet per year, as summarized in Table 2. The first component of the water savings estimate is the 4,150 acre-feet per year of seepage losses for the East Main Canal. The second component of the water savings is the 470 acre feet per year of seepage losses for the North Crossover Main Canal. The combined total of the two canal seepage losses represents the 4,620 acre feet per year of estimated water savings.

The water losses identified in this project are currently seeping into the ground and into seepage ditches. Once water is lost to seepage, it is no longer available to be used by others. There are no known benefits associated with the current seepage losses.

1a. To obtain the total annual water savings estimate on Table 2, Ferris, Flinn & Medina, LLC, conducted an inflow/outflow test on a typical section at the upstream and downstream ends of each of the two proposed canals. The method utilized consisted of measuring both, the water current velocities and the cross sectional areas at the upstream and downstream ends of each canal. These readings were then used to calculate the discharge rate into and out of each canal; the difference between these two discharge rates being the seepage.

A summary of the water loss total is included in Table 2 with calculations available in Appendix B.

Table 2: Annual Transit Loss Reduction

CANAL	WATER LOSS (AC FT / YR)	SECTION LENGTH IN MILES (LINEAR FEET)	ANNUAL TRANSIT LOSS REDUCTION (AC FT / YR / MILE)
East Main Canal	4,150	2.321 (12,255)	1,788
North Crossover Main Canal	470	1.903 (10,050)	247
TOTAL (AC-FT / YR)	**4,620**		
TOTAL (MILES)		**4.224**	
ANNUAL TRANSIT LOSS REDUCTION (AC FT / YR / MILE)			**2,035**

1b. Water current velocities were collected for each canal using Teledyne RDI's StreamPRO Acoustic Doppler Current Profiler (ADCP). The StreamPRO ADCP is a type of sonar that measures and records water current velocities over a range of depths. This allowed for the capturing of accurate water current velocity readings without the need to interrupt the District's water demand operations. Canal cross sections were measured in the field immediately before the water current velocities were captured using the StreamPRO ADCP. Once a cross section of the canal was measured, the StreamPro ADCP would be used to begin measuring the water current velocities in the exact same location where the cross sections were measured. Figures 3.1 and 3.2 show the method of measuring the water current velocities using the StreamPro ADCP on each of the proposed canals. The widths of the two proposed canals were small enough to avoid having to use a complicated pulley system to move the StreamPRO ADCP across the canal cross section. Instead, the StreamPro ADCP was attached to an aluminum handle rig that allowed for a steady and more accurate way of moving the StreamPRO ADCP across each of the canal cross sections. A minimum of 4 StreamPro ADCP transects were made for each upstream and downstream section. Water current velocities in each of the two canals were very consistent and had very minor variations between each transect. In the end, the average water current velocity was recorded for each upstream and downstream section at each of the two canals. These average water current velocities were then multiplied by their corresponding canal cross sectional area measurements. With these two data sets, a manual calculation was made to estimate the inflow and outflow discharge rates in cubic feet per seconds (CFS). The difference between these two discharge rates was the seepage loss total for each canal.

Figure 3.1: Measuring of Water Current Velocities at the East Main Canal

Figure 3.2: Measuring of Water Current Velocities at the North Crossover Main Canal

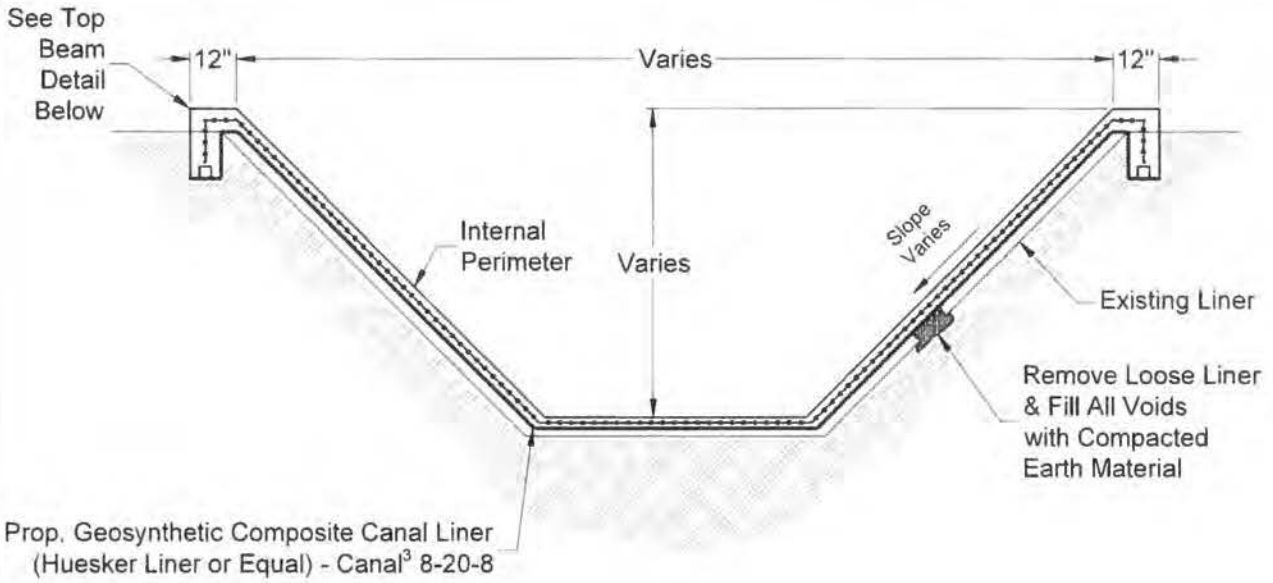
1c. The expected post-project seepage losses are negligible. The proposed geosynthetic composite liner includes an impermeable 20 mil polyethylene liner between two non-woven geotextile layers. Furthermore, an average thickness of 4" of shotcrete is proposed to cover the proposed geosynthetic composite canal liner. The shotcrete will aid in preventing seepage while at the same time providing protection to the geosynthetic liner against damage from mowers and canal cleaning equipment.

1d. From the seepage test results, it was determined that the East Main Canal incurs seepage losses of 11.37 acre-feet per day. These seepage losses translate to 4,150 acre-feet per year, which when divided by the test section length of 2.321 miles is equivalent to 1,788 acre-feet per mile per year. The North Crossover Main Canal incurs seepage losses of 1.288 acre-feet per day which translate to 470 acre-feet per year. When divided by the test section length of 1.903 linear feet, the losses for the North Crossover Main Canal are equivalent to 247 acre-feet per mile every year. Thus, the anticipated annual transit loss reductions, in terms of acre-feet per mile for the overall project, is 2,035 acre feet per mile. Table 2 summarizes the results of the seepage study. Detailed seepage test results are provided in Appendix B.

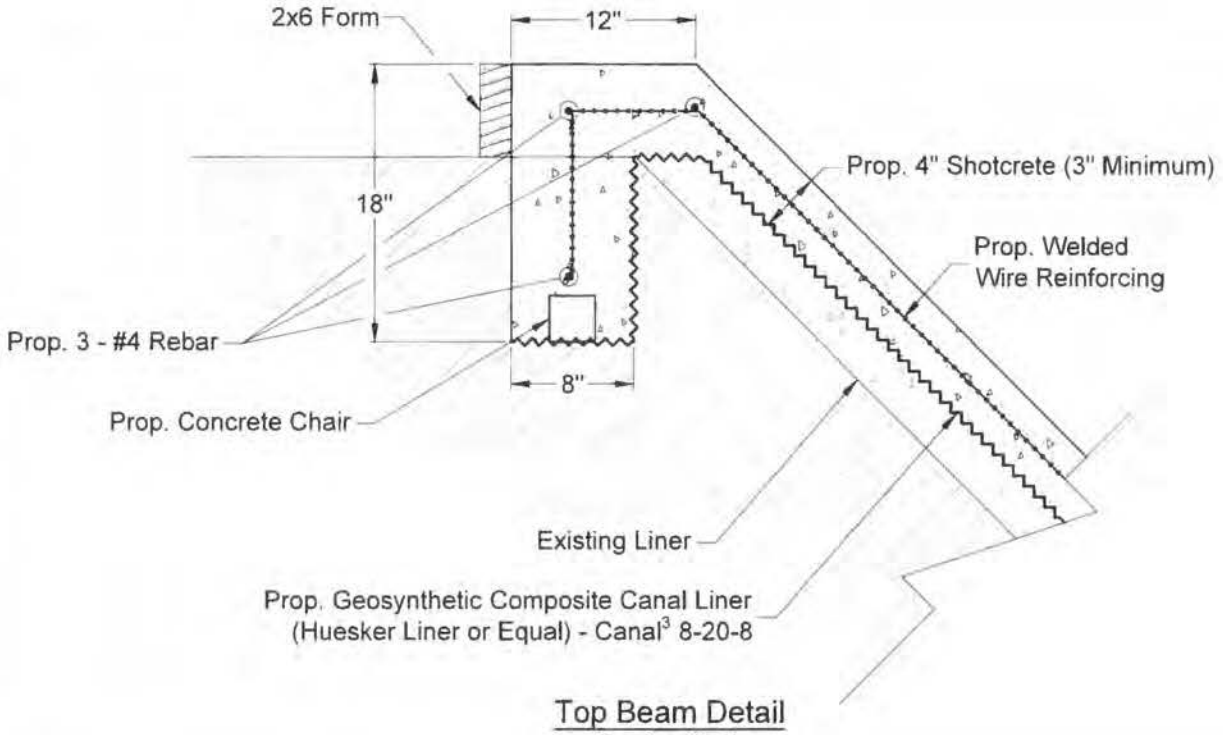
1e. A seepage test will be performed on each of the newly lined canals to verify there is no leakage once construction is completed. It can be assumed all seepage will be eliminated with the use of geosynthetic composite liner and shotcrete system.

1f. Materials for the proposed typical canal lining include Huesker Liner - Canal[3] 8-20-8, a geosynthetic composite liner with an impermeable 20 mil polyethylene liner between two non-woven geotextile layers. The proposed geocomposite liner raises the cost, but also ensures that the liner system is impermeable over a much longer period of time, as the polyethylene layer stops seepage, even as concrete cracks. An average of 4 inches of shotcrete with welded wire reinforcing will also be used in the proposed sections. The proposed lining materials are shown in Figure 4.1. A minimum of 3" of shotcrete is proposed to cover the proposed geosynthetic composite canal liner, but the average thickness is projected to be 4". A top beam and anchor trench to hold the liner in place will be constructed by constructing a 12" deep and 8" wide anchor trench that will be reinforced with three number 4 continuous rebar and wire mesh reinforcing projecting into the 4" thick shotcrete layer. The anchor trench holds the liner in place during the shotcrete process and the additional strength provided by the reinforced beam provides protection against damage from mowers and canal cleaning equipment.

Also proposed are 36" x 36" Fresno Slide Gates with Stainless Rails as canal check gates. Irrigation outlets will include 24" Fresno Pressure Gates, Model 4200 with Stainless Rails and Bronze Seats where necessary.



Canal Cross Section Detail
Scale: 1"=4'



Top Beam Detail
Scale: 1"=1'

Donna Irrigation District

Figure 4.1

Proposed Liner Detail

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Evaluation Criterion B - Renewable Energy

Subcriterion B.2 - Increasing Energy Efficiency in Water Management

The yearly water savings of 4,620 acre-feet presently being lost to seepage will result in reduced pumping from the first and second lift stations. The reduced pumping is expected to provide a yearly energy savings of 1,260,898 kWh, or 4.80% of the District's current average consumption per year (see Appendix H).

The EPA states on their website that "the transportation sector generates the largest share of greenhouse gas emissions." A total of 29 percent of the 2019 greenhouse gas emissions came from the transportation sector. The proposed project proposes to take steps to modernize the District's antiquated method of collecting the flow and level data of its main canals. Currently, the flow and level data are inspected visually by field operators using vehicles to drive to these sites. Multiple operator drive to the remote locations of the First Lift and Second Lift Pump stations to inspect the flow and levels of the District's main canal. This is a task that takes place every day, 365 days out of the year. The project aims at installing two solar powered monitoring stations at both, the First and Second Lift Pump Stations. The two proposed monitoring stations will monitor both volumetric flow and canal level of the District's main irrigation canals with remote data access via operators' smartphones. The two proposed monitoring stations will be powered by solar generated electricity, thus establishing and using a renewable energy source. The proposed remote monitoring stations will eliminate the need for fossil-fuel powered automobiles presently required for visual inspection of water volumetric flow and levels. These metering stations will not incur any fossil-fuel consumption from power plants to receive electricity. The reduction in pumping costs reduces air pollution through energy conservation.

The District operates the First Lift Pump Station located on the Rio Grande and the Second Lift Pump Station located at the District's reservoir approximately 7 miles from the Rio Grande (see Figure 1.2). The First Lift Pump Station operates on engines run by natural gas and/or electricity. The Second Lift Pump Station can be operated with natural gas and/or electricity as well.

The yearly energy savings is 1,260,898 kWh. This energy savings estimate originates from the point of diversion, and it is calculated by analyzing the District yearly average energy consumption at the First Lift Pump Station; it is then divided by the total acre-feet of water diversions of 192,458.18 acre-feet for the year. From this analysis, the energy required to pump one acre-foot of water can be obtained in kWh/Acre-Foot. This figure is then applied to the water savings total of 4,620 acre-feet of the proposed project, and then doubled since all of the water conserved by the project will be re-lifted at the Second Lift which has similar equipment and power costs. The total energy savings for the project translates to an energy cost saving of $25,094.83 (see Appendix H).

The project is expected to result in reduced vehicle miles driven, which will in turn reduce greenhouse gas emissions. As previously mentioned, the project will incorporate two new

solar monitoring stations at the District's First and Second Lift Pump Stations. These monitoring stations will reduce the vehicle miles driven by providing district operators with the ability to access the District's main irrigation canal volumetric flow and level real time information through remote data access accessible via their smartphones. This modernization in district infrastructure will eliminate the need for fossil-fuel powered automobiles presently required for visual inspection of water volumetric flow and levels. A total of 11.06 Metric Tons of greenhouse gas emissions per year are expected to be removed from the atmosphere as a result of this project. The greenhouse gas emissions calculations are available in Appendix G.

The two proposed metering stations will be powered by solar panels. These monitoring stations will not incur any fossil-fuel consumption from power plants to receive electricity. On the contrary, they will result in solar energy production, thus establishing and using a renewable energy source.

The types of metering stations proposed are installed in other more modernized irrigation districts throughout the region and have been proven over time to provide reliable data in an efficient manner. Proposed flow and level meters will provide additional points of data available to the region to monitor its water resources and develop historical data for future analysis and resource predictions. Remote monitoring systems allow much more efficient, real-time, detection of problems, minimizing loss of water resources.

Evaluation Criterion C - Sustainability Benefits

The District services the City of Donna and North Alamo Water Supply Corporation (NAWSC). The two potable water systems (PWS) are vulnerable to drought conditions, which occur often in the region. All water in the region is supplied by the Lower Rio Grande and this source is shared with Mexico by treaty. Appendix A includes excerpts from the "Lower Rio Grande Basin Study," US Department of Interior, Bureau of Reclamation and Rio Grande Regional Water Authority, December 2013 (Basin Study). The one key quotation from the Basin Study that the proposed project addresses is:

"In summary, the climate-affected future supply situation for surface water indicates that the expected shortfall of over 300,000 acre-feet for municipal demands by the year 2060 (see figure 2-7) will be exacerbated in the median and 5th percentile flow factor scenarios. The projection that present municipal water rights would be 100% reliable in future years as evidenced by our WAM runs is only possible at the expense of agricultural rights, which fall to 1.6% reliable in the annual climate-affected projections (see figure 2-18). This reduction in irrigation flows also has serious impacts on the delivery of water to municipalities due to the need for push water. In combination with risks stemming from Mexico's ability to meet obligations to supply water under the Treaty, Rio Grande surface water poses significant reliability risks in the future."

Push water is defined as the water required to fill channels and pipelines and storage facilities and overcome transportation losses, including seepage and evaporation to deliver water to the end user from the source. For Donna Irrigation District, the system losses are normally shared by the irrigation users and the municipal customers that

operate PWS. Table 1 summarizes the findings of a water audit for the years 2016 through 2020, which quantifies District demands and operating efficiency. The District diverts an average of 72,000 acre-feet per year, approximately 4,000 of which is for its two municipal customers. The District loses approximately 30,000 acre-feet per year while delivering 42,000 acre-feet per year to its customers, an efficiency of 58%. The proposed project will increase long-term drought resilience for the City and NAWSC by reducing municipal push water requirements for the entities by 4,620 acre-feet per year. During extreme drought conditions, municipal water allocation has historically sold for up to $100 per acre foot. The proposed project will save those entities several hundred thousand dollars per year in an extreme drought. While the primary objective of this project is water conservation through eliminating seepage losses, the proposed project will also significantly increase the reliability of water supplies to the City and NAWSC, especially in drought conditions and emergency/natural disaster scenarios.

The US Fish and Wildlife Service (USFWS) is a major water right holder in the Lower Rio Grande Valley Watermaster System. As the Lower Rio Grande Valley National Wildlife Refuge (Refuge) expanded, it also acquired water rights. The Refuge manages their water to restore critical habitat. A description of how the Refuge utilizes the water is included in Appendix I. Also provided in Appendix I is Refuge information on the endangered Ocelot and how the wild cats are a management priority. The Refuge manages its water resources as it determines most beneficial to the Ocelot, along with other species in the area. Conserved water, at times, is allocated to water accounts held by the US Fish and Wildlife, further promoting conservation activities throughout the region. The Refuge utilizes its water to restore critical habitat for the Ocelot and other endangered species. Conserved water from the proposed project can be allocated to the Refuge.

Water conservation improvements to the District will in turn conserve water in Falcon and Amistad Reservoirs, which are home to many species of wildlife which depend on those water sources to sustain life. Conservation of those bodies of water will help maintain aquatic wildlife through combatting falling water levels and rising salinity levels. Figure 6 reflects the levels at Falcon and Amistad Reservoirs since they were full in 2011. The District's storage limit of 132,630 acre feet is 4% of the US share of storage in the reservoirs, a significant portion.

The proposed project will allow the District to successfully address the major water reliability concern in the region and improve the District's water resource management. When the District has a full storage balance in the Reservoir System, all conserved water is allocated to other users in the system which include mining, industrial and municipal water users. This project will have a real impact on the other users in the system and provide greater flexibility to water managers, resulting in a more efficient use of water supplies.

The Lower Rio Grande Valley Watermaster System is unique in that it shares its water supply with Mexico based on an International Treaty. Falcon and Amistad are storage reservoirs for the water supply. According to the Treaty, 1/3 of water from several

Mexican Tributaries is allotted to the US. Since the Treaty was formed, Mexico has constructed reservoirs upstream of Falcon and Amistad that allow Mexico to withhold runoff, which to many in the US is considered a violation of the Treaty. The system is further complicated by the fact that the International Treaty with Mexico allows Mexico to defer water deliveries up to five years. Figure 5 is the status of the current five year cycle. All lines that end below the diagonal red line represent 5-year periods in which Treaty obligations were not met. Mexico is about one year behind in delivery of water to the US causing drought in the more heavily irrigated Districts in South Texas. There have been recent conflicts in Mexico where farmers have protested against the Mexican government's plans to repay the debt as stipulated in the Treaty. The fact that Mexico delays releases is evident in the graph displayed in Figure 6, where Mexico's percentage of storage in the Falcon and Amistad reservoirs is much less than the US share. The result is a system susceptible to extreme drought and international water conflict. The Amistad-Falcon Storage Conditions from 1996 to present, shown on Figure 6, for example, highlight extended low periods of conservation capacity. It is important to note that between the years of 1996 and 2004, the reservoir storage dropped below 50% and remained there for the entire nine years. One third of water released into Falcon and Amistad from Mexican reservoirs eventually becomes US water, so Mexico delays that release as long as possible. The conservation that will occur from this project helps ease international conflict over the shared, limited, water resource.

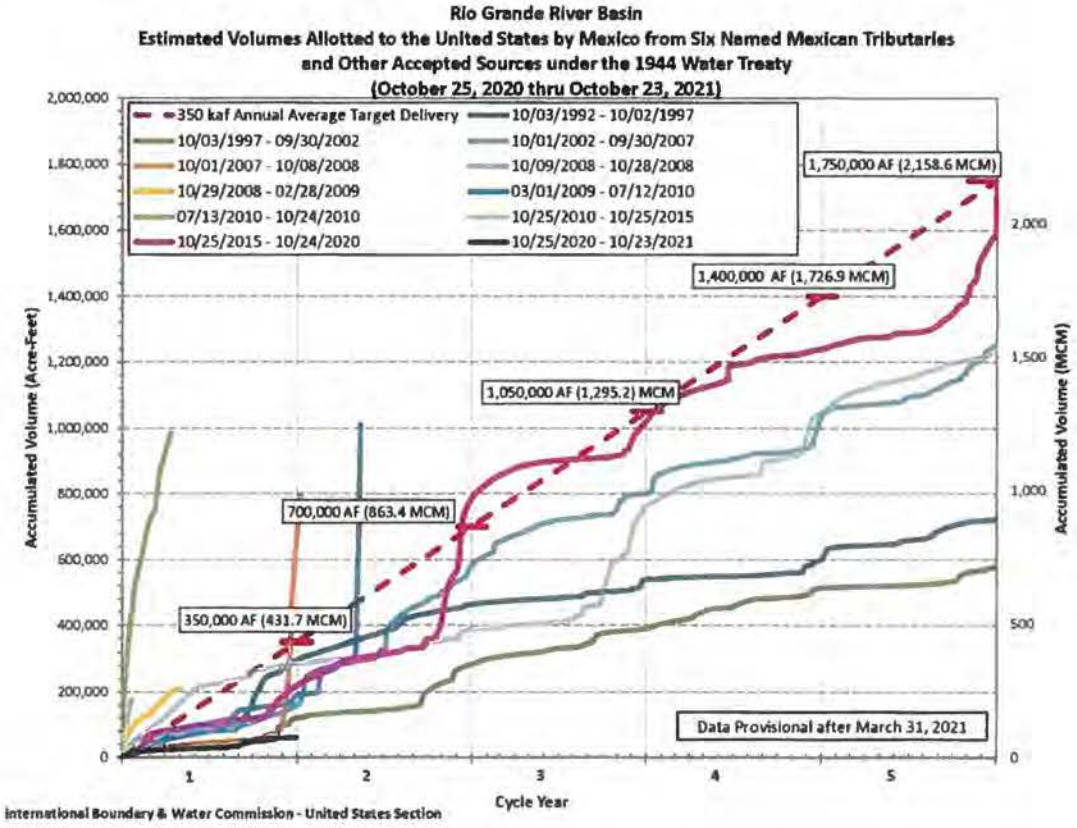


Figure 5: Five Year Repayment Cycle to the US by Mexico

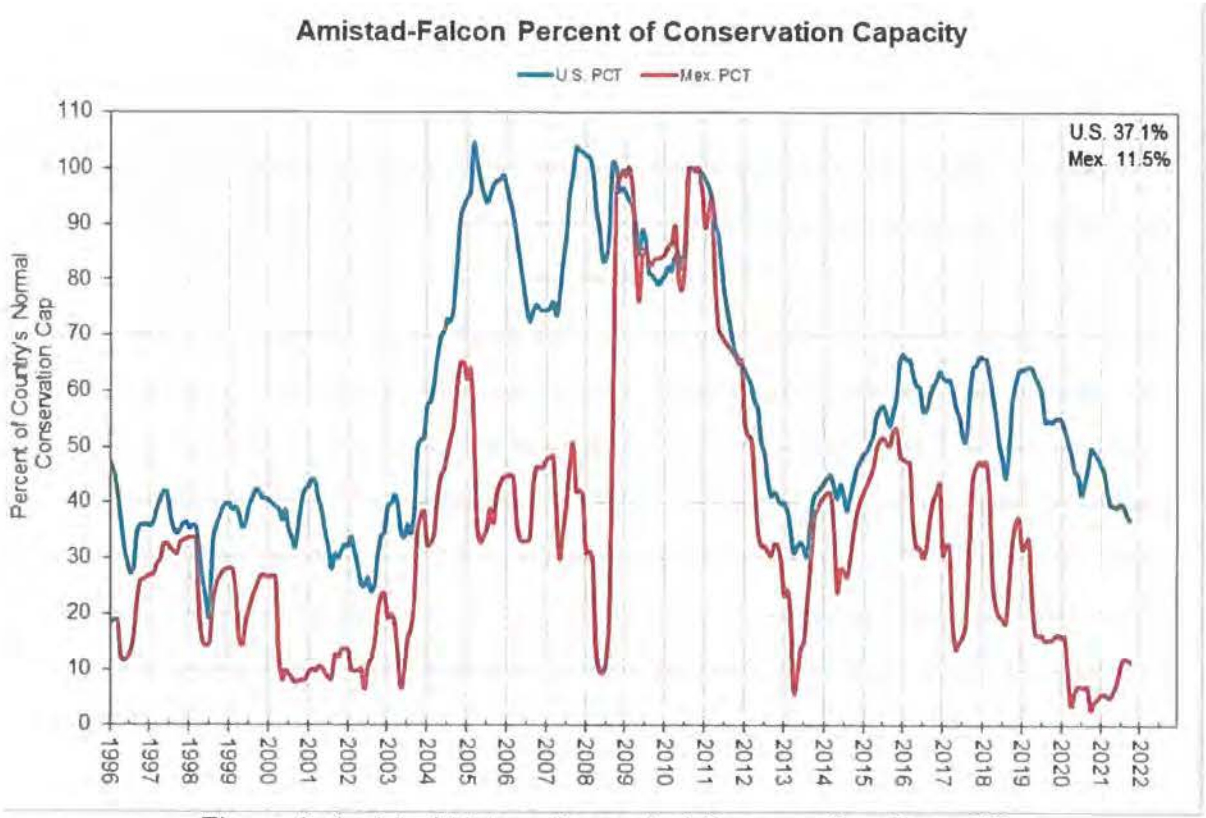


Figure 6: Amistad-Falcon Percent of Conservation Capacity

The District relies on visual inspection of water volumetric flow rates and canal levels which requires the use of fossil-fuel powered automobiles for traveling.

The proposed project will include two monitoring stations that will monitor both volumetric flow and/or level to the First Lift Pump Station and at the Second Lift Pump Station with remote data access via operators' smartphones. Currently, the flow and level data are inspected visually by field operators using vehicles to drive to these sites. By utilizing remote data collection, the District will reduce its energy consumption and vehicle emissions with respect to water management.

As previously described, conservation in the Lower Rio Grande Valley Watermaster System helps reduce competition for the over allocated supply. All 4,620 acre-feet of conserved water from this project are expected to remain in the system for allocation among users.

The Watermaster will allocate surplus water in the system among users. All 4,620 acre-feet of conserved water from this project are expected to be used in the region for the intended purposes.

C.1 - Combating the Climate Crisis
The proposed project will conserve water in the Lower Rio Grande Valley Watermaster System which already has a limited water supply. In this manner, the project will strengthen water supply sustainability and increase the regions resilience to future droughts caused by climate change.

The proposed project is also expected to lower the greenhouse gas emissions by a total of 11.06 Metric Tons per year (see Appendix G). This, as explained under Evaluation Criterion B, will be achieved by reducing the vehicle miles driven by District operators through the installation of solar powered canal monitoring stations at the District's First and Second Lift Pump Stations. By installing the two solar canal monitoring stations, the proposed project will establish and utilize a renewable energy source.

C.2 - Disadvantaged or Underserved Communities
The proposed project will benefit rural, disadvantaged communities by increasing the reliability and resiliency of water supplies to said communities. The City of Donna, served by the District, has a population of 16,797 as of 2020, 5,011 households, and 36.5% of its population in poverty [US Census Bureau QuickFacts, www.census.gov, Accessed Oct. 1st 2021]. The City has a median household income of $29,724, which amounts to only 46% of the statewide median household income ($64,034) for the State of Texas [DataUSA:Texas, www.datausa.io, Accessed Oct. 1st, 2021], meeting the definition of a disadvantaged community as per Section 1015 of the Cooperative Watershed Act. Executive Order 13985 defines an underserved community as "adversely affected by persistent poverty and inequality" having individuals who are denied equitable treatment such as those of Latino heritage and persons living in rural communities. The City is comprised of a 92.7% Latino or Hispanic population.

NAWSC, another PWS serviced by the District, is a rural water supply corporation. Over the years its service area has overlapped municipal boundaries, but its formation was based on the need for drinking water in rural areas. There is no census data available for NAWSC, however, its demographics mirror those of the City of Donna, 92% Latino and median income of 42.6% of the state wide median household income.

This project will benefit agricultural and municipal users in the District's system by making more usable water available to them through a reduction in seepage losses via the lining of the two proposed canals, as well as reducing the number of greenhouse gas emissions in the area through the installation of solar powered monitoring stations at the First and Second Lift Pump Stations.

C.3 - Tribal Benefits:
No tribal benefits are expected from this project.

C.4 - Other Benefits:
4b. The project will directly benefit agriculture and municipal users in the District's system by making more usable water available to them through a reduction in seepage. However, the Lower Rio Grande Valley Watermaster System also includes industrial and mining

water rights holders. Because all conserved water from this project is expected to remain in the system for allocation among all water right holders, the project will also indirectly benefit industrial and mining water rights holders.

4c. The "Lower Rio Grande Basin Study" was completed in December 2013 by the USBR in cooperation with the Rio Grande Regional Water Authority (RGRWA). The District is a member of the RGRWA. The Basin Study refers to the 2010 Region M Plan, "Rio Grande Regional Water Plan", dated October 1, 2010 to reiterate that Irrigation Conveyance System Conservation as one of the water management strategies that will result in the greatest amount of water for further use when compared to 15 other strategies.

The proposed project conserves Rio Grande water through irrigation conveyance conservation of seepage losses, making the conserved water available to other users in the Lower Rio Grande Valley Watermaster System.

4d. As previously discussed, the ongoing drought is a source of international dispute with Mexico, which shares the Rio Grande resources with irrigation districts and municipalities in the United States along the South Texas border. The proposed improvements will result in more water in storage for the US, reducing the pressure on Mexico to comply with the Treaty that essentially allows Mexico 5 years to release US share of flows from upstream reservoirs in Mexico. The Treaty also allows a 5 year extension, equating to a total of 10 years for Mexico to pay its water debt.

Evaluation Criterion D - Complementing On-Farm Irrigation Improvements

The proposed canal lining project will directly facilitate the implementation of on-farm improvements projects such as drip irrigation, because the canal levels will be capable of holding water without leaking or seepage losses. This will significantly increase the available head energy that will then be transferred directly to the irrigation fields. This available energy will help supply pumps needed for drip irrigation systems and allow for more efficient on-farm improvements.

Having the impermeable canal system allows more opportunity for NRCS funded drip irrigation systems. Without the threat of seepage losses, the District will be able to utilize the newly lined canals as storage reservoirs for producers to draw out of the canals during periods when the District pumps are not running. The proposed two lined canal will not seep, allowing a longer duration for these systems to run without operating the Second Lift pumps.

Technical assistance from the local NRCS is also available for those interested in implementing on-farm systems. Producers implementing on-farm systems will provide additional water savings to the District and are therefore encouraged by the District to partake in such projects. The proposed project will allow producers to take advantage of the more efficient on-farm systems.

A map of the District's water service area boundary is included in Figure 1.2.

Evaluation Criterion E - Planning and Implementation

Subcriterion E.1 – Project Planning

1) The District has a Water Conservation and Drought Contingency Plan in place. The State of Texas mandates that districts of this size implement such a plan and submit an updated plan every five years. In addition, they are to report annually on the success and progress of the plan. The proposed project meets an objective of the District's Water Conservation Plan which identifies the modernization of District infrastructure to "greatly reduce water losses" as stated under *Section V. Five-Year and Ten-Year Targets* of the plan.
2) Canal lining projects are part of the "2022 State Water Plan," that includes all the recommendations of the "2021 Rio Grande Regional Water Plan." Canal lining is listed as a Conservation Strategy in the Regional Plan and by inclusion, the State Plan. Appendix A includes excerpts from the Regional Plan and State Plan.
3) The proposed project conforms to the District's planning effort of water savings. The "Lower Rio Grande Basin Study" completed by the USBR identifies Irrigation Conveyance System Conservation and On-Farm and Irrigation Water System Conservation as two water management strategies to meet future water demands. This canal lining project is an Irrigation Conveyance System Conservation Project that will allow District producers to take advantage on-farm irrigation improvements.

Subcriterion E.2 – Readiness to Proceed

The proposed project is capable of proceeding upon entering into a financial assistance agreement with the BOR. Table 3 includes the Milestones and Schedule of Expenditures, as well as, a breakdown is provided for the BOR's share of the cost. The schedule assumes October 1, 2022 as the date for the agreement with the USBR and project completion within 2 years of the agreement date. The project construction can begin upon entering into a financial assistance agreement, and approval of the environmental compliance by the area office.

The District will prepare and adopt a Storm Water Pollution Prevention Plan (SWP3) for this project. Any requirements resulting from consultation with US Fish & Wildlife Services, Texas Parks and Wildlife Department, Texas Commission on Environmental Quality and the Texas Historical Commission will be incorporated into the SWP3. The SWP3 will address runoff from the site as well as requirements for trash management and dust and noise control.

The District's Engineer, Ferris, Flinn & Medina, LLC, performed a seepage study on the North Crossover Main Canal and the East Main Canal in support of the proposed project. In addition, as part of final report for this project, the District will continue to implement a Watermaster ledger to determine efficiency on an annual basis that will help track water efficiency.

There are no new policies or administrative actions required to implement the proposed project.

Table 3
Milestones and Schedule of Expenditures

		Expenditures	
Reporting Period	**Milestones**	**Total Cost**	**USBR Share**
October 1, 2022 to December 31, 2022	Enter Agreement with BOR. Environmental Review and Permitting (100% Complete).	$65,690.06	$32,845.03
January 1, 2023 to May 31, 2023	Design Surveying and Geotechnical Investigation (100% Complete). Engineering Design (100% Complete).	$387,181.00	$193,590.50
June 1, 2023 to December 31, 2023	Bid Canal Lining Project & Award of Contract to Successful Bidder. Construction of Canal Lining Improvements (50% Complete).	$1,742,314.47	$871,157.24
January 1, 2023 to July 31, 2024	Construction of Canal Lining Improvements (100% Complete). Post lining seepage test performed.	$1,742,314.47	$871,157.24
August 1, 2024 to September 30, 2024	Final Report to BOR.	$12,500.00	$6,250.00
	Project Total	**$3,950,000.00**	**$1,975,000.00**

Evaluation Criterion F - Collaboration

All conservation projects in the area help reduce competition for the over allocated supply. Therefore, it is in the best interest of all other users in the system to pursue water conservation projects.

Letters of project support are provided in Appendix F. The North Alamo Water Supply Corporation and the City of Donna, both benefactors of the proposed project, have provided letters of support.

Evaluation Criterion G - Additional Non-Federal Funding

The Non-Federal Funding proposed for this project is as follows:

Non Federal Funding	=	$1,975,000.00	=	50%
Total Project Cost		$3,950,000.00		

Evaluation Criterion H - Nexus to Reclamation Project Activities

The USBR is heavily invested in the Rio Grande Watermaster System through financial assistance of many conservation projects over the past 40 years. The "Lower Rio Grande Basin Study" was completed in December 2013 by the USBR, in cooperation with the Rio Grande Regional Water Authority (RGRWA). The District is a member of the RGRWA. The Basin Study refers to the 2010 Region M Plan, "Rio Grande Regional Water Plan", dated October 1, 2010 to reiterate that Irrigation Conveyance System Conservation as one of the water management strategies that will result in the greatest amount of water for future use when compared to 15 other strategies. This canal lining project is an Irrigation Conveyance System Conservation Project.

The Basin Study ultimately chose one water management strategy out of the 15 identified that did not use the Rio Grande as a source and was cost effective; desalination of brackish groundwater (DBG). The District's project conserves Rio Grande water through irrigation conveyance conservation, making conserved water available to others.

The District's project is connected to reclamation activities. Reclamation has been essential to the recent conservation efforts in the lower Rio Grande Basin. This project builds upon that success. Conservation in Donna Irrigation District eventually benefits other users in the system, as conserved water is allocated to others.

The proposed project is not expected to benefit any tribes.

(5) Performance Measures

Upon completion of the geosynthetic composite canal liner and shotcrete, the District will measure seepage out of the canal using the same procedure outlined in Evaluation Criterion A. The testing will provide the actual post lining efficiency.

The District will also commit to continue the annual audit and build upon the years of 2016-2020. Once the project is implemented, the results will show up in a reduction in system losses and river losses. The proposed project will increase the District's efficiency by 6.2%. The District is required to report its overall efficiency, annually, to the Texas Water Development Board and that information is available to the public. The updated Table 1 will be included in the Final Report to the USBR.

In this manner, the performance of the new lining system will be measured and the results will be provided as part of the Final Report to the USBR.

In this manner, the performance of the new lining system will be measured and the results will be provided as part of the Final Report to the USBR.

Project Budget:

(1) Funding Plan and Letters of Commitment

The District will convert 5,148.978 acre-feet of irrigation rights to 2,574.489 acre-feet of municipal use and sell them to NAWSC for $4,611,965.14. The entities have agreed to defer the conversion and sale of 1,826.08 acre-feet until such time that the NAWSC needs the water. This agreement will result in the proceeds of $2,791,300.35 early next year, in time to fund the project. The non-federal share of the budget will be funded by the proceeds from the sale of water rights to NAWSC. As previously mentioned, the first portion of that sale will close early next year and the District can provide its account balances to the USBR at that time. There are no third party sources of funds. There are no pre-award costs proposed for this project.

(2) Budget Proposal

The total project cost is $3,950,000. Table 4 below outlines the total cost and the portion to be paid by the applicant, $1,975,000, which represents 50% of the total budget after considering the $1,975,000 grant from the USBR. There are no third party contributors.

Table 4 provides the funding sources from non-federal entities. It should be clarified that the sale of water rights to NAWSC will occur and the funds will be utilized, as mandated by State regulations, for capital improvement projects. NAWSC has no approval authority regarding the use of the proceeds.

Table 4
Total Project Cost

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal funding	$1,975,000.00
Costs to be paid by the applicant	$1,975,000.00
Value of third-party contributions	$0.00
TOTAL PROJECT COST	**$3,950,000.00**

The Budget Proposal is outlined in Table 5 and described in the Budget Narrative. More information on the development of the budget and documentation is provided in Appendix D.

Table 5
Proposed Budget

BUDGET ITEM DESCRIPTION	COMPUTATION $/Unit	COMPUTATION Quantity	Units	TOTAL COST
SALARIES/WAGES				$0.00
FRINGE BENEFITS				$0.00
TRAVEL				$0.00
EQUIPMENT				$0.00
CONTRACTUAL CONSTRUCTION				
Lining of East Main Canal				
Shotcrete	$7.25	219,645	SF	$1,592,426.25
Geosynthetic Composite Canal Liner	$1.00	219,645	SF	$219,645.00
Lateral Canal Gate	$9,750.00	13	Each	$126,750.00
Main Canal Gate	$12,000.00	3	Each	$36,000.00
Subtotal Lining of East Main Canal		*$1,974,821.25*		
Lining of North Crossover Main Canal				
Shotcrete	$7.25	160,800	SF	$1,165,800.00
Geosynthetic Composite Canal Liner	$1.00	160,800	SF	$160,800.00
Lateral Canal Gate	$9,750.00	2	Each	$19,500.00
Main Canal Gate	$12,000.00	2	Each	$24,000.00
Subtotal Lining of North Crossover Main Canal		*$1,370,100.00*		
Solar Powered Monitoring Stations				
Remote Metering and Level Locations	$10,935.00	2	Each	$21,870.00
Subtotal Solar Powered Metering Station		*$21,870.00*		
Subtotal Contractual Construction				**$3,366,791.25**
CONTRACTUAL PROFESSIONAL SERVICES				
The following services are based on the sum of the construction costs listed above that total			$3,366,791.25	
Engineering	@	6.00%		$202,007.48
Surveying	@	3.50%		$117,837.69
Inspection	@	3.50%		$117,837.69
Geotechnical	@	2.00%		$67,335.83
			Subtotal	**$505,018.69**
OTHER				
Environmental and Cultural Compliance Costs based on 2% of Contractual Construction	@	2.02%		$67,971.36
TOTAL DIRECT COSTS				**$3,939,781.30**
INDIRECT COSTS				
Based on 10% of not more than $25,0000 for Five Contracts	10.00%	of	$102,187.00	**$10,218.70**
TOTAL ESTIMATED PROJECT COSTS				**$3,950,000.00**

(3) Budget Narrative

This Narrative describes the general methodology used to develop the budget. A detailed budget methodology, the source of the prices and the calculations are included in Appendix D.

The average cost per square feet to shotcrete each canal was developed by analyzing the Bid Tabulation prepared for Hidalgo Irrigation District No.2 for Lateral E Canal. The Bid Tabulation for the Lateral E Canal project is included in Appendix D. The average of the receive bids for the Lateral E Canal was used to obtain a cost per square foot figure of $6.30. A Construction Analytics Inflation Factor of 1.15 was then applied to obtain the final cost per square foot figure of $7.25. These cost analysis calculations are available in Appendix D. The shotcrete cost of $7.25 per square foot is then applied to the total areas for each of the two proposed canal lining projects.

The cost calculation of the Geosynthetic Composite Canal Liner is also included in Appendix D. This estimate was developed from a recent quote provided by Huesker Inc. in support of this grant application. The Quote is included in Appendix D. From the quote, a cost per square foot figure of $0.85 was obtained. A Construction Analytics Inflation Factor of 1.06 was then applied to obtain a cost per square foot figure of $0.90. This cost was rounded up to the nearest dollar to obtain the final figure of $1.00 per square foot presented in the budget.

The first component of the project is the Lining of the East Main Canal. The East Main Canal includes a section that is 8,485 feet long with a canal perimeter of 17 feet and a section that is 3,770 feet long with a canal perimeter of 20 feet. This represents a total lining area of 219,645 square feet. The above cited shotcrete figure of $7.25 per square foot is applied to the total lining area of the East Main Canal. This represents a total of $1,592,426.25 for the shotcrete component. Then, the $1.00 per square foot cost of the Geosynthetic Composite Canal Liner is applied to the total lining area of the East Main Canal. This represents a total of $219,645.00 for the Geosynthetic Composite Canal Liner. The East Main Canal also includes the installation of 13 Lateral Canal Gates and 3 Main Canal Gates each with a cost of $9,750 and $12,000 respectively. The quote for these gates is available in Appendix D. Since the quote is for materials only, the estimate includes a 1.5 installation factor to the quote provided. Subtotal for the lining of the East Main Canal is $1,974,821.25.

The second component of the project is the Lining of the North Crossover Main Canal. The North Crossover Main Canal proposed section is 10,050 feet long with a canal perimeter of 16 feet. This represents a total lining area of 160,800 square feet. The above cited shotcrete figure of $7.25 per square foot is applied to the total lining area of the North Crossover Main Canal. This represents a total of $1,165,800.00 for the shotcrete component. Then, the $1.00 per square foot cost of the Geosynthetic Composite Canal Liner is applied to the total lining area of the North Crossover Main Canal. This represents a total of $160,800.00 for the Geosynthetic Composite Canal Liner. The North Crossover Main Canal also includes the installation of 2 Lateral Canal Gates and 2 Main Canal Gates each with a cost of $9,750 and $12,000 respectively. The

quote for these gates is available in Appendix D. Since the quote is for materials only, the estimate includes a 1.5 installation factor to the quote provided. Subtotal for the lining of the North Crossover Main Canal is $1,370,100.00.

The third component of the project is the installation of 2 Solar Powered Monitoring Stations. A station will be installed at the District's First and Second Lift Pump Stations. Each of the proposed stations costs a total of $10,935.00 to install. This cost is based on an open channel flow meter installed in Cameron County Irrigation District No.6, quoted by United Water Services in September of 2020. The unit includes solar power equipment and cellular communication card. The United Water Services quotation that includes installation is included in Appendix D. A Construction Analytics Inflation Factor of 1.1 is applied to the September 2020 quote. Subtotal for the 2 Solar Powered Monitoring Stations is $21,870.00.

The Subtotal for the Contractual Construction of the three project components is $3,366,791.25.

The Budget Proposal also includes Contractual Professional Services for Engineering and Surveying. The cost for each is based on a percentage of the Subtotal for the Contractual Construction cost of $3,366,791.25.

Engineering Contractual Services includes Ferris, Flinn & Medina, LLC (FFM), which serves as the District Engineer. Engineering involves utilizing the boundary and topographic survey to develop a set of construction plans and specifications to bid and construct the project(s) by outside contractors. The District will not be performing any work, aside from participating in the administration of contracts, reporting and payments. The engineering also includes contract administration during construction. This cost is based on 6% of Subtotal Contractual Construction cost of $3,366,791.25. Six percent of materials and construction is a standard lump sum fee/budget for a project of this magnitude. The engineering cost is $202,007.48.

Surveying Contractual Services will include FFM performing a topographic and boundary survey, as well as construction staking. Inspection services during construction will be necessary to ensure that the general contractors perform in accordance with the plans and contract documents. Rebar inspection, prior to casting concrete, is also necessary. Surveying and Inspection services are crucial to project success and a budget of 3.5% of Subtotal Contractual Construction Cost for each of these services is reasonable. The cost of Surveying and Inspection is $117,837.69 for each service.

Geotechnical includes subsurface investigations along the project to properly design the canal lining section and provide information to prospective bidders regarding the ground condition during the bidding of the project. The geotechnical includes materials testing of shotcrete as well as any density tests that may be required. A standard budget of 2% of Subtotal Contractual Construction Cost for this service is reasonable. The cost of Geotechnical is $67,335.83.

Environmental and Cultural Compliance costs of $67,971.36, are budgeted for this project. This includes the portion that the USBR will retain for its portion of the work. There are no environmental concerns regarding this project. A review with the Texas Historical Commission will occur. An archeological report on the history of the canal system is expected. The canal liner will not alter the shape of the existing canal. Ferris, Flinn & Medina, LLC, has worked with Southern Archaeology Consultants, from Indian Lake, Texas (near Los Fresnos) to assist with these matters. The budget of 2.02% of Subtotal Contractual Construction Cost is an accurate estimate of the combined resources of the USBR and the consultants to accomplish these tasks.

The District proposed to charge indirect costs at a de minimus rate of 10% of the modified total direct costs. There are five contracts associated with this project as follows: Canal Shotcrete Lining, Geosynthetic Composite Canal Liner, Solar Powered Monitoring Stations, engineering and surveying, and geotechnical. Each will be over $25,000 with the exception of the Solar Powered Monitoring Stations; therefore, the indirect cost of 10% of each contract, up to the first $25,000, amounts to $10,218.70.

The total project budget is $3,950,000.00.

Environmental and Cultural Resources Compliance:

There are no environmental concerns for this project and Environmental Compliance should proceed quickly for this project.

- The project will not impact the surrounding environment. There are no earth disturbing or brush clearing activities involved. All of the work will occur on District right of way or canal banks that are maintained by the District.
- No species listed or proposed to be listed, or critical habitat will be affected by the project.
- There are no wetlands or other surface waters within the project boundaries.
- The water delivery system was constructed between 1902 and 1960. The canals are over fifty years old, which means communication with the State Historic Preservation Office about the project will occur. SHPO will be informed of the canal's current condition and need for improvement. They will also be made aware that no significant changes to the canal are planned. Information will be provided to SHPO as needed.
- The project will result in the modification of existing canal gates, which will be replaced with modern canal gates to prevent leaking. The exact construction date of which cannot be determined, nor can their dates of modification.
- Some facilities in the District were constructed as early as 1902. Many facilities in the District are eligible for listing on the National Register of Historic Places. Communication with the State Historic Preservation Office about the project will occur prior to commencing any construction activities.
- There are known archaeological sites in the project area. Communication with the State Historic Preservation Office about the project will occur prior to commencing any construction activities.

- The proposed project will not have an adverse effect on low income and minority population. On the contrary, the project will improve the reliability of the water supply for the City of Donna and NAWSC; both with majority low income and minority populations.
- The project will not impact tribal lands.
- The project will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native species known to occur in the area.

It is anticipated that only an archeological report on the history of the canal system will be requested for this project. The coordination with the Texas Historical Commission by an archaeological consultant will occur at the beginning of the project and is built into the schedule.

Required Permits or Approval:

The District owns the land required for the project; therefore, no permits or approvals are required, aside from a Texas Antiquities Permit.

Communication with the State Historic Preservation Office will occur during the procurement phase of the project; the first 90 days. There are no anticipated delays to the project schedule. Additionally, the District will develop a Storm Water Pollution Prevention Plan to comply with the TCEQ – Storm Water General Permit for a construction activity.

Letters of Project Support:

Letters of project support are provided in Appendix F. The North Alamo Water Supply Corporation and the City of Donna, both benefactors of the proposed project, have provided letters of support.

Official Resolution:

The District considered the Official Resolution at their regular meeting of October 29, 2021. The Official Resolution is included as Appendix C.

Appendix A
Excerpts from "Lower Rio Grande Basin Study," "2022 State Water Plan," and "2021 Rio Grande Regional Water Plan"

Lower Rio Grande Basin Study

Under the Authority of the SECURE Water Act (Public Law 111-11)
Great Plains Region, Oklahoma-Texas Area Office

U.S.Department of the Interior
Bureau of Reclamation
Denver, Colorado
Donna Irrigation District

Rio Grande Regional Water Authority

WaterSMART: WEEG FY 2022
Funding Group II
31 of 92

December 2013
11/02/2021

III. Water Management Strategies from the Region M Plan

The relationship is strong between the Region M Plan[33] and this Basin Study. The Regional Plan is the product of stakeholder vetted information compiled by subject matter experts. In addition, all previous chapters of this Basin Study have been vetted as technical memoranda through the Region M Planning Team at their public meetings. The 2010 Region M Plan, as endorsed by the State of Texas and incorporated into the State Water Plan, recommends a portfolio of WMSs to ameliorate supply imbalances in the study area (figure 3-3). Because the WMSs were formulated to address the future supply imbalances that are incorporated into this Basin Study, and have been previously subjected to rigorous analysis based on local capabilities, they represent an excellent starting point for meeting the third requirement of this Basin Study: development of appropriate adaptation and mitigation strategies to meet future water demands.

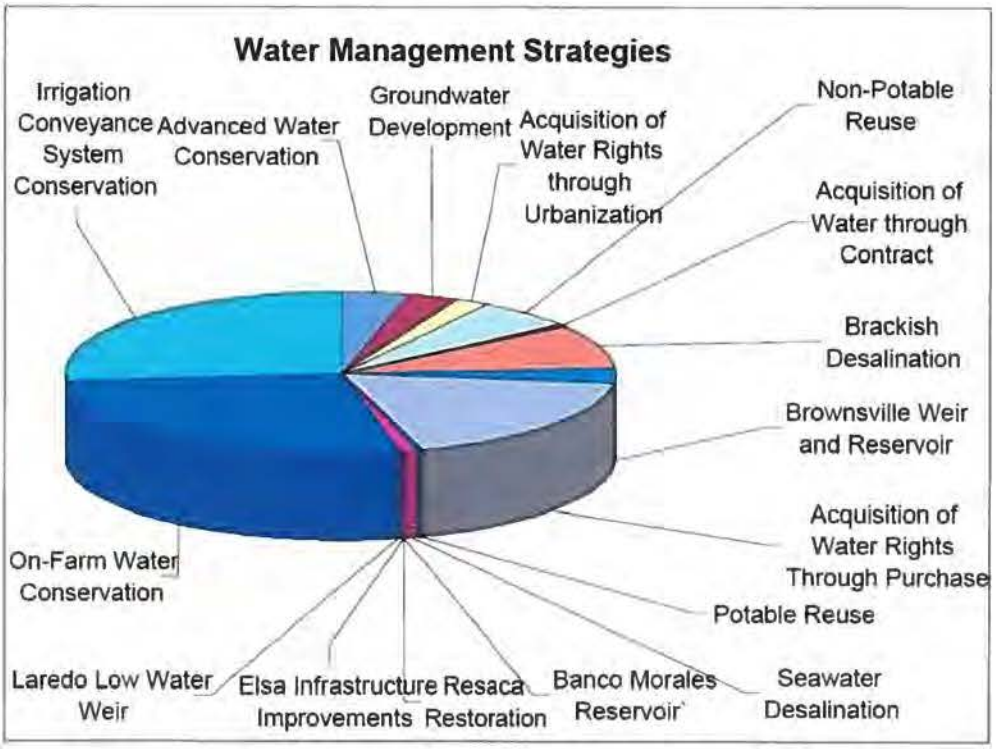


Figure 3-3: Region M Plan-recommended WMS potential supply contribution.

[33] The Texas State and Regional Planning Process is described in chapter 1, section A, subsection 1: "Local Planning Process."

These WMSs represent conservation efforts and capital projects addressing reuse, groundwater sources, and optimization of the surface water distribution system. The amount of water to be supplied by these WMSs, as estimated by the Region M Planning Group, was based on the shortfalls expected by each WUG associated with the WMS. These projected supplies are not incorporated into the WAM and had no influence on the projected future water rights reliabilities.

The study is limited by scope and budget to investigate those strategies that specifically address the potential for climate change, which has been indicated by the study. Using the planning objective described in this technical memorandum, a selection of WMSs that meet those specific constraints have been investigated further in the study. One of the key constraints is that the selected WMS must reduce dependency on the Rio Grande. The growing need to develop alternative water sources within control of the study partners was expressed by RGRWA and confirmed by the study analysis.

Nevertheless, the most robust solution to the expected shortages in the study area will also include the continued development of the range of strategies recommended by Region M, many of which would increase the efficiency of the use of Rio Grande supplies. Together, the study may enable development of water sources independent of the Rio Grande, and the development of the other WMSs in the State Plan may provide more efficient use of Rio Grande supplies.

A. Evaluation Criteria

The WMSs that best meet the planning objective of the study are evaluated in the discussion below. Each major component of the planning objective has been matched to a major criterion of the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&Gs) (U.S. Water Resources Council, 1983), which govern the planning of all Federal water projects. Although the WMSs are not Federal projects, the policies established by these P&Gs are appropriate for use in this Basin Study. These criteria are:

- **Effectiveness:** The extent to which an alternative reliably meets the planning objective by alleviating a specified problem and achieving goals.
- **Acceptability:** The workability and viability of an alternative with respect to how compatible it is with authorities, regulations, policies, and environmental law.
- **Completeness:** The extent to which an alternative accounts for all necessary investments or other actions to ensure realization of goals.

- **Efficiency:** The extent to which an alternative is cost effective. We will introduce this criterion after the initial screening undertaken in this planning objective rationale and then determine how well the alternatives that meet the planning objective also meet the efficiency criterion.

The demonstrated future water supply imbalance that needs to be addressed, and the planning constraints that are specific to the study area, are addressed by the evaluation criterion in the following manner:

1. Effectiveness

Effectiveness measures the extent to which an alternative reliably meets the planning objective by alleviating a specified problem and achieving goals. Specifically, effectiveness was measured in terms of improving reliability by reducing dependency on the Rio Grande River. In addition, the temporal (year round) and locational (Cameron, Willacy, and Hidalgo Counties) aspects described above were considered.

2. Acceptability

Acceptability measures the workability and viability of an alternative with respect to how compatible it is with authorities, regulations, policies, and environmental law. Specifically, acceptability was measured in terms of protecting existing water rights and in meeting the planning objective to preserve downstream flow.

3. Completeness

Completeness measures the extent to which an alternative accounts for all necessary investments or other actions to ensure realization of goals. Completeness was measured in terms of implementation potential within the reasonable control of study sponsors.

B. Water Management Strategies

1. Role of Conservation

The State Water Plan contains two conservation-based WMSs for the study area: advanced water conservation and on-farm and irrigation water system conservation.

a. Advanced Water Conservation

Advanced water conservation methods were analyzed and evaluated by Region M based on the best management strategies developed by the Texas Water

b. *On-farm and Irrigation System Water Conservation*

On-farm water conservation offers a large potential to reduce the volume of water used for irrigation in agriculture. Technologies and methods currently available for on-farm water conservation include conversion to plastic pipe, low energy precision application, irrigation scheduling using an evapotranspiration network, drip irrigation, metering, unit pricing of water, use of water efficient crops, and other options.

The Irrigation Technology Center (ITC) of Texas A&M University was responsible for providing data for this WMS. The data were gathered by investigating both the effects of on-farm conservation in this region and the extent to which irrigation demands could be reduced through adoption of on-farm water conservation measures. These measures included farm-level water measurement and metering, replacement of field ditches canals with poly pipe, and adoption of improved water management practices and irrigation technologies. It should be noted that the investigation conducted by Texas A&M University provides documentation that 54% of agricultural water delivered within the region is measured or metered on a farm-level. Also, 36% of the agricultural water applied in the region is through poly or gated pipe, and 30% is applied using advanced water management practices and/or improved irrigation technology.

Water saving estimates were prepared for two scenarios: on-farm water savings without improvements to irrigation conveyance and distribution facilities and on-farm savings with such improvements. The amount of water that reaches the field turnout is partially dependent upon conveyance efficiency, which also influences the type of on-farm water conservation measures that can be applied.

According to the Texas Project for AgWater Efficiency,[36] as much as 80% of all agricultural conservation in the Lower Rio Grande area occurs within irrigation district conveyances. For example, insufficient "head" at the delivery point, also related to previous "push water" discussions in this Basin Study, can make it difficult to deliver irrigation water evenly over the span of a field no matter what irrigation methods or technologies are used. Approximately 50% of the area experiences insufficient head. Similarly, certain irrigation technologies, such as drip and microirrigation, require near continuous delivery of relatively small amounts of water. Most existing irrigation conveyance and distribution systems were designed to deliver large volumes of water over relatively short time periods.

Diminishing agricultural land use in the study area by 2060 could result in much smaller potential savings than projected by the Region M Plan. The region's annual demand for irrigation water is projected to decrease from 1,163,633 ac-ft/yr in 2010 to 981,749 ac-ft/yr in 2030 and then are projected to remain flat through 2060 (see table 3-1). This lower demand estimate arises

[36] http://texasawe.org/

2021 RIO GRANDE REGIONAL WATER PLAN

Prepared by: Rio Grande Regional Water Planning Group
With administration by: Lower Rio Grande Valley Development Council

NOVEMBER 5, 2020

RIO GRANDE REGIONAL WATER PLANNING GROUP

BLACK & VEATCH
Building a world of difference.

ES.4.1.1 Irrigation District Conservation

IDs carry over 85 percent of the water that is used from the Rio Grande system in Region M. These districts were initially built to deliver water for agricultural use, but many districts now serve municipal and industrial users as well. Most of these systems have similar components, with initial pump stations to divert water from the river, some storage in either off-channel reservoirs or in the main canals, and canal or pipeline networks that deliver water to municipal utilities for treatment and distribution or to farmlands. Black & Veatch worked with Texas A&M AgriLife Research to develop expected water conservation and costs for conservation WMSs for all 27 IDs in Region M.

Stakeholder meetings were held with IDs to discuss potential WMSs, estimated costs, water savings, and implementation feasibility. This effort included a review and analysis of the water conservation strategies submitted by IDs and development of WMSs for the IDs that did not submit specific projects.

It is intended that these IDs could implement any water conservation or storage improvements, including, but not limited to, metering, control automation, gates, canal lining, repair of canal lining, pipeline installation, district interconnects, new reservoirs, reservoir improvements, or any other strategy that provides beneficial, measurable conservation improvements to the ID.

ES.4.1.2 Municipal Infrastructure Improvements

Operational, treatment, and distribution projects that allow a WUG to either access a new supply, eliminate known losses, or develop new supplies are included as municipal infrastructure improvements. Municipal infrastructure improvements focus on problem-specific WMSs that relate to treatment, storage, or distribution and transmission. Insufficient treatment capacity or capability can be a supply limitation, inadequate storage can disrupt operations, and transmission and distribution projects may be required for entities that are experiencing significant water losses due to eroded pipelines, or leaking water tanks. Because these projects are particular to the municipal utility systems, they were evaluated individually from the available information.

ES.4.2 Wastewater Reuse

With increasing pressure statewide on water resources, Texas water users are considering and pursuing reuse or recycling of wastewater. Wastewater can be treated and reused for either potable or non-potable uses and can include a step that returns water to the environment for a period of time (indirect) or not (direct). All approaches to reuse have been evaluated, and the most appropriate alternatives recommended.

ES.4.2.1 Non-Potable Reuse

Wastewater reuse is most commonly used for agriculture, landscape, public parks, and golf course irrigation; industrial uses; dust control; and construction activities. This WMS is feasible if several factors are taken into consideration: (1) the location of wastewater treatment facilities relative to the location of potential users of reclaimed water, (2) the level of treatment and quality of the reclaimed water, (3) the water quality requirements of particular users, and (4) the public acceptance of reuse.

In addition, implementation of recommended WMSs can be expected to result in construction and associated expenditures in local areas where such projects are constructed, but neither the economic benefits of such expenditures, nor the subsequent economic development that might result from such expenditures, are estimated in this plan.

The following subsections provide evaluations for each potentially feasible WMS in the 2021 RWP.

5.2.1 Water Infrastructure and Distribution Systems

Infrastructure and distribution systems increase supplies through reducing losses and removing infrastructure bottlenecks that have limited the amount of water that can be supplies (water treatment plant [WTP] capacity, system storage, etc.).

5.2.1.1 Irrigation District Improvements

IDs carry over 85 percent of the water that is used from the Rio Grande system in Region M. These districts deliver water for all categories of water user. Most IDs have similar components: initial pump stations to divert water from the river, some storage in either off-channel reservoirs or in the main canals, and canal and/or pipeline networks that deliver water to farmland and municipal utilities for treatment and distribution. Most systems measure the water supplied to farmers using a flow rate estimate from delivery pipe rather than metering, which makes accurate volumetric pricing difficult.

The ID systems require significant regular maintenance to mitigate losses and can benefit from more proactive improvements like gate and meter automation. Districts may experience losses in the range of 10 to 40 percent of the water that they divert. ID improvements include conservation measures, which directly reduce measurable losses, and operational improvements like automated gates and increased off-channel storage. According to TWDB rules, ID conservation yield is estimated for a drought year. ID improvements represent a group of low-cost WMS for Region M that decrease losses and improve service.

Many of the IDs submitted projects to the RWPG. A survey to collect information on new projects and completed projects was sent to the IDs in February of 2018. From this survey, 10 WMSs were submitted, and 43 were maintained from the previous planning cycle by a total of 18 IDs, representing a consistent approach to improving operations and reducing losses. Stakeholder meetings were held with representatives from the ID to discuss strategies, estimated costs, water savings, and implementation feasibility. The ID conservation WMSs that were submitted were used to form the basis of a general ID conservation WMS for those IDs that did not submit any specific project information.

ID conservation strategies include the following:

- Canal lining (new linings and replacement of damaged linings);
- Installation or replacement of pipeline;
- General repairs and improvements, including new metering installation;
- Metering and controls, including installation of automated system controls, meters and supervisory control and data acquisition (SCADA) systems where implementation leads to measurable efficiency gains;

- Interconnects between IDs where IDs are capable of serving new WUG or measurable efficiency gains are achieved; and
- New reservoirs and reservoir improvements or expansions, including dredging, are included as WMS improvements that are not classified as "conservation." Where drought year water losses from insufficient or malfunctioning storage are measurably reduced, these projects have been included with an associated firm yield.

All of the submitted WMS were assumed to apply to the first decade of planning, 2020, unless noted otherwise. The total annual estimated potential water savings in 2020 for all of the WMSs submitted was approximately 76,000 acre-feet (acft). The amount of water that can be conserved per ID was calculated based on estimates of current conveyance efficiency and a maximum efficiency of 90 percent.[1]

Table 5.2-2 shows the estimated cost per acre-foot of water conserved or stored by WMS Category. ID improvements decrease costs associated with operations and maintenance (O&M) of facilities, so O&M costs are shown as $0.

Table 5.2-2 Estimated Cost per Acre-Foot of Water Conserved by Water Management Strategy

	CANAL LINING	PIPELINE INSTALLATION	GENERAL REPAIRS AND IMPROVEMENTS
O&M Cost/acft	$0	$0	$0
Capita Cost/acft	$6,840	$4,323	$7,570

It is intended that these IDs should implement any water conservation strategies, including, but not limited to, the following: metering, control automation, gates, canal lining, repair of canal lining, pipeline installation, district interconnects, new reservoirs, reservoir improvements, or any other strategy that provides provide beneficial, measurable conservation improvements to the ID.

Metering and Controls

In accordance with TCEQ Watermaster rules, IDs in Region M meter water from the Rio Grande as it is pumped out of the river but do not typically meter water provided to irrigators or for domestic water use for lawn watering and livestock. Canal riders, employees of the district, drive along the canals to verify that only users who requested water are withdrawing from the canals and estimate the amount of water delivered. In many cases the canal riders are also responsible for manually opening and closing headgates and turning pumps on and off.

In most districts agricultural water deliveries are measured in "irrigations," which are considered to be between 4 to 8 inches of water over each irrigated acre, depending on the district, and are monitored by canal riders on the basis of the estimated flow rate and time that a headgate is open and/or measured water depths at some point in the field. There are significant losses associated with manual operations of district conveyance systems and the inaccuracies associated with visual observations of how much

[1] For comparison, the public water supply systems in Region M average approximately 86 percent efficiency, with about 14 percent losses caused by leaks and breakage in their systems.

2022
State Water Plan

WATER FOR TEXAS

Texas Water Development Board

Table 8-3. Planning group determined thresholds for water loss audit and leak repair strategies and targets for voluntary action

Region	Threshold for water management strategy[a]	Target for voluntary action
A	Cities: ≥15% total loss WSCs: ≥25% total loss	na
C	Urban/suburban systems: >12% total loss Rural systems: >18% total loss	na
D	na	>15% loss
E	>10% loss	>200 gpcd
F	Cities: ≥15% total loss WSCs: ≥25% total loss	na
H	>10% real loss	na
I	Less than 32 connections per mile: >18% total loss More than 32 connections per mile: >12% total loss	na
J	>10% loss	>200 gpcd
N	>15% real loss (pipeline replacement) >5% apparent loss (meter replacement)	na

[a] *Whereas the thresholds used to develop water management strategies by the planning groups include the use of GPCD as well as the use of water loss expressed as a percentage, the water industry does not recognize percentage as a metric or performance indicator for water loss, and the TWDB does not use percentage of water loss in its review and analysis of water loss audits. Type of water loss is specified where known.*

> = greater than
≥ = greater than or equal to
% = percent
gpcd = gallons per capita per day
na = not applicable
WSC = water supply corporation

8.4.2 Agricultural conservation

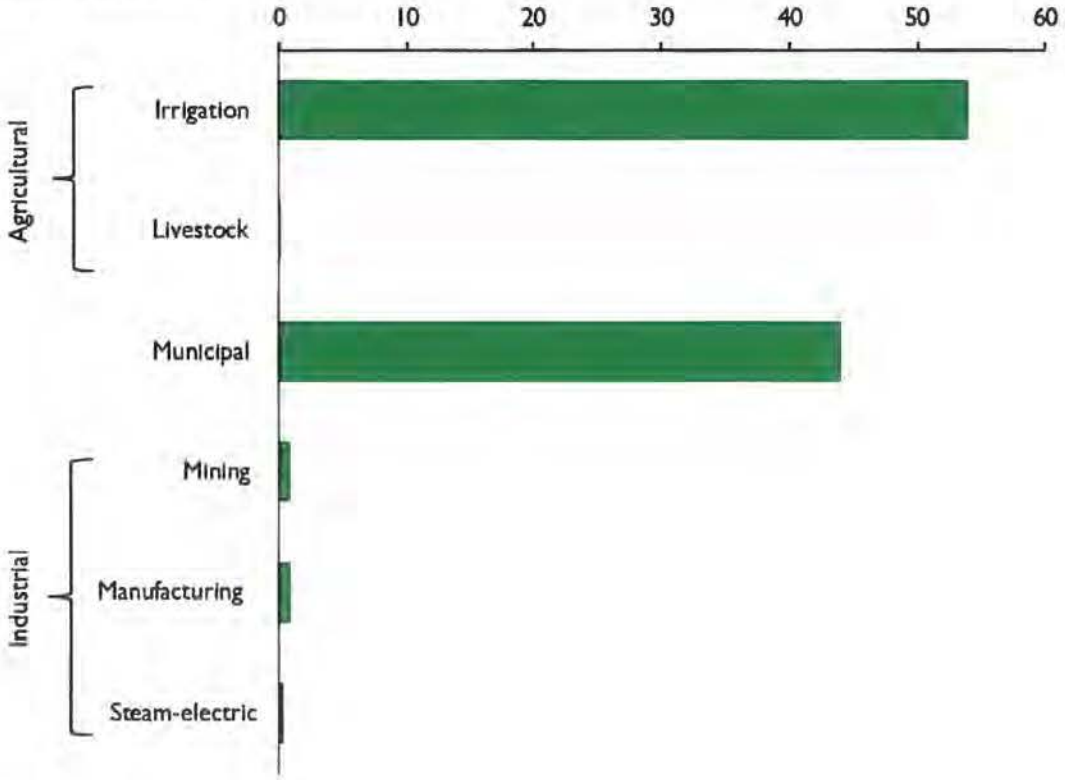
Irrigation for agricultural production is the largest water demand sector in the state for most of the planning horizon and is projected to account for 40 percent of annual statewide water use in 2070. Identified water supply needs for this sector account for 44 percent of total statewide needs in 2070.

Irrigation conservation strategies include changes to irrigation methods, equipment, and crops. For example, conversion to Low Energy Precision Application systems and irrigation scheduling, as well as other activities associated with irrigation best management practices, can help producers reduce their water use. Like municipal conservation, irrigation conservation strategies tend to be an aggregate of multiple best management practices, any one of or several of which could be implemented to achieve the estimated water savings of the strategy. About 536,000 acre-feet per year in irrigation conservation strategies is recommended in 2020, and 1.2 million acre-feet per year is recommended in 2070 (Table 8-2).

Implementing all recommended irrigation conservation strategies will cost approximately $1.1 billion, or slightly more than 1 percent of the total capital costs of all recommended water management strategy projects in the plan. Conservation is the primary strategy recommended to address identified irrigation needs in most regions and has an estimated statewide average implementation cost of about $181 per acre-foot in 2070. Irrigation conservation is consistently the largest statewide relative share of recommended conservation and remains so in 2070, even as volumes of municipal needs addressed by conservation increase across the planning horizon (Figure 8-1).

In addition to irrigation water use for agricultural production, livestock water use is another water need identified within the state. However, compared to irrigation water use, livestock accounts for a less significant amount of water use throughout the state. Conservation strategies are also recommended for a small number of livestock water users in Region J, roughly less than 500 acre-feet per year in 2020 and 2070.

Figure 8-1. Share of statewide recommended conservation water management strategies by use sector in 2070 (percent)



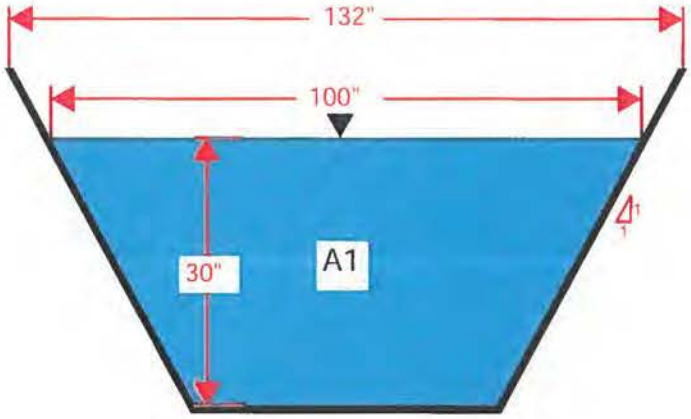
8.4.3 Industrial conservation

Conservation is also a recommended strategy for numerous steam-electric, manufacturing, and mining water users. Recommended conservation measures for these users, to be implemented mostly by private interests, are generally based on best management practices appropriate for each facility, which may include evaluating more efficient cooling and process water practices, water audits, or submetering. Although presented individually in this subchapter, these sectors of use are collectively presented as *industrial conservation* elsewhere in this state water plan. In 2020, 21,000 acre-feet per year in industrial

Appendix B
Seepage Calculations

Test Date:
10-18-2021

East Main Canal - Section A1 (upstream)



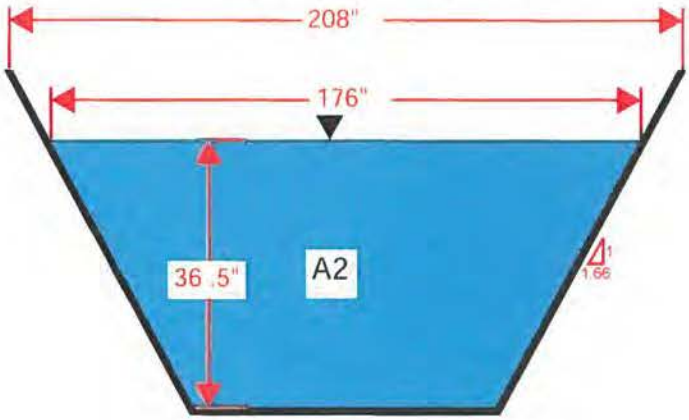
Area1 = 14.580 s.f.

StreamPro ADCP Field Data:

Velocity1 = 0.994 ft/sec

Q1 = 14.58 s.f. * 0.994 ft/sec = 14.49cfs

East Main Canal - Section A2 (downstream)



Area2 = 29.197 s.f.

StreamPro ADCP Field Data:

Velocity2 = 0.300 ft/sec

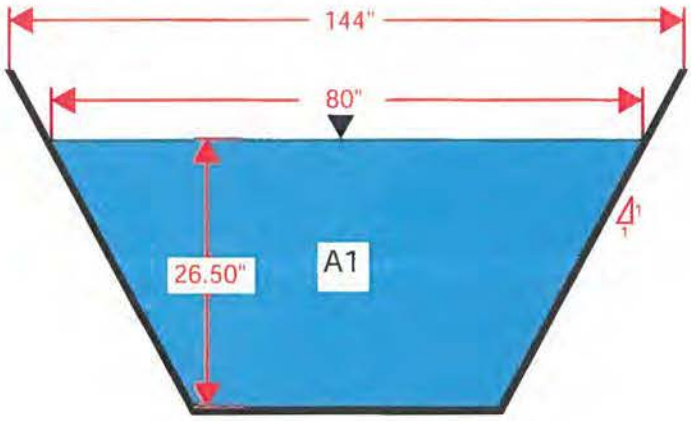
Q2 = 29.197 s.f. * 0.300 ft/sec = 8.76cfs

No evaporation observed on evaporation marker.

Qloss = Q1 - Q2 = 5.73 cfs
Qloss = 4,150 acre-feet / year

Test Date:
10-19-2021

North Crossover Main Canal - Section A1 (upstream)



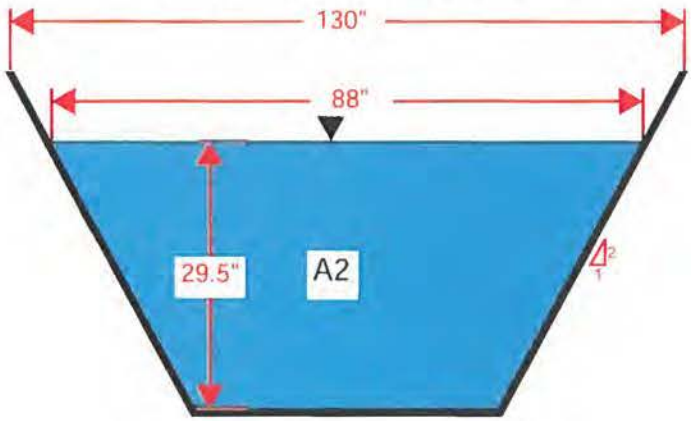
Area1 = 9.85 s.f.

StreamPro ADCP Field Data:

Velocity1 = 2.293 ft/sec

Q1 = 9.85 s.f. * 2.293 ft/sec = 22.58 cfs

North Crossover Main Canal - Section A2 (downstream)



Area2 = 13.56 s.f.

StreamPro ADCP Field Data:

Velocity2 = 1.617 ft/sec

Q2 = 13.56 s.f. * 1.617 ft/sec = 21.93cfs

No evaporation observed on evaporation marker.

Qloss = Q1 - Q2 = 0.65 cfs
Qloss = 470 acre-feet / year

Teledyne RD Instruments

StreamPro ADCP

Shallow Streamflow Measurement System

Your Shallow Water Solution

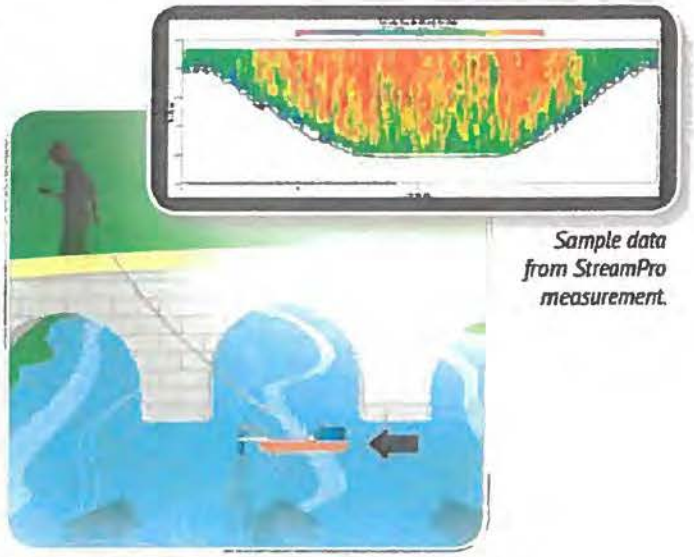
The StreamPro's transducer can be towed from the front or middle of the float, or can be removed and hand-held in the water for applications such as under-ice flow measurements.

Teledyne RD Instruments' STREAMPRO ADCP (Acoustic Doppler Current Profiler) represents a revolutionary advancement in streamflow measurement. You can accurately measure discharge in shallow streams in a matter of minutes—a fraction of the time required using traditional hand-held devices. With StreamPro there's no need to move from station to station to obtain single-point velocity data or compute the discharge by hand; streamflow measurements are obtained in real-time.

Get out of the water: StreamPro can be tethered to be pulled from a bridge, cableway, or tagline pulley system. This greatly improves operator safety when compared to traditional wading techniques.

Collect high-accuracy data: This dramatic advancement in stream flow measurement is made possible by Teledyne RD Instruments' Broadband Doppler signal-processing technology, which achieves superior accuracy in velocity measurement.

Go right to work: StreamPro has been designed to allow any level of user to immediately begin collecting high-quality data. The simple and highly intuitive user interface has been designed to ensure proper operation.



Sample data from StreamPro measurement.

Teledyne RDI's StreamPro ADCP can simply be pulled across the stream as you walk across a bridge, or attached to a tagline to collect real-time data.

PRODUCT FEATURES

- **Quick:** Collect complete streamflow measurements in streams or canals in a matter of minutes.
- **Convenient:** No need to move from station to station. Simply cross a bridge or use a tagline to collect data.
- **Easy to Operate:** Data is conveniently acquired using a mobile deivce equipped with a highly intuitive user interface.
- **Reduced Disturbance:** Small transducer head, 3.5cm in diameter, for minimal flow disturbance.
- **Affordable:** Value-priced system designed to suit your budget.
- **Bottom Tracking:** Reliable bottom-tracking in 0.1m - 7m depth.
- **Wireless:** Bluetooth communications utilized between electronics and PocketPC or laptop.
- **Low Power Consumption:** Full day of operation on 8 AA batteries.
- **Versatile:** Minimum cell size 2cm with up to 30 cells. Standard profiling range of up to 2m (6m with upgrade).
- **Flexible Data Format:** All acquired data is compatible with Teledyne RDI's WinRiver II software for data display and processing.

StreamPro ADCP

Shallow Streamflow Measurement System

TECHNICAL SPECIFICATIONS

Water Velocity Profiling	Profiling range	0.1m[1] to 2m standard or 6m[2] with upgrade
	Velocity range	±5m/s[3]
	Accuracy	±1% of water velocity relative to ADCP, ±2mm/s
	Resolution	1mm/s
	Number of cells	1–20 standard or 1–30 with upgrade
	Cell size	2cm to 10cm standard or 20cm with upgrade
	Blanking distance	3cm
	Data output rate	1Hz
Bottom Tracking	Depth range	0.1m–7m[2]
	Accuracy	±1.0% of bottom velocity relative to ADCP, ±2mm/s
	Resolution	1mm/s
Depth Measurement	Range	0.1m–7m[2]
	Accuracy	1%[4]
	Resolution	1mm

Sensors	Temperature (standard)	Tilt (pitch and roll) (optional)	Compass (heading) (optional)
Range	-4° to 45°C	±90°	0-360°
Accuracy	±0.5°C	±0.3°	±1°

Operation Modes	Standard profiling (Broadband) High-precison profiling (included)
Transducer	Frequency: 2MHz Configuration: Janus 4 beams at 20° beam angle
Software	• StreamPro Software for Pocket PC • WinRiver II (included) for moving-boat measurement • SxS Pro (optional) for stationary measurement (i.e., under-ice); comes with an uncertainty model for in situ quality evaluation and control
Available Upgrades	• Extended profiling range to 6 meters • SxS Pro Software for stationary measurement. • Compass and tilt (pitch and roll) sensors • GPS • High-speed float
Communications	Bluetooth wireless Baud rates: 115,200 bps
Construction	Cast polyurethane with stainless hardware
Power	Voltage: 10.5 –18 VDC (8 AA batteries, alkaline or rechargeable NiMH) Battery capacity: 7.5 hours continuous with 8 AA alkaline batteries; 12.75 hours continuous with 8 AA NiMH rechargeable batteries
Environmental	Operating temperature: -5°C to 45°C Storage temperature: -20°C to 50°C
Physical Properties	Weight in air: 5.9 kg including electronics, transducer, float, and batteries Dimensions: Electronics housing: 16 x 21 x 11cm Transducer: 3.5cm diam. x 15cm length Float: 42 x 70 x 10cm *(line drawings available upon request)*

1 Assume one good cell (minimum cell size) with high precision profiling mode, range measured from the transducer surface.
2 Assume fresh water, actual range depends on temperature and suspended solids concentration.
3 2m/s for standard float; 3.5m/s for optional high-speed float.
4 Assume uniform water temperature and salinity profile

TELEDYNE RD INSTRUMENTS
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Canal³®

Geocomposite for Canals & Water Containment Applications

HUESKER

Engineering with Geosynthetics

HUESKER

Why Is Canal³ The Preferred Choice?

Canal³®

geocomposite for canals and water containment applications

Canal³ is a multi-layer geosynthetic composite membrane designed for water containment applications offering an easy, reliable and cost-effective canal lining solution. **Canal³** provides superior puncture resistance and increased interface friction properties that allows the liner to be deployed directly in contact with most existing soils and steepened side slopes.

Puncture Resistance

Canal³ is comprised of a polyethylene membrane laminated between two nonwoven protection layers. The nonwovens can be designed for increased puncture protection if deemed necessary by site conditions, allowing onsite soils to be used as the subgrade material without the cost of placing an expensive bedding material or placement of separate nonwoven layers.

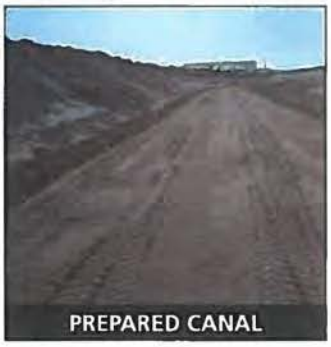
Interface Friction

Lining an existing earthen canal typically requires reshaping the bottom and side slopes prior to installing the **Canal³** geocomposite. The side slopes can range from relatively flat to very steep depending on site conditions and property boundaries. The bottom nonwoven on **Canal³** provides a superior interface friction response with onsite soils which prevents **Canal³** from sliding. The top nonwoven layer also allows for soil or shotcrete to be used as cover material even for 1.5 H : 1 V slopes.

HUESKER

Canal³ Geocomposite. When Every Drop Counts.


BEFORE RESHAPING


PREPARED CANAL


CANAL³ INSTALLATION

The demand for water and the high costs of delivery requires implementation of proven conservation practices. Lining canals with Huesker's **Canal³** geocomposite is the most effective step towards water conservation. With seepage rates of unlined canals up to 60%, lining with **Canal³** reduces seepage losses to below 5% and increases available water for delivery.

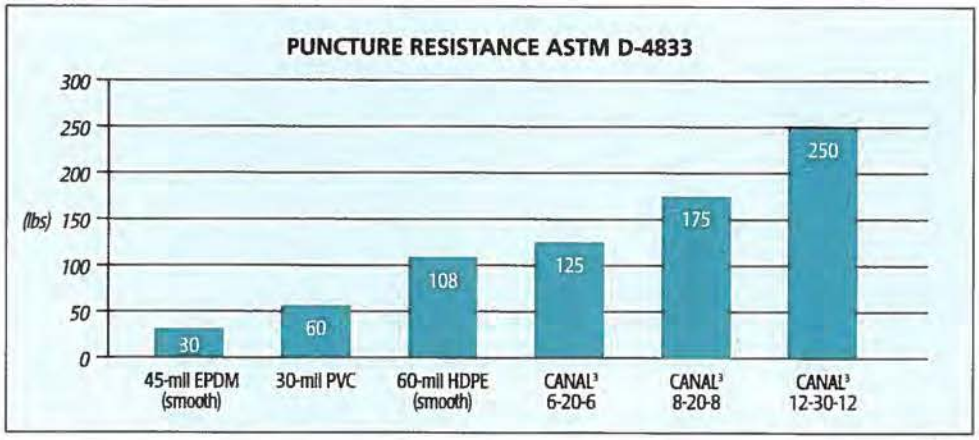
Huesker's **Canal³** may be comprised of polyester or polypropylene nonwovens depending upon project specific design parameters. Manufactured to a standard width of 17 feet (5.18 m) and a custom width up to 25 feet (7.6 m), **Canal³** can be installed parallel or perpendicular to the centerline of the canal in order to minimize excess material in exposed, buried, or shotcreted applications.

HUESKER

Canal³ Proven Performance.

Canal lining installations require cleaning and reshaping of the canal prior to the liner installation. Typically other liners call for a sand bedding layer or a nonwoven cushion above the reshaped canal to provide puncture protection for the liner. **Canal³** is designed with a high puncture protective layer beneath and above the membrane liner, and can be placed directly on the existing reshaped soils eliminating the costs of placing a sand layer.

The following chart includes published ASTM D-4833 puncture index test values for typical canal liners. Recently, a thorough field assessment of various types of canals concluded, "Without question, liners with a protective barrier performed the best and have required no maintenance, while the performance on the liners without a protective barrier has varied significantly," (Evaluation of Canal Lining Projects in the Lower Rio Grande Valley of Texas, Karimov, Leigh, Fipps, P.E., 2009.)



Canal³ provides superior puncture properties for various site conditions from smooth to rough subgrades and is available in several styles. Irrigation districts and contractors agree that the ease of installing **Canal³** over other liners is not only cost effective but also reduces installation time by using our wider width materials. Installations of **Canal³** can be performed by a subcontractor or by irrigation personnel with minimal instructions from a Huesker technical representative. The following are recommendations for the proper selection of the **Canal³** products for various site conditions.

Material	Subgrade			Application		
	Smooth	Moderate	Rough	Buried	Exposed	Shotcreted
Canal³ 6-20-6	✓			✓		
Canal³ 8-20-8	✓	✓		✓	✓	✓
Canal³ 12-30-12	✓	✓	✓	✓	✓	✓

Installation

In order to achieve a successful installation, the first step is to deliver materials safely to the site. Each roll of **Canal**³ is wrapped with heavy duty plastic for protection during shipment along with two lifting straps for ease of unloading at the jobsite. **Canal**³ is typically shipped to the customer on flatbed trucks which allows easy unloading with slings or a lifting bar.

To aid in the deployment process, Huesker supplies an installation guide which provides a detailed overview for installing **Canal**³. **Canal**³ can be installed perpendicular or parallel to the centerline depending on the size of the canal and its alignment. Details of the typical anchoring methods are included in the Installation Manual for specific configurations of side slopes.

Recommended seaming methods include using a hot melt adhesive, standard wedge welding, or a combination of both. Laboratory test results are available for each of these methods of seaming.

When mechanical fastening is required, **Canal**³ is easily attached to concrete structures by using batten strips which are anchored into the concrete using expansion anchors.

Huesker's **Canal**³ composite has been installed worldwide in various applications with successful results, and continues to be the designers first choice for canal lining applications. In today's water conservation environment, eliminating costly seepage is a priority to ensure that every drop counts today and for future generations.

For more information on **Canal**³, call Huesker at (800) 942-9418 or visit our website at **www.huesker.com**.

HUESKER

Case Study

In 2007, the Porter Canal owned by the New Sweden Irrigation District located in Idaho Falls, Idaho was reshaped and lined with **Canal**³ 12-30-12 by a commercial developer due to seepage onto a proposed commercial subdivision. The project consisted of reshaping 1,400 linear feet of the Porter Canal and installing 157,500 ft² of **Canal**³ geocomposite liner by HK Contractors, Inc. The custom roll size of 25 feet wide x 300 feet long reduced the number of seams and expedited the installation process. The entire project took approximately 2 weeks; 1 week to reshape the existing canal, 4 days to install the **Canal**³, and another 3 days to seam and attach to a bridge structure. After construction, the Developer built on the now dry parcel adjacent to the canal.

Project: Lining of Porter Canal
Location: Idaho Falls, Idaho
Owner: New Sweden Irrigation District
Contractor: HK Contractors, Inc.
Material: Canal³ 12-30-12

Case Study

In 2004, after years of concrete repairs, and high seepage rates, Hidalgo County Irrigation District No. 2 located in San Juan, Texas decided to rehabilitate their Lateral "A" canal. The 7.26 mile lateral was drained, and cleaned of loose debris, as well as cracks filled prior to the installation of **Canal**³ 8-20-8 geocomposite above the existing concrete canal. Approximately 850,000 ft² of **Canal**³ were supplied in standard and custom roll widths to reduce waste along the entire reach of the canal. The Contractor employed a modified shotcreting method for placing the 3-inches of shotcrete above the **Canal**³ which resulted in placing over 125 yd³/day. Incorporating the **Canal**³ above the existing concrete canal with the shotcrete above provides a "secondary" containment layer beneath the shotcrete layer extending the life of the canal beyond 50 years, according to the 10-year Study written by the Bureau of Reclamation.

Project: Rehabilitation of Lateral "A" Canal
Location: San Juan, Texas
Owner: Hidalgo County Irrigation District No.2
Contractor: McAllen Construction
Material: Canal³ 8-20-8

Fornit®

Engineered polypropylene biaxial geogrids provide tensile reinforcement, confinement and separation to the base and subbase aggregate layers for both paved and unpaved roads that are used to access canals for periodic maintenance. Fornit® geogrids increase the bearing capacity of underlying soils by introducing a uniform tensile element into the roadway system that distributes the applied loads over a greater area. Lateral displacement of the aggregate is reduced with Fornit® geogrids, thereby maintaining the base course thickness.

Fortrac® 3D

Fortrac® 3D is a further development of the renowned Fortrac® geogrid and is used for slope stabilization, veneer stability and turf reinforcement to control soil erosion. Fortrac® 3D is a flexible, three-dimensional reinforcement grid manufactured from high-tensile strength, creep resistant yarns with a three dimensional structure that enhances its interaction with soil. The geogrid is given a special polymer coating to protect it from UV exposure and installation damage. Its well understood long-term properties allow Fortrac® 3D to be designed for the specific period of use required for each project.

Ultimat®

Ultimat® needle-punched nonwovens are manufactured using polypropylene or polyester staple fibers to produce the widest widths and heaviest weights available in many colors. Ultimat® heavyweight nonwovens provide excellent puncture protection when placed above and below membrane liners in reservoirs and landfill applications. The wide width greatly reduces the installation costs when compared with typical nonwoven widths. Ultimat® also provides superior separation between finer subgrade soils and typical base course extending the life of roadways. Using various diener staple fibers, Ultimat® can be designed for capping application where filtration of specific particle sizes is required.

Canal³® *is a lining solution for irrigation canals and other water containment applications. The top and bottom layers of the nonwovens not only provide increased puncture protection, but also increased interface friction. Canal³® is neither affected by changing temperatures or frost which typically cause cracks in concrete lining solutions or by animals which often cause damage to membrane liners. This innovative canal liner can be installed in exposed or buried applications. Shotcrete can also be applied onto Canal³® for additional protection from vandalism and ultraviolet light.*

For more information about the application of Canal³®, please contact us.

HUESKER

Engineering with Geosynthetics

Count on us!

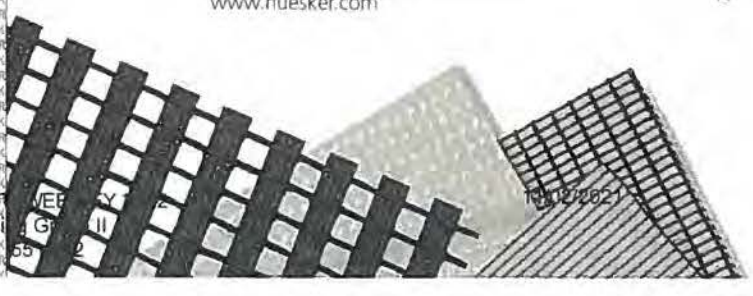
The Huesker Geocomposites, LLC Warranty

Huesker Geocomposites, LLC warrants its products to be free from defects in material and workmanship when delivered to Huesker's customers. Huesker further warrants that its products conform to the specifications published in Huesker's current sales literature. If a Huesker product is defective, or does not meet our published specifications, and our customer gives notice to Huesker before installing the product, Huesker will replace the product without charge to our customer, or refund the purchase price at Huesker's election. Replacing the product or obtaining a refund are the buyer's sole remedy for a breach and Huesker will not be liable for any consequential damage attributed to a defective product. **This warranty is given in lieu of all other warranties, expressed or implied, oral or written, and Huesker hereby expressly disclaims all other warranties, including the implied warranty of merchantability and the implied warranty of fitness for a particular purpose. There are no warranties which extend beyond the description of the face hereof.** To the best of our knowledge, the information contained in this catalog is accurate; however, Huesker cannot assume any liability whatsoever for the accuracy or completeness thereof. Final determination of the suitability of any information or material for the use contemplated, or its manner of use, and whether the suggested use infringes any patents is the sole responsibility of the user.

GEOSYNTHETICS MADE BY HUESKER
- reliability by experience!

HUESKER

HUESKER GEOCOMPOSITES, LLC
HUESKER inc.
10701-W South Commerce Boulevard
Charlotte, NC 28273
P.O. Box 411529, Charlotte, NC 28241
Phone (704) 588-5500, (800) 942-9418
Fax (704) 588-5988
E-mail marketing@hueskerinc.com
www.huesker.com



Appendix C
Official Resolution

CERTIFICATE FOR RESOLUTION OF
DONNA IRRIGATION DISTRICT

STATE OF TEXAS
COUNTY OF HIDALGO

We, the undersigned officers of the Board of Directors of Donna Irrigation District, hereby certify as follows:

1. The Board of Directors of said District convened a Regular Meeting on the 29th day of October 2021, at the regular designated meeting place in said District, and the roll was call of the duly constituted officers and members of said Board, to-wit:

Vice President – Johnny Skalitsky
Secretary – Enrique Gonzales
Director – Rodolfo Gonzalez, Jr.
Director – Larry L. Smith

And all of said persons were present, constituting a quorum. Whereupon, the following transacted at said Meeting. A motion was made and seconded that the Board approve the following:

Resolution

WHEREAS, Donna Irrigation District of Donna, Hidalgo County, Texas ("District") is a political subdivision of the State of Texas operating pursuant to applicable State statues, including Chapters 58 and 49 of the Texas Water Code and Articles XVI, Section 59 of the State Constitution; and

WHEREAS, the Board of Directors of the District ("Board"), which is its governing body, has filed an Application for a WaterSMART: Water and Energy Efficiency Grants for fiscal year (FY) 2022 - Funding Group II for a federal share amounting to $1,975,000, to include the lining of 12,255 linear feet of the East Main Canal, lining of 10,050 linear feet of the North Crossover Main Canal, and installation 2 solar level and flow metering stations.

WHEREAS, the Board desires to approve the Application referenced as Funding Opportunity No. R22AS00023 for submission to the U.S. Bureau of Reclamation ("Reclamation") and endorse it for approval by Reclamation.

NOW, THEREFORE, BE IT RESOLVED, that the General Manager is the District's representative and is hereby authorized to enter into any and all agreements or other documents pertaining to the Application and consummation of Project work and necessary funding related thereto; that the Board and General Manager of the District have reviewed and support the Application to appropriate officials; the District has the capability to provide the amount of funding specified in the funding plan included in the Application, estimated to be $3,950,000 less $1,975,000 Federal Share for Funding Group II; and the Board will work with Reclamation to meet established deadlines for entering into Cooperative Agreement and the General Manager of the District is hereby instructed to work with Reclamation to meet established deadlines for entering into Cooperative Agreement and do any and all things necessary to accomplish consummation of all requirements of the Application and Project work pursuant to the Application, Project funding, and all related matters.

And, after due discussion, said motion, carrying with it the passage of said Resolution prevailed and carried by the following vote:

AYES: 4

NOES: _____

That the above and foregoing paragraphs are a true, full and correct copy of the aforesaid Resolution and Order adopted at the Meeting described above, that said Resolution and Order has been duly recorded in said Board's Minutes of said Meeting, that the above and foregoing paragraphs are a true, full and correct excerpt from said Board's minutes of said Meeting pertaining to the passage of said Resolution and Order, that the persons named in the above and foregoing paragraphs are the duly chosen, qualified and acting officers and members of said Board as indicated therein; that each of the officers and members of said Board was duly and sufficiently notified, officially and personally, in advance, of the time, place, and purpose of the aforesaid Meeting, and each of said officers and members consented, in advance, to the holding of said Meeting for such purpose; and that said Meeting was open to the public and public notice of the time, place, and purpose of said meeting was given, all as required by Chapter 551, Government Code, *Vernon's Ann. Cov. Statutes.*

SIGNED AND SEALED the 29th day of October 2021.

Enrique Gonzales, Secretary

Johnny Skalitsky, Vice President

STATE OF TEXAS
COUNTY OF HIDALGO

This instrument was acknowledged before me on the 29th day of October 2021, by Enrique Gonzales., Secretary of the Board of Directors of DONNA IRRIGATION DISTRICT, a political subdivision of the State of Texas, on behalf of said political subdivision.

LINDA KRUMMEL
ID# 711239-5
Notary Public
STATE OF TEXAS
My Comm. Exp. 03-10-2025

Linda Krummel
Notary Public in and for the State of Texas

STATE OF TEXAS
COUNTY OF HIDALGO

This instrument was acknowledged before me on the _____ day of _____ 2021, by Johnny Skalitsky, Vice President of the Board of Directors of DONNA IRRIGATION DISTRICT, a political subdivision of the State of Texas, on behalf of said political subdivision.

LINDA KRUMMEL
ID# 711239-5
Notary Public
STATE OF TEXAS
My Comm. Exp. 03-10-2025

Linda Krummel
Notary Public in and for the State of Texas

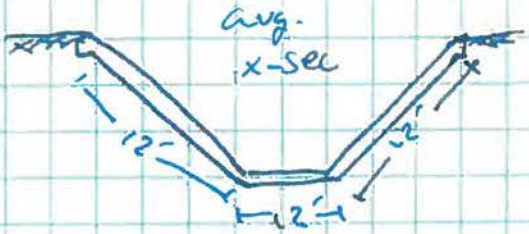
Appendix D
Budget Development and Documentation

440-008

6-25-21

HCID #2 , 8-01-2019 Lateral "E"

#1 $4,991,700 ±
#2 $5,761,350 ±
#3 $6,236,800 ±



Average #1 - #3: $\$5,663,283.33$

Less Geo-Liner: $\frac{\$345,750 + \$691,500 + \$276,000}{3}$

$= \$437,950$

Perimeter of Canal = 36'
Canal Length = 23,050'

Total S.F. = (36')(23,050') = 829,800 S.F.

Total Cost = $\frac{\$5,663,283.33 - \$437,950}{829,800 \text{ S.F.}} \approx 6.30/\text{S.F.}$

$\$6.30/\text{S.F.} * 1.15$ C.A. Factor = $\boxed{\$7.25/\text{S.F.}}$

Hueskar Canal^3 Liner Cost

* Quote for 400,000 ft^2 *

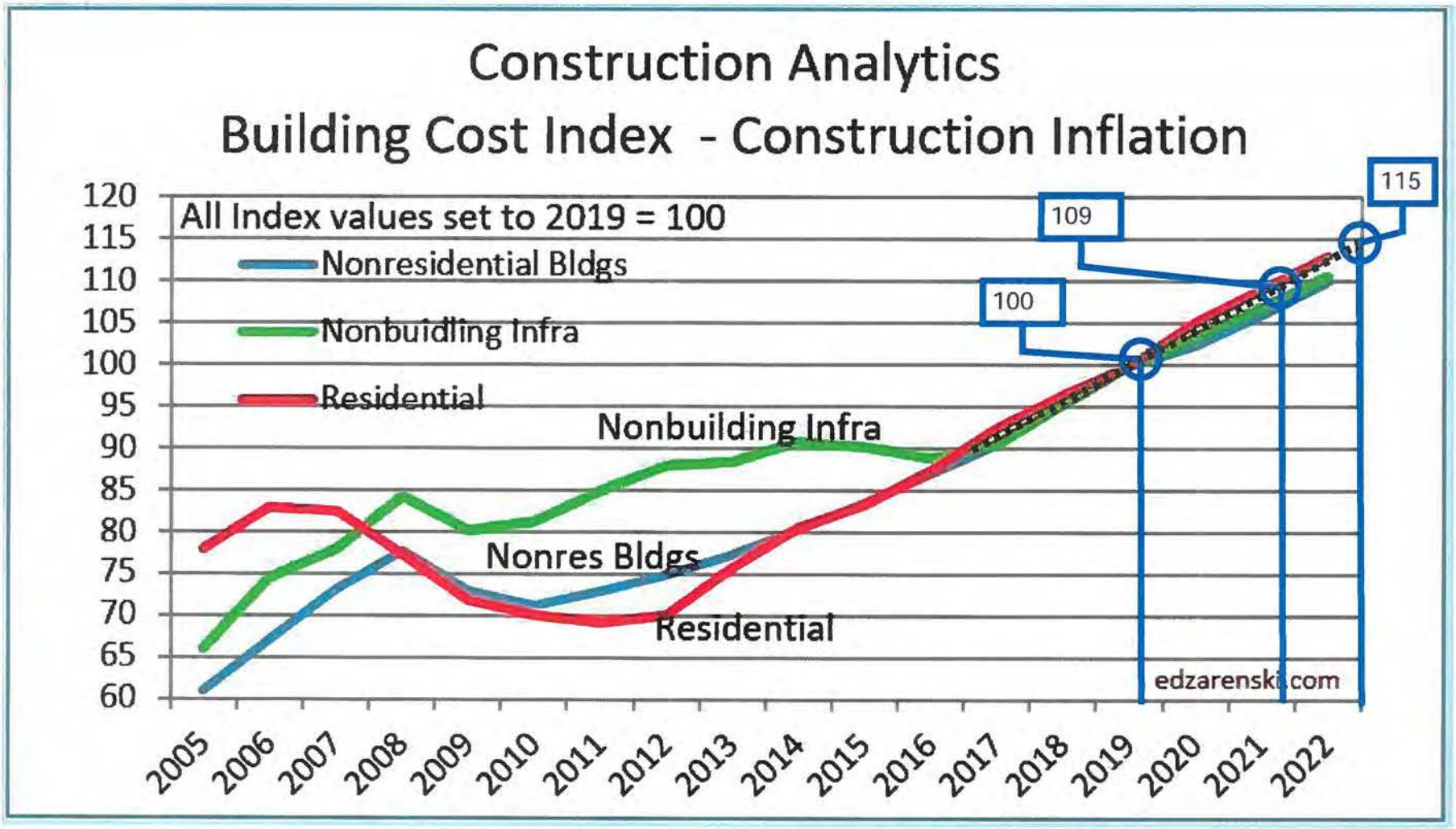
Canal^3 8-20-8	=	$303,750 ±
Adhesive Parallel	=	$1,600 ±
Adhesive Perpendicular	=	$14,560 ±
Freight	=	$17,250 ±
		$545 ±
		$2,310 ±

Total = $340,005 ± / 400,000 S.F. = $0.85/S.F.

$0.85/S.F. * 1.06 C.A. Factor = $0.90/S.F. ≈ $1.00/S.F.

$\boxed{\therefore \text{Use } \$1.00/\text{S.F.}}$

C. L.



CA Construction Inflation Factor for Canal Lining, August 2019 to December 2023

$$\frac{\text{December 2023} = 115}{\text{August 2019} = 100} = 1.15 \text{ CA Factor}$$

CA Construction Inflation Factor for Huesker Liner, October 2021 to December 2023

$$\frac{\text{December 2023} = 115}{\text{October 2021} = 106} = 1.06 \text{ CA Factor}$$

LATERAL "E" CANAL

Bid Tabulation

Installation of Geosynthetic Membrane Composite for Lini

Bids Opened: Thursday - August 1, 2019
Time: 9:00 AM
Location: HCID2 Office, 326 N. Standard Ave., San Juan, Te

ITEM NO.	DESCRIPTION	QTY	UNIT	[illegible]	[illegible]	OG Construction @ 8:56 AM		Pederson Construction @ 8:58 AM	
				UNIT PRICE	TOTAL	UNIT PRICE	TOTAL	UNIT PRICE	TOTAL
A. BASE BID									
1	Sediment removal and power wash	23,050	LF	$ 15.00	$ 345,750.00	$ 28.00	$ 645,400.00	$ 9.00	$ 207,450.00
2	Installation of Canal 3 with Geo	23,050	LF	$ 15.00	$ 345,750.00	$ 30.00	$ 691,500.00	$ 12.00	$ 276,600.00
3	Cast in place 3" reinforced concrete	23,050	LF	$ 120.00	$ 2,766,000.00	$ 109.00	$ 2,512,450.00	$ 150.00	$ 3,457,500.00
4	36" deep reinforced concrete	21	EA	$ 3,000.00	$ 63,000.00	$ 5,000.00	$ 105,000.00	$ 4,250.00	$ 89,250.00
5	Remove and Reinstall active valve	18	EA	$ 2,000.00	$ 36,000.00	$ 5,000.00	$ 90,000.00	$ 2,500.00	$ 45,000.00
6	Anchoring of Geocomposite liner	18	EA	$ 2,000.00	$ 36,000.00	$ 4,500.00	$ 81,000.00	$ 3,500.00	$ 63,000.00
7	Anchoring and detailing of Geoco	1	EA	$ 2,000.00	$ 2,000.00	$ 5,000.00	$ 5,000.00	$ 4,000.00	$ 4,000.00
8	Anchoring of Geocomposite Liner	1	EA	$ 4,000.00	$ 4,000.00	$ 7,500.00	$ 7,500.00	$ 3,500.00	$ 3,500.00
9	Anchoring and detailing of Geoco	1	EA	$ 4,000.00	$ 4,000.00	$ 4,500.00	$ 4,500.00	$ 3,500.00	$ 3,500.00
10	Anchoring and detailing of Geoco	1	EA	$ 4,000.00	$ 4,000.00	$ 7,500.00	$ 7,500.00	$ 3,500.00	$ 3,500.00
11	Removal of abandoned reinforced	1	EA	$ 5,000.00	$ 5,000.00	$ 8,000.00	$ 8,000.00	$ 7,500.00	$ 7,500.00
12	Removal of reinforced concrete	1	EA	$ 3,000.00	$ 3,000.00	$ 10,000.00	$ 10,000.00	$ 3,250.00	$ 3,250.00
13	Anchoring of Geocomposite Liner	1	EA	$ 5,000.00	$ 5,000.00	$ 15,500.00	$ 15,500.00	$ 3,500.00	$ 3,500.00
14	Anchoring of Geocomposite Liner	1	EA	$ 7,000.00	$ 7,000.00	$ 12,500.00	$ 12,500.00	$ 4,000.00	$ 4,000.00
15	Removal of abandoned reinforced	1	EA	$ 6,000.00	$ 6,000.00	$ 5,000.00	$ 5,000.00	$ 6,500.00	$ 6,500.00
16	Anchoring of Geocomposite Liner	1	EA	$ 7,000.00	$ 7,000.00	$ 9,000.00	$ 9,000.00	$ 3,750.00	$ 3,750.00
17	Anchoring of Geocomposite Liner	1	EA	$ 5,000.00	$ 5,000.00	$ 8,000.00	$ 8,000.00	$ 3,750.00	$ 3,750.00
18	Removal of abandoned reinforced	1	EA	$ 6,000.00	$ 6,000.00	$ 7,500.00	$ 7,500.00	$ 7,500.00	$ 7,500.00
19	Removal and Reinstallation of exist	1	EA	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00	$ 12,500.00	$ 12,500.00
20	Anchoring of Geocomposite Liner	1	EA	$ 7,000.00	$ 7,000.00	$ 23,500.00	$ 23,500.00	$ 3,750.00	$ 3,750.00
21	Anchoring of Geocomposite Liner	1	EA	$ 7,000.00	$ 7,000.00	$ 9,000.00	$ 9,000.00	$ 4,500.00	$ 4,500.00
22	Fill and Repair of cavities under	2,100	SY	$ 20.00	$ 42,000.00	$ 30.00	$ 63,000.00	$ 50.00	$ 105,000.00
23	Removal and Replacement of exist	2,100	SY	$ 12.00	$ 25,200.00	$ 30.00	$ 63,000.00	$ 80.00	$ 168,000.00
24	Irrigation water management and	1	LS	$ 1,200,000.00	$ 1,200,000.00	$ 1,350,000.00	$ 1,350,000.00	$ 1,700,000.00	$ 1,700,000.00
25	Traffic Control Management and	1	LS	$ 25,000.00	$ 25,000.00	$ 10,000.00	$ 10,000.00	$ 25,000.00	$ 25,000.00
26	Removal of existing abandoned	5	EA	$ 6,000.00	$ 30,000.00	$ 2,500.00	$ 12,500.00	$ 5,000.00	$ 25,000.00
TOTAL BASE BID					$ 4,991,700.00		$ 5,761,350.00		$ 6,236,800.00

ALL AWARDED

Contractor entered $ 5,945,750.00 as bid amount. Difference of $ 184,400.

Line items were calculated incorrectly on submitted bid.

Contractor entered $ 5,991,100.00 as bid amount. Difference of $ 245,700.

Line items were calculated incorrectly on submitted bid.

Carlos Luna

From: McClinton, Roy <rmcclinton@huesker.com>
Sent: Friday, October 29, 2021 8:09 AM
To: Carlos Luna
Subject: RE: Quote Request - Donna Irrigation District

Hi Carlos,
Sorry for the delay.

Please use the following for your Grant Application:

Required QTY – 400,000 ft² (no waste added)

Canal³ 8208 – 25 feet x 300 feet = 7,500 ft²/roll

54 rolls x 7,500 ft²/roll = 405,000 ft² @ $0.75/ft² = **$303,750.00 FCA Shelby, NC**

Adhesive – Jowat 221.60 – packaged in 33-lb bags - Coverage - 6 feet /1-lb of adhesive

1. Installation parallel to the canal with a 25 feet width covering the entire canal cross-section (including anchor trenches) with seams every 300 feet
   A. 10 bags @ $160.00/bag = **$1,600.00 FCA Shelby, NC**

2. Installation perpendicular to the canal from anchor trench across to anchor trench - seams every 24.5 feet (6-inch overlap side-to-side)
   B. Assuming cross-section length including anchor trenches is 35 feet ~ 467 seams x 35 feet = 16,345 ft of seams ~ 91 bags (includes +10% waste) @ $160.00/bag = **$14,560.00 FCA Shelby, NC**

Freight – Valid for only 30 days as freight costs are fluctuating almost daily.

54 rolls - Shelby, NC to Donna, Texas – 3 flatbeds required for the 54 rolls – 18 rolls per flatbed at today's rate of $5,750.00/truck = **$17,250.00**

10 bags of Adhesive – LTL – **$ 545.00**

91 bags of Adhesive – LTL – **$2,310.00**

Let me know if you need more information, etc.

QUOTE

UNITED WATER SERVICES, LLC
SERVICES & CONTROL

P.O. BOX 2071
HARLINGEN, TX 78551
Phone: (956) 226-0374
Fax : (956) 790-0299
msaleh@uws-us.com

TO Frank Ferris, PE
Ferris, Flinn & Medina, LLC
1405 N. Stuart Place Rd.
Harlingen, TX 78552
(956) 364-2236

QUOTE NO. UWS1621
DATE September 30, 2020
CUSTOMER ID NAWSC
EXPIRATION DATE IN 30 DAYS

SALESPERSON	Reference #	JOB	PAYMENT TERMS	Ship Via
MEDHAT SALEH	Mace W/comm.	Reservoir Flume Mace meter	30 DAYS NET	TBD

ITEM NO.	QUANTITY	DESCRIPTION	UNIT PRICE	LINE TOTAL
1	1	New Mace- Agriflo XCI, Doppler ultrasonic velocity sensor card, WebComm card w/ antenna, area/velocity sensor w/ 100 m cable, mounting kit, solar panel, 12 month prepaid code and sensor mounting kit	$ 8,140.85	$ 8,140.85
2	1	Labor for system installation, configuration and start-up at ReservoirFlume	$ 1,800.00	$ 1,800.00
Quotation prepared by: _MEDHAT SALEH_				

SUBTOTAL $ 9,940.85
SALES TAX -
5

To accept this quotation, sign here and return: _____

THANK YOU FOR YOUR BUSINESS!

CA FACTOR $\frac{10/1/23}{9/30/20} = \frac{115}{104} = 1.1$

9940.85×1.1
$= 10,935$

QUOTATION

Fresno Valves and Castings, Inc
PO Box 40
7736 E Springfield Ave, Selma, CA 93662
Ph: (559) 834-2511 Fx: (559) 834-4821

QUOTATION #: FVC210201_105539_1
DATE CREATED: Feb 01, 2021 - 10:55 AM
DATE PRINTED: Feb 01 2021 - 10:55 AM

TO: Ferris, Flinn & Medina - ATTN: Frank Ferris

PROJECT	LEAD TIME	SHIPPING TERMS	BILLING TERMS
BID Unit 6 Rehab	12 Weeks	FOB Selma, CA/Pre-Pay & Add	Net 30 Days

ITM#	DESCRIPTION	QTY (EA)	WT (LBS)	PRICE($)	EXTND'D PRICE($)
1	54" Diameter Series 5900 Fabricated 304 SST Flap Gate: Flat Back for Wall Mounting, Neoprene Seal, 304 SST Link Arms with Bronze Bushings, SST Pins, SST Assembly Fasteners, SST Stud Anchors (Epoxy by Others)	1	0	14,049.00	14,049.00
2	Fabricated Slide Gate, #304 SS, 54" Wide x 54" High w/132" Frm, Self Contained, Rising Stem w/Stem Cover, 3-Sided J-Seal, With Electric Actuator (480V, 3PH, 60HZ), Left Wall Mount, Right Wall Mount, Bottom Wall Mount Flush, Top Wall Mount, Seating Head 10 Ft, Unseating Head 0 Ft	1	980	18,555.00	18,555.00
3	Fabricated Slide Gate, #304 SS, 36" Wide x 36" High w/132" Frm, Self Contained, Rising Stem w/Stem Cover, 3-Sided J-Seal, With Gear Lift, Left Wall Mount, Right Wall Mount, Bottom Wall Mount Flush, Top Wall Mount, Seating Head 10 Ft, Unseating Head 0 Ft,	2	700	7,710.00	15,420.00
				TOTAL ($)	48,024.00

BUDGETARY ESTIMATE

* This quote was prepared With Limited Benefit of Project Plans and Specifications. Should any modifications be required to the quoted materials or design of the items contained in this quote based upon the subsequent receipt of plans, specifications or other such Project information, Fresno Valves & Castings reserves the right to modify this quotation to reflect any such additional material or design costs. In the event that such plans, specifications or other such product information is not obtained until after the customer has placed an order for the items as originally quoted, Fresno Valves & Castings reserves the right to amend and/or cancel the customer's purchase order to reflect the product and pricing changes required to meet Project plans and specifications.

* This quote was not necessarily prepared to meet the material and fabrication requirements of ARRA or any other such similar Act. If the items included in this quote must meet the standards of ARRA or any other such similar act, please notify us and a separate quotation will be prepared for your review and consideration.

Quotation prepared by: Rich Korbe (richJK@fresnovalves.com)

To accept this quotation, sign here and return: _____

1. Quote is valid only to addressee stated above.
2. Quote is valid for period of 60 days or for a shorter period if, at any time, FVC provides written notice of withdrawal of this quotation.
3. Ordering of nonstandard materials and manufacturing of gates will occur only after receipts of approved submittal drawing by FVC from customer or authorized representative.
4. Orders cancelled after receipt of order are subject to a cancellation fee equal to 150 percent of the materials, labor and overhead incurred to date in the manufacture of order items.
5. This quotation is limited to the specific items quoted above and in the configuration of the items quoted above. FVC does not assume responsibility to supply additional items included in the related project that are not quoted above or for variances between quoted configurations and project plans and specifications.
6. FVC provides a one year warranty on materials and workmanship for all gate products manufactured by FVC. A copy of FVCs warranty will be provided to customer upon FVCs receipt and approval of customer order. Warranty of other product supplied by FVC is limited to the warranty provided by such other manufacturer.
7. Quotation is based on the assumption that purchase order terms and conditions are substantially equal to FVCs established terms and condition of sale. If, in the opinion of FVC, purchase order terms and conditions are sufficiently different than FVCs terms and conditions of sale, FVC reserves the right to amend the purchase order terms and conditions or reject the purchase order.

QUOTATION

Fresno Valves and Castings, Inc
PO Box 40
7736 E Springfield Ave, Selma, CA 93662
Ph: (559) 834-2511 Fx: (559) 834-4821

QUOTATION #: FVC200309_152913_1
DATE CREATED: Mar 09, 2020 - 03:29 PM
DATE PRINTED: Mar 09 2020 - 03:29 PM

TO: Ferris, Flinn & Medina - ATTN: Frank Ferris

PROJECT	LEAD TIME	SHIPPING TERMS	BILLING TERMS
United Irrigation District	See Notes	FOB Selma, CA/Pre-Pay & Add	Net 30 Days

ITM#	DESCRIPTION	QTY(EA)	WT(LBS)	PRICE($)	EXTND'D PRICE($)
1	14" x 15" Fresno Series 2800 Model 28B Alfalfa Valve	156	0	374.00	58,344.00
2	16" Diameter Series 4200 Type W Pressure Gate: Wall Mounted, Bronze Seating Faces, SST Frame and Assembly Fasteners, 20' Tall Rising Stem Extension (Mounting Fasteners not Included)	156	0	3,173.00	494,988.00
3	18" Fresno Series 2800 Model 28A Alfalfa Valve for Saddle Outlet	31	0	1,250.00	38,750.00
4	18" Diameter Series 4200 Type W Pressure Gate: Wall Mounted, Bronze Seating Faces, SST Frame and Assembly Fasteners, 20' Tall Rising Stem Extension (Mounting Fasteners not Included)	7	0	3,377.00	23,639.00
5	24" Diameter Series 4200 Type W Pressure Gate Wall Mounted Bronze Seating Faces, SST Frame and Assembly Fasteners, 20' Tall Rising Stem Extension (Mounting Fasteners not Included)	22	0	5,672.00	124,784.00
6	Fabricated Slide Gate, #304 SS, 30" Wide x 30" High w/57" Frm, Self Contained, Rising Stem w/Stem Cover, 3-Sided J-Seal, With Gear Lift, Left Wall Mount, Right Wall Mount, Bottom Wall Mount Flush, Top Wall Mount, Seating Head 10 Ft, Unseating Head 10 Ft,	10	470	6,643.00	66,430.00
7	Fabricated Slide Gate, #304 SS, 36" Wide x 36" High w/66" Frm, Self Contained, Rising Stem w/Stem Cover, 3-Sided J-Seal, With Gear Lift, Left Wall Mount, Right Wall Mount, Bottom Wall Mount Flush, Top Wall Mount, Seating Head 10 Ft, Unseating Head 10 Ft,	7	560	7,127.00	49,889.00
				TOTAL ($)	856,824.00

Notes: 1.) Shipments dependant upon stock levels at time of order. 2.) All prices are quoted as list prices.

* This quote was prepared Without The Benefit of Project Plans and Specifications. Should any modifications be required to the quoted materials or design of the items contained in this quote based upon the subsequent receipt of plans, specifications or other such Project information, Fresno Valves & Castings reserves the right to modify this quotation to reflect any such additional material or design costs. In the event that such plans, specifications or other such product information is not obtained until after the customer has placed an order for the items as originally quoted, Fresno Valves & Castings reserves the right to amend and/or cancel the customer's purchase order to reflect the product and pricing changes required to meet Project plans and specifications.

* This quote was not necessarily prepared to meet the material and fabrication requirements of ARRA or any other such similar Act. If the items included in this quote must meet the standards of ARRA or any other such similar act, please notify us and a separate quotation will be prepared for your review and consideration.

Quotation prepared by: Rich Korbe (richJK@fresnovalves.com)

To accept this quotation, sign here and return: _____

1. Quote is valid only to addressee stated above.
2. Quote is valid for period of 60 days or for a shorter period if, at any time, FVC provides written notice of withdrawal of this quotation.
3. Ordering of nonstandard materials and manufacturing of gates will occur only after receipts of approved submittal drawing by FVC from customer or authorized representative.
4. Orders cancelled after receipt of order are subject to a cancellation fee equal to 150 percent of the materials, labor and overhead incurred to date in the manufacture of order items.
5. This quotation is limited to the specific items quoted above and in the configuration of the items quoted above. FVC does not assume responsibility to supply additional items included in the related project that are not quoted above or for variances between quoted configurations and project plans and specifications.
6. FVC provides a one year warranty on materials and workmanship for all gate products manufactured by FVC. A copy of FVCs warranty will be provided to customer upon FVCs receipt and approval of customer order. Warranty of other product supplied by FVC is limited to the warranty provided by such other manufacturer.
7. Quotation is based on the assumption that purchase order terms and conditions are substantially equal to FVCs established terms and condition of sale. If, in the opinion of FVC,

Appendix E
Water Conservation and Drought Contingency Plans

Water Conservation and Drought Contingency Plan
of
Donna Irrigation District, Hidalgo County No. 1

P. O. Box 775
Donna, Texas 78537-0775

(956) 464-3641 - (956) 464-9955 Fax

WATER CONSERVATION PLAN

I. STRUCTURAL FACILITIES

A. *Description of service area:* The District is composed of approximately 32,000 acres of irrigable farmland located in central Hidalgo County, Texas.

B. *Total miles of main canals and pipelines:* The District has 32.0 miles of main canal.

C. *Total miles of lateral canals and pipelines:* The District has 60 miles of lateral canals and 88 miles of concrete pipelines. The District also maintains approximately 123 miles of drains for agricultural lands within its boundaries.

D. *Reservoir capacity:* The District has an off-channel reservoir with a current estimated capacity of 1,200 acre feet.

E. *Pumps and pumping stations:* The District operates a pumping plant located on the Rio Grande and a second lift pumping plant located at the District's reservoir approximately 7 miles from the Rio Grande. The river pumping plant operates on engines run by natural gas and or electricity. The second lift reservoir pumping plant can be operated with natural gas and electricity. The delivery of irrigation water is through a system of underground pipelines mostly on the first lift between the River and the reservoir and open concrete line canals north of the District's reservoir. The District also maintains relift pumps in some areas of the District.

F. *River meters:* The amount of water diverted by the District from the River is measured in accordance with the rules and regulations of the Rio Grande Watermaster and amounts diverted are reported monthly to the Rio Grande Watermaster.

G. *Field gates and measuring devices:* Meters are used throughout the District boundaries, where possible, measuring in acre feet the amount of water used in each field being irrigated. Where meters cannot be used, deliveries measured by the hour depending on length of time needed to irrigate each field. There are gates located in the District's main canals to regulate the flow of water into the pipelines or lateral canals, which in turn have gates and valves which regulate the flow into the fields.

H. *Canal construction:* The District has 4.3 miles of unlined main canals, 27.7 miles of lined main canals and 60 miles of lined lateral canals and 88 miles of concrete pipeline.

I. *Canal conditions and improvements:* The Condition of the District's main canal and concrete pipeline is good. However, the District is currently planning for improvements to its lateral canals.

II. MANAGEMENT PRACTICES

A. *Water available to district:* The District was awarded water rights to the Rio Grande in *State v. Hidalgo County Water Control and Improvement District No. 18, et al,* (Tex.Civ.App. 1969, error ref'd n.r.c.) and was thereafter issued Certificate of Adjudication No. 23-805 evidencing the right to divert and use a maximum of 94,063.6 acre feet per annum for irrigation purposes within the District boundaries with a Class "A" priority; the District also holds rights under Certificate of Adjudication No. 23-875 to divert 480 acre feet of Class "A" irrigation priority water for the deliveries for irrigation purposes; the District has diversion rights under Certificate of Adjudication No. 23-852 for 12.50 acre feet per annum for municipal, domestic, and livestock use for the town of La Blanca, and under Certificate of Adjudication No. 23-805 for 2690 acre feet for municipal purposes for deliveries to North Alamo Water Supply Corporation, and 4190 acre feet per annum for delivery to the City of Donna under existing contracts with both entities.

The Rio Grande Watermaster allocates water to the District and other water rights holders on the Lower Rio Grande based upon their respective water rights and availability of water. Over the past five (5) years, the District has been allocated and diverted from the River an average of 55,000 acre feet per year. This has been a drought period. The District estimates that its percentage of loss in the system, after diversion of water from the River, is approximately 25%.

B. *Water delivery management:* The district has field personnel who monitor water deliveries and the condition of the District's delivery system. Waste of water is not permitted and may be subject to penalties assessed by the District. There is a regular maintenance program on the canals and pipeline right of ways to prevent additional loss of water due to seepage. Concrete lining is repaired when necessary and earth and banks are maintained to prevent soil erosion. Canal rights of way and drainage ditches are maintained as clean as possible of trees, brush, and debris.

C. *Water pricing policy:* As required by Chapter 58, Texas Water Code, the District's irrigation water rate structure is composed of a flat rate assessment and a water delivery charge. Currently, the flat rate assessment is $17.00 per flat rate acre and the water delivery charge is $10.00 per acre. Contract delivery rates to municipal suppliers are a flat rate per acre foot delivered established by the Board of Directors.

D. *Water conservation policies:* District personnel observe on a daily basis the District system to prevent leaks and when leaks occur, to repair and minimize water losses. The District encourages farmers to improve irrigation techniques on the farms so as to conserve water and prevent pollution from entering into farm drains and into the general area drainage system. The District encourages bench leveling of land in the District as well as other on farm water conservation techniques.

E. *Raw water deliveries to municipal suppliers:* The District has contracts to deliver approximately 4,190 acre feet of Rio Grande water to the City of Donna and 2,690 acre feet of water to North Alamo water Supply Corporation under existing water supply and delivery contracts. This water is delivered from the District's irrigation canal and pipeline system and is metered at the delivery point to the City. The amount of water measured at the Rio Grande is reported monthly to the Rio Grande Watermaster and is based upon the amount of water delivered plus transportation losses. The Rio Grande Watermaster charges these deliveries against the applicable municipal priority water allocation.

In the future, water supply and delivery contract entered into for the furnishing of Rio Grande water to municipal suppliers, or any extension of existing contracts, shall contain provisions that the customer shall develop and implement a water conservation plan or water conservation measures using the applicable elements contained in Title 30, Texas Administrative Code, Chapter 288, and in the event, after treatment, such water is resold to another supplier, then such contract shall also contain provisions dealing with water conservation requirements in accordance with Title 30, Texas Administrative Code, Chapter 288.

III. USER PROFILE

The District has approximately 32,000 acres of irrigable farmland located in its boundaries and the number of acres irrigated annually depends upon available water supply. The District has approximately 1,700 irrigation accounts and delivers water for the irrigation of various crops including cotton, grain, sugar cane, citrus, alfalfa, vegetables, and a limited amount of pastureland. Substantially row-type irrigation is used on most crops and flood-type irrigation (use of borders) on citrus and pasturelands. Many of the irrigated land served has underground drainage system and some of the irrigated lands are benched-leveled.

IV. RIO GRANDE REGIONAL WATER PLANNING GROUP (Region M. Texas Water Development Board)

A copy of this Water Conservation Plan shall be filed with the Rio Grande Regional Water Planning Group, or its successor, and the District will coordinate its activities in order to ensure consistency with approved Regional Water Plans.

V. FIVE-YEAR AND TEN-YEAR TARGETS

The District is replacing broken and leaking gates on the existing pipeline system located on the south side of the District. Sections of the system, which was constructed in the early 1960's, are also being replaced as a result of broken pipes. These replacements should greatly reduce water losses.

The District encourages the farmers or landowners to install pipelines and valves to more efficiently irrigate their fields. The District helps with the installation of the line to the existing outlet. This helps to conserve water through evaporation and broken earthen ditches.

As an incentive to conserve water, the District charges a lower rate per acre on the drip irrigation and sprinkler irrigation. There has been an increase in the number of farmers using these systems as a result of the noticeable amount of savings on water and cost per acre.

Plans are being proposed to replace the siphon that crosses the land between the floodway levees located on the south side of the District. These plans also include the portion of the earthen main canal north of the siphon to be either concrete lined or replaced with a pipeline.

DROUGHT CONTINGENCY PLAN

A. PURPOSE OF PLAN

The following drought contingency plan for the District is intended to minimize the adverse impact of water supply shortages or emergency conditions which may arise in the District and includes the District's policies and procedures for the equitable and efficient allocation of water on a pro-rata basis during times of shortage in accordance with Texas Water Code, Section 11.039. It was and is implemented after public meetings held by the Board of Directors.

B. ACTIVATION OF WATER PROGRAM

Water allocation to irrigation users in the District will go into effect, if the Board deems allocation necessary, when the District's total irrigation water rights account shown by the Rio Grande Watermaster records contained a storage balance of 94,063.6 acre feet of water. Upon activation of the Allocation Program, a maximum of four (4) irrigations of 6/10 acre feet for each irrigation for each flat acre on which all flat rate assessment is paid and maintenance tax is paid, or is less than six (6) months past due, will be allocated to each flat rate account (referred to as the "irrigation account"). The water allotment in each irrigation account will be expressed in acre feet of water.

C. WATER ALLOCATION

As water is allocated to the District's account by the Rio Grande Watermaster in an amount reasonably sufficient for allocation to District irrigation users, the additional water allocated to the District will be equally distributed, on a pro-rate acreage basis, to those irrigation accounts having a balance of less than four (4) irrigations for each flat rate acre (i.e., 2.4 acre feet per acre).

The irrigation accounts shall be composed of the same parcels of land as identified by ownership for flat rate assessment purposes as carried in the records of the District.

An irrigation account on which the Flat Rate has not been paid by January 1, will forfeit all water in that irrigation account. All water contained in the water allotment in the irrigation account associated with the Maintenance Tax will be forfeited if the Maintenance Tax is not paid by August 1.

D. TRANSFERS

The water allotment in an irrigation account may be transferred within the boundaries of the District from one irrigation account to another. The transfer of water can be made only by the landowner's agent who is authorized in writing to act on the behalf of the landowner in the transfer of all or a part of the water allotment from the described land of the landowner covered by the irrigation account.

A water allotment may be transferred to land outside the District boundaries by paying the current water delivery charge as if the water was actually delivered by the District to the land covered by an irrigation account. The amount of water allowed to be transferred shall be stated in terms of acre feet and deducted from the landowner's current water allotment balance in the irrigation account involved. Transfers of water outside the District shall not effect allocation of water under Paragraph B above.

A landowner for use in the District may transfer water from outside the District. The district will pump and deliver the water on the same basis as District water is delivered, except that a twenty-five (25%) percent conveyance loss will be charged against the amount of water transferred for use in the District as the water is delivered.

E. ACCOUNTING FOR WATER USE

The amount of water which will be charged to water allotments established for each irrigation account will be based upon the amount of water delivered for irrigation to the land covered by an irrigation account as shown by meter reading and expressed in terms of acre feet. It shall be a violation of these Rules and Regulations for a District irrigation user to exceed the amount of water contained in an irrigation account.

F. OTHER WATER DELIVERIES

During the time that the Water Allocation Program is in effect, the District will not normally make delivery of water under water contracts or for yard irrigation. Special arrangements for such water deliveries when possible must be made with the General Manager.

G. TERMINATION OF WATER ALLOCATION

The Water Allocation Program will remain in effect until the District's total irrigation account storage balance as shown by the Rio Grande Watermaster's records exceeds 94,063.6 acre feet and the District deems that the need for allocation no longer exists.

H. NOTICE

Notice of the activation and termination of the Drought Contingency Plan and Water Allocation Program will be give by notice on the District's public bulletin board.

I. EFFECTIVE DATE

The effective date of this Drought Contingency Plan was and is hereby extended following the date of Publication hereof and ignorance of the Rules and Regulations contained in the Plan is not a defense for a prosecution for enforcement of the violation of the Rules and Regulations.

J. COORDINATION WITH REGIONAL WATER PLANNING GROUP

A copy of this drought management plan shall be filed with the Rio Grande Regional Water Planning Group (Region M, Texas Water Development Board) and the District will coordinate its activities so as to ensure consistency with the approved Regional Water Plan.

K. WATER DELIVERED TO MUNICIPAL SUPPLIERS

Water is delivered to municipal suppliers in accordance with existing contracts and the District's water conservation plan and drought management plan. Upon the activation of the District's drought contingency provisions, the District will coordinate with municipal suppliers to whom it delivers Rio Grande water for treatment. Normally, if the District expects a shortage in irrigation deliveries which could make it difficult to maintain deliveries to municipal suppliers, it will advise its municipal suppliers, if reasonably possible, at least sixty (60) days in advance, of this possibility, otherwise, as soon as is possible. A copy of this notice will be sent to the Rio Grande Watermaster and Texas Water Development Board. Following such notice, the District will monitor available water supply and irrigation deliveries in coordination with the Rio Grande Watermaster, Texas Water Development Board, and municipal suppliers during the shortage period.

PENALTIES

Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of these Rules and Regulations shall be considered in violation of Section 11.03, Texas Water Code, Vernon's Texas Codes Annotated, which provides for punishment by a fine of not less than $10.00 nor more than $200.00 or by confinement in the county jail for not more than thirty (30) days, or both, for each violation, and these penalties shall be in addition to any other penalties provided by the laws of the State and may be enforced by complaints filed in the appropriate court jurisdiction in Hidalgo County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Rules and Regulations.

AUTHORITY

The foregoing Water Conservation Plan and Drought Contingency Plan are adopted in accordance with the provisions of Section 11.083; 58.127-130; and Section 49.004 of the Texas Water Code, Vernon's Texas Codes Annotated; and in accordance with Sections 11.1271 – 11.1272, Texas Water Code, Texas Codes Annotated and Title 30, Texas Administrative Code, Chapter 288.

CERTIFICATE OF ADOPTION

The undersigned officers of the Board of Directors of Donna Irrigation District, Hidalgo County Number One, hereby certify that a regular Meeting of the Board of Directors of said District was held on the 12th day of July, 2019, at the offices of the District in Donna, Hidalgo County, Texas; that the above and foregoing Water Conservation Plan and Drought Contingency Plan was approved by a majority of the duly chosen, qualified and acting officers and members of said Board and that each of the officers and members of said Board was duly and sufficiently notified, officially and personally, in advance, of the time, place, and purpose of the aforesaid Meeting, and each of said officers and members consented, in advance, to the holding of said Meeting for such purpose; and that said Meeting was open to the public and public notice of the time, place, and purpose of said meeting was given, all as required by Chapter 551, Government Code, *Vernon's Texas Codes Annotated.*

SIGNED AND SEALED the 12th day of July, 2019.

D M Baldaberry
Secretary

Rosendo Guzman
President

STATE OF TEXAS §
COUNTY OF HIDALGO §

This instrument was acknowledged before me on the 12th day of July, 2019, by Rosendo Guzman the President of the Board of Directors of DONNA IRRIGATION DISTRICT, HIDALGO COUNTY NUMBER ONE, a political subdivision of the state of Texas, on behalf of said political subdivision.

Linda Krummel
Notary Public in and for the State of Texas

Appendix F
Letters of Support

City of Donna
The Heart of the Valley

November 1, 2021

Ms. Nora Zapata
General Manager
Donna Irrigation District
PO Box 775
Donna, TX 78537-0775
donnaid747@hotmail.com

Re: Letter of Support for Donna Irrigation District Grant Application to the US Bureau of Reclamation, WaterSMART: Water and Energy Efficiency Grants for fiscal year (FY) 2022 - Funding Group II

Dear Ms. Zapata,

The City of Donna supports the District's efforts to conserve water through a WaterSMART Grant. Conservation of the area's limited water resources benefits all users in the Lower Rio Grande. In addition, the project will conserve water and energy, resulting in the lowest possible water rates for the City of Donna while having a positive impact on the environment. Therefore, the City of Donna supports the WaterSMART application to help fund the lining of the North Crossover Main Canal and East Main Canal project.

Respectfully,
City of Donna

Carlos Yerena
City Manager, City of Donna

cc: Frank A. Ferris, PE

NORTH ALAMO WATER SUPPLY CORPORATION
3/8 MILE S OF SH 107 ON DOOLITTLE ROAD
420 S DOOLITTLE RD EDINBURG TX 78542-9707

TELEPHONE 956-383-1618
FAX 956-383-1372

October 29, 2021

Ms. Nora Zapata
General Manager
Donna Irrigation District
PO Box 775
Donna, TX 78537-0775
donnaid747@hotmail.com

Re: Letter of Support for Donna Irrigation District Grant Application to the US Bureau of Reclamation, WaterSMART: Water and Energy Efficiency Grants for fiscal year (FY) 2022 - Funding Group II

Dear Ms. Zapata,

North Alamo Water Supply Corporation (NAWSC) relies heavily upon the District for delivery of water for treatment. As such, we support the District's continued efforts to secure funding to modernize the system. The improvements will result in water conservation to help keep our delivery rates as low as possible. Therefore, North Alamo Water Supply Corporation supports the lining of the North Crossover Main Canal and East Main Canal through a WaterSMART Grant.

Respectfully,
North Alamo Water Supply Corporation

Steven P. Sanchez
General Manager
ssanchez@nawsc.com

cc: Frank A. Ferris, PE

Appendix G
Greenhouse Gas Emissions Calculation

Calculation of Greenhouse Gas Emission Reduction

Greenhouse Gas Emissions District Vehicles:

2010 Ford F150

Vehicle	EPA Fuel Economy	Greenhouse Gas Emissions (tailpipe)
2010 Ford F150 Pickup 4WD FFV 5.4 L, 8 cyl, Automatic 6-spd, Regular Gasoline or E85		
	Reg **Gas 15 MPG 14 18 combined city/hwy city hwy 6.7 gal/100 mi**	592 grams/mile

Trip Distance from District Office to First Lift Pump Station: 8.4 miles

4 trips / day = 4 trips * 8.4 miles

total miles driven per day = 33.60 miles / day

* total miles driven per year = 12,264 miles / year

Trip Distance from District Office to Second Lift Pump Station: 4.4 miles

4 trips / day = 4 trips * 4.4 miles

total miles driven per day = 17.60 miles / day

* total miles driven per year = 6,424 miles / year

TOTAL MILES / YR = 18,688 miles / year

Greenhouse Gas Emissions = 592 grams / mile * 18,688 miles / year

Greenhouse Gas Emissions = 11,063,296 grams of CO2 / year

TOTAL Reduced Greenhouse Gas Emissions = 11.06 Metric Tons / year

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**Assumed 4 trips per day for 365 days.*

Appendix H
Energy Conservation

Total kWh	Total Cost	Overall Cost/kWh	Total Acre-Feet Pumped	Cost/Acre-Foot	kWh/Acre-Foot
26,263,003	$ 522,695.43	$ 0.020	192,458.18	$ 2.716	136.46

Annual Savings from Improvements at First Lift		
Water Savings	4620 Acre-feet	
E Savings	630,449 kWh	
% E Savings	6.40%	
Cost Savings @ First Lift		$ 12,547.42

The Second Lift has the same lift in feet as the first. All of the water conserved by the project will be relifted at the Second Lift with similar equipment and power cost. The total cost saving will be double the energy savings at the First Lift.

Total Project Annual Energy Savings	1,260,898 kWh
Total Project Annual Energy Cost Savings	$ 25,094.83

Note: Months with incomplete data are omitted. kWh for gas are based on raw avaialable energy in gas by converting BTU to to kWh.

Month	Total Energy Consumption			Acre Feet Pumped	Cost/Acre Foot	kWh/Acre Foot
	kWh	Cost	Cost/kWh			
Jan-18	1,084,803	$ 14,006.82	$ 0.013	5,265.30	$ 2.660	206.03
Feb-18	785,257	$ 17,287.22	$ 0.022	6,524.20	$ 2.650	120.36
Mar-18	1,141,436	$ 19,528.85	$ 0.017	11,117.40	$ 1.757	102.67
Apr-18	1,300,395	$ 21,090.22	$ 0.016	8,920.10	$ 2.364	145.78
May-18	1,633,160	$ 28,416.35	$ 0.017	10,922.20	$ 2.602	149.53
Jun-18	1,086,324	$ 17,536.59	$ 0.016	11,539.10	$ 1.520	94.14
Jul-18	1,352,202	$ 23,682.68	$ 0.018	8,832.70	$ 2.681	153.09
Aug-18	992,477	$ 17,295.81	$ 0.017	6,795.50	$ 2.545	146.05
Sep-18	414,988	$ 10,799.31	$ 0.026	4,266.80	$ 2.531	97.26
Oct-18	396,580	$ 8,682.53	$ 0.022	1,995.30	$ 4.351	198.76
Nov-18	479,905	$ 10,196.24	$ 0.021	2,048.70	$ 4.977	234.25
Dec-18	386,628	$ 11,925.90	$ 0.031	2,206.40	$ 5.405	175.23
Jan-19	1,149,013	$ 19,404.54	$ 0.017	7,245.30	$ 2.678	158.59
Feb-19	916,398	$ 16,268.87	$ 0.018	5,328.13	$ 3.053	171.99
Mar-19	519,312	$ 13,119.22	$ 0.025	4,930.85	$ 2.661	105.32
Apr-19	841,894	$ 18,561.53	$ 0.022	5,530.24	$ 3.356	152.23
May-19	807,927	$ 21,558.86	$ 0.027	5,904.31	$ 3.651	136.84
Jun-19	1,178,876	$ 26,338.45	$ 0.022	11,638.43	$ 2.263	101.29
Sep-19	382,435	$ 9,200.64	$ 0.024	1,835.40	$ 5.013	208.37
Oct-19	477,229	$ 12,211.05	$ 0.026	3,046.60	$ 4.008	156.64
Nov-19	407,998	$ 25,205.87	$ 0.062	4,213.62	$ 5.982	96.83
Feb-20	1,395,972	$ 21,105.42	$ 0.015	10,726.44	$ 1.968	130.14
Mar-20	917,200	$ 16,172.69	$ 0.018	5,316.38	$ 3.042	172.52
Apr-20	1,299,033	$ 21,712.65	$ 0.017	8,702.42	$ 2.495	149.27
May-20	1,264,088	$ 21,010.08	$ 0.017	11,311.99	$ 1.857	111.75
Jun-20	489,415	$ 10,462.04	$ 0.021	3,516.15	$ 2.975	139.19
Jul-20	1,101,578	$ 11,549.30	$ 0.010	6,436.10	$ 1.794	171.16
Aug-20	42,080	$ 6,807.18	$ 0.162	2,436.80	$ 2.793	17.27
Sep-20	413,954	$ 12,413.04	$ 0.030	1,941.80	$ 6.393	213.18
Oct-20	477,250	$ 14,097.49	$ 0.030	4,871.43	$ 2.894	97.97
Nov-20	715,267	$ 13,896.45	$ 0.019	4,074.49	$ 3.411	175.55
Dec-20	411,928	$ 11,151.54	$ 0.027	3,017.60	$ 3.695	136.51

Month	Electricity Consumption				
	Cirro Energy - 300 Reliant - 311		Cirro Energy - 301 Reliant - 312		
	kWh	Cost	kWh	Cost	Cost/kWh
Jan-18	440	101.65	0	$ 612.28	$ 1.62
Feb-18	1,560	$ 292.29	81,792	$ 5,562.89	$ 0.07
Mar-18	1,720	$ 302.33	101,952	$ 6,465.18	$ 0.07
Apr-18	1,560	$ 283.31	80,832	$ 5,582.39	$ 0.07
May-18	1,760	$ 531.60	73,728	$ 7,683.98	$ 0.11
Jun-18	1,400	$ 57.30	79,104	$ 3,237.51	$ 0.04
Jul-18	2,080	$ 395.58	91,968	$ 6,117.34	$ 0.07
Aug-18	1,920	$ 336.53	45,696	$ 4,026.40	$ 0.09
Sep-18	1,760	$ 316.00	38,976	$ 3,896.72	$ 0.10
Oct-18	1,520	$ 287.91	0	$ 1,261.22	$ 1.02
Nov-18	1,320	$ 468.66	0	$ 1,261.22	$ 1.31
Dec-18	1,240	$ 293.74	0	$ 2,522.44	$ 2.27
Jan-19	1,640	$ 309.80	0	$ -	$ 0.19
Feb-19	1,400	$ 189.25	3,840	$ 2,483.25	$ 0.51
Mar-19	280	$ 11.46	63,600	$ 4,857.71	$ 0.08
Apr-19	400	$ 151.44	97,680	$ 6,407.96	$ 0.07
May-19	440	$ 282.29	145,440	$ 10,624.35	$ 0.07
Jun-19	480	$ 18.15	191,040	$ 11,604.99	$ 0.06
Sep-19	240	$ 115.65	3,840	$ 2,591.52	$ 0.66
Oct-19	240	$ 114.91	32,400	$ 4,615.27	$ 0.14
Nov-19	360	$ 126.01	62,400	$ 18,542.40	$ 0.30
Feb-20	480	$ 72.04	53,520	$ 5,442.80	$ 0.10
Mar-20	440	$ 56.40	67,440	$ 6,301.48	$ 0.09
Apr-20	520	$ 65.00	143,520	$ 9,940.70	$ 0.07
May-20		$ 69.76	81,840	$ 8,242.00	$ 0.10
Jun-20	280	$ 27.74		$ 3,980.92	$ 14.32
Jul-20	960	$ 85.00	3,360	$ 635.26	$ 0.17
Aug-20	320	$ 39.00	41,760	$ 3,987.80	$ 0.10
Sep-20	240	$ 25.70	94,560	$ 6,460.49	$ 0.07
Oct-20	320	$ 33.40	116,160	$ 8,174.92	$ 0.07
Nov-20	400	$ 39.97	15,600	$ 2,572.34	$ 0.16
Dec-20	280	$ 29.01	48,240	$ 4,324.01	$ 0.09

Month	Gas Consumption				
	Fowler			Texas Gas Service	Gas Total
	MMBtu	kWh	Cost	Cost	Cost/kWh
Jan-18	3,700	1,084,363	$ 10,619.00	$ 2,673.89	$ 0.012
Feb-18	2,395	701,905	$ 9,436.30	$ 1,995.74	$ 0.016
Mar-18	3,541	1,037,764	$ 9,985.62	$ 2,775.72	$ 0.012
Apr-18	4,156	1,218,003	$ 12,384.88	$ 2,839.64	$ 0.012
May-18	5,315	1,557,672	$ 16,582.80	$ 3,617.97	$ 0.013
Jun-18	3,432	1,005,820	$ 11,119.68	$ 3,122.10	$ 0.014
Jul-18	4,293	1,258,154	$ 13,823.46	$ 3,346.30	$ 0.014
Aug-18	3,224	944,861	$ 9,865.44	$ 3,067.44	$ 0.014
Sep-18	1,277	374,252	$ 4,035.32	$ 2,551.27	$ 0.018
Oct-18	1,348	395,060	$ 4,556.24	$ 2,577.16	$ 0.018
Nov-18	1,633	478,585	$ 5,813.48	$ 2,652.88	$ 0.018
Dec-18	1,315	385,388	$ 6,540.56	$ 2,569.16	$ 0.024
Jan-19	3,915	1,147,373	$ 15,842.82	$ 3,251.92	$ 0.017
Feb-19	3,109	911,158	$ 10,547.07	$ 3,049.30	$ 0.015
Mar-19	1,554	455,432	$ 4,708.88	$ 3,541.17	$ 0.018
Apr-19	2,538	743,814	$ 7,639.45	$ 4,362.68	$ 0.016
May-19	2,259	662,047	$ 6,526.38	$ 4,125.84	$ 0.016
Jun-19	3,369	987,356	$ 9,701.12	$ 5,014.19	$ 0.015
Sep-19	1,291	378,355	$ 3,185.00	$ 3,308.47	$ 0.017
Oct-19	1,517	444,589	$ 3,970.20	$ 3,510.67	$ 0.017
Nov-19	1,178	345,238	$ 3,308.94	$ 3,228.52	$ 0.019
Feb-20	4,579	1,341,972	$ 9,524.32	$ 6,066.26	$ 0.012
Mar-20	2,898	849,320	$ 5,940.90	$ 3,873.91	$ 0.012
Apr-20	3,941	1,154,993	$ 7,251.44	$ 4,455.51	$ 0.010
May-20	4,034	1,182,248	$ 8,189.02	$ 4,509.30	$ 0.011
Jun-20	1,669	489,135	$ 3,271.24	$ 3,182.14	$ 0.013
Jul-20	3,744	1,097,258	$ 6,477.12	$ 4,351.92	$ 0.010
Aug-20	0	0	$ -	$ 2,780.38	
Sep-20	1,089	319,154	$ 3,070.98	$ 2,855.87	$ 0.019
Oct-20	1,231	360,770	$ 2,942.09	$ 2,947.08	$ 0.016
Nov-20	2,386	699,267	$ 7,682.92	$ 3,601.22	$ 0.016
Dec-20	1,240	363,408	$ 3,844.00	$ 2,954.52	$ 0.019

Appendix I
Lower Rio Grande Valley
National Wildlife Refuge

U.S. Fish & Wildlife Service
(https://www.fws.gov/)

Search
All Refuges

Lower Rio Grande Valley (/refuge /Lower_Rio_Grande_Valley/)

National Wildlife Refuge | Texas

A UNIT OF THE National Wildlife Refuge System
(https://www.fws.gov/refuges/)

Resource Management

RESOURCE MANAGEMENT (/REFUGE/LOWER_RIO_GRANDE_VALLEY /WHAT_WE_DO/RESOURCE_MANAGEMENT.HTML)

Creating a Wildlife Corridor (/refuge/Lower_Rio_Grande_Valley /resource_management/wildlife_corridor.html)

Restoring Habitat (/refuge/Lower_Rio_Grande_Valley/resource_management /restoring_habitat.html)

Wetlands Management (/refuge/Lower_Rio_Grande_Valley/resource_management /wetlands_management.html)

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Wetlands Management

For centuries, the Rio Grande regularly flowed over its banks. The river would blanket the Lower Rio Grande Valley and, over centuries, would inevitably alter its own course. The seasonal floods would replenish historic river channels locally known as resacas and spread rich nutrients assuring life for the river's floodplain forests.

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Last Updated: [illegible] 2012

The Rio Grande's waters would find their way from Colorado to the Gulf of Mexico. The spring snow melt flowed into the Rio Grande joining other river flows along the way and bringing seasonal flood waters to the most southern tip of Texas. The Rio Grande would physically move during large flood events and shift its position, leaving its former channel to become a distributary channel. These channels acted as a conduit for moving water to the Gulf of Mexico and were former locations of the Rio Grande channel. When overflowing its main and distributary channel banks, the Rio Grande would carve new river channels (oxbows) locally known as "resacas." During high flood events, the Rio Grande delta would have been inundated with slow moving water. As the river retreated, the newly formed resacas and rich soils brought by the flooding would remain. This helped establish the resacas and its lush, tall trees such as Texas ebony, anacua, tepeguaje, sugar hackberry, cedar elm and Rio Grande ash, which make up the majority of the floodplain forest community. From a bird's eye view the resacas look like a series of unconnected horseshoe-shaped bends that line the final stretch of the river.

With human settlement came the need to curb the flooding, as well as the need to access fresh river water. Soon after, an impressively engineered system of irrigation canals and levees allowed people to prosper on the farming of the rich soils. In 1953, Falcon Dam was built to tame the Rio Grande and prevent flooding in the lower delta of the Rio Grande Valley. It was one of many agreements that would dam and divert river waters further upstream. Today many Resaca's now serve as storm water reservoirs, irrigation district reservoirs, irrigation channels, residential lakes and farm land. Today, tracts of the Lower Rio Grande Valley National Wildlife Refuge resemble islands in a sea of cleared and altered lands. Each year resacas on the refuge are identified for restoration based on funding, resources on hand, needed management and acreage. The more than 1,300 acres of resaca and floodplain forest habitat on the refuge remind us of what the land used to look like.

Based on pre-dam hydrologic flow records of the Rio Grande, refuge staff maintain this living piece of history by mimicking the historic flood seasons of the Rio Grande. Pumps, pipelines, valves and adjudicated water rights are used to draw waters from the river and delivered to the resacas and floodplain forests during flow peaks in spring (May – June) and fall (September – October). Conversely, as happened historically, the resaca's are allowed to dry out at other times of the year. During this time, biologists use an integrated management approach utilizing herbicide, fire, mechanical treatments and active water management to control invasive and exotic plants so that when the waters return, the resacas will be rich with native plants beneficial to wildlife.

During the summer months, resacsa are managed to provide breeding, nesting, brood rearing and feeding habitats for resident species such as mottled ducks, black- bellied and fulvous whistling ducks, rails, gallinules, least bitterns, grebes, moorhens, coots, kingfishers, wading and neo-tropical birds, butterflies, dragonflies, invertebrates, amphibians, reptiles and water dependent wildlife. In the winter, resacas are maintained to provide habitat for resident species and optimal migration stopover, resting and feeding habitats for migrating and wintering waterfowl, wading and shore birds.

While nature did it best, the refuge's seasonal management efforts ensure continued life for the resacas and floodplain forests. They provide year-round habitat for birds, watering holes for willdife and homes for a fascinating medley of insects, reptiles and amphibians.

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Leopardus pardalis

The ocelot is a small wild cat that is a management priority for the Lower Rio Grande Valley National Wildlife Refuge. Restoring and protecting habitat benefits this and many other species found in this biologically rich region.

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Ocelots

Ocelots are beautiful spotted cats that once roamed from South Texas up into Arkansas and Louisiana.

These wild cats are a management priority for the Lower Rio Grande Valley National Wildlife Refuge. Current estimates are that fewer than 50 of these wild cats are left in the U.S., with all of them residing in South Texas.

The single greatest threat to ocelots is loss of habitat. They have no place to go because the native vegetation has been cleared making it hard for them to establish new territories, find the shelter they need to rest, feed and raise their young. That is why habitat restoration is a priority for the refuge. Creating a wildlife corridor and restoring habitat is not just good for ocelots, it's good for all wildlife species that evolved to depend on the south Texas habitat, 95% of which has been cleared in deep South Texas.

The Fish and Wildlife Service is the lead agency responsible for the recovery of this species and works with many partners, public and private, to ensure this beautiful cat will grace the Texas landscape for generations to come.

When visiting the refuge, you may be one of the lucky few to actually see an ocelot. They are quite different than bobcats, another cat species that they are often confused with. Ocelots are smaller than bobcats and have a longer tail. They stand about a foot high and the adults weigh 15-30 pounds and measure about 3' long from their nose to the tip of their tail. They have a long ringed or barred tail and their rounded ears are black with a single, large white spot.

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Last Updated: Jul 22, 2012

Do you know the difference between an ocelot and bobcat (/uploadedFiles/Ocelot ID Guide_508.pdf)?

Helpful Links

Ocelot Recovery Plan (https://www.fws.gov/southwest/es/Documents /R2ES/Draft_Ocelot_Recovery_Plan-First_Revision.pdf)
Adopt An Ocelot (http://www.friendsofsouthtexasrefuges.org/?id=253)
Ocelot Conservation Festival (http://www.friendsofsouthtexasrefuges.org /default.asp?id=274)

What to do if you do see an ocelot (dead or alive)

Please immediately call any of the following phone numbers:

- Law Enforcement Dispatch: (956)784-7608 or 7520
- After Hours Law Enforcement Dispatch: (956)874-4664
- Laguna Atascosa National Wildlife Refuge: (956)748-3607
- Santa Ana National Wildlife Refuge (https://www.fws.gov/refuge /Santa_Ana/): (956)784-7500

Provide important information, including your name and a phone number where you can be reached. The location, time and type of sighting (dead or alive). Identifying marks that confirm it was an ocelot and not a bobcat. Directions to the location and details of the site.

If you find a dead ocelot, please stay with the carcass if you can until FWS arrives. If you are not able to stay, please photograph the carcass and move it off the road so that it is not visible to passersby. Be sure to let FWS know exactly where to find the carcass so they can retrieve it and collect important information such as internal tags and genetic information.

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