H.C.I.D. NO 2 LINING OF THE LATERAL E CANAL

May 7, 2018

APPLICANT:

Hidalgo County Irrigation District No. 2
P.O. Box 6
San Juan, TX 78589

PROJECT MANAGER:

Alfonso A. Gonzalez, P.E.
Perez Consulting Engineers, LLC
808 Dallas Avenue
McAllen, TX 78501
PH: (956) 631-4482
aag@perezce.com

November 2016. Lining of the H.C.I.D.2's Alamo Main Canal, a project funded in part with resources from the U.S. Bureau of Reclamation – Water & Energy Efficiency Grants. Black synthetic geocomposite liner under the steel reinforcement. The concrete crew ready to wrap up the day.

Table of Contents

Exhibits

1. D.2.2.4 EXECUTIVE SUMMARY

May 7th, 2018

The Hidalgo County Irrigation District No.2, hereby the applicant, seeks consideration for approval of Funding Opportunity Announcement (FOA) BOR-DO-18-F006 **under Section B.2.2. Funding Group II** to implement the funds towards a Water Conservation Project. With its main office in San Juan, Texas, the Hidalgo County Irrigation District No.2's encompasses approximately 71,000 acres of land in the Lower Rio Grande Valley within the south-central portion of the Hidalgo County, Texas; refer to the District's General Location Map Figure 1. The District is an active member of the Rio Grande Regional Water Planning Group, Rio Grande Regional Water Authority (RGRWA), Lower Rio Grande Water District Managers' Association, Texas Irrigation Council, Texas Water Conservation Association, Lower Rio Grande Water Committee, Inc., and the Rio Grande Watermaster Advisory Committee

The District proposes to line the Lateral E Canal with synthetic geocomposite membrane covered with three (3) inches of reinforced concrete apron to reduce water losses to seepage, eliminate canal leaks, and improve the canal efficiency. The lining project will **begin on the east side of S. Cynthia Street at approximately 1/3 of a mile east of 2nd St. (Col. Rowe Blvd.) and 3/4 of a mile south of U.S. Expressway 83 (Interstate 2) in McAllen, TX, and end at the headgate of the Alamo Main Canal located approximately 1/3 of a mile east of S. Nebraska Avenue and 1.8 miles south of U.S. Expressway 83 (Interstate 2) in San Juan, TX**; refer to Figure 4. The District proposal meets the eligibility criteria of Section C.3.1.1. "Water Conservation Projects" by offering a solution that will provide water conservation, support water supply reliability, complement on-farm water conservation practices, and improved energy efficiency. Project funds will be applied towards the total project cost including but not limited to materials, professional services, construction services, and incidentals needed for the completion of the project. The District's proposal will conserve approximately **1,110 ac – ft / yr** of water and **158,400 KW-HR / YR** of electrical power not needed from the grid to lift and deliver the conserved water into the Lateral E Canal.

The District proposes to undertake the project in a single phase to reduce administrative and mobilization costs involved with construction services procurement policy. To accomplish the goal, the District will have to begin with the engineering design in the Fall of 2018 and follow with its construction beginning in mid to late summer 2019 to complete the project in early 2020. The total estimated project cost is $ 7,040,831.10. The District has capability to commit 85.80% of the of total project cost using funds from the District's Capital Improvements Fund. The District plans to apply $1,000,000.00 from grant monies as follows:

FY 2018	$250,000.00
FY 2019	$500,000.00
FY 2020	$250,000.00

The project is located within the District's right of way and complies with all environmental and cultural resources requirements.

The District comprehensively assessed the implementation of hydropower and determined that the geographical conditions and key components for successful implementation of hydropower technology are unavailable. A summary of the District's assessment can be found in section E.1.3. EVALUATION CRITERION C - Implementing Hydropower.

2. D.2.2.4 BACKGROUND DATA

The Hidalgo County Irrigation District No.2 (District) was originally created as a water improvements district by order of the commissioners' court of the Hidalgo County Texas on April 26, 1920. Today the District functions as a political subdivision of the State of Texas operating under the provisions of Chapter 58, Title 4 of the Texas Water Code and Article XVI, Section 59 of the State of Texas Constitution. The District is located within the Lower Rio Grande Valley in the south-central portion of the Hidalgo County, Texas; refer to the District's General Location Map Figure 1. Hidalgo County is one of the eight counties within the Rio Grande Regional Water Planning Group. The State of Texas assigned the letter M to the Rio Grande Regional Water Planning Group also known as Region M corresponding to one of sixteen (16) local bodies established under Senate Bill No. 1 (SB 1) to coordinate long term water supply planning; Figure 2 provides the map of Region M. The District encloses approximately 71,000 gross acres of land around the cities of Pharr, San Juan, and Alamo Texas; refer to the Service Area Map Figure 3. The City of McAllen borders the western edge of the District and the City of Edinburg the northwestern edge.

The District holds water rights to divert from the Rio Grande 137,775 acre -foot per year for irrigation purposes, and 12,732 acre-foot per year for domestic, municipal, and industrial (dmi) use.

In addition, the District holds 6,140 acre -foot per year of dmi water rights for the City of McAllen, 4,710 acre -foot per year of dmi water rights for the City of Pharr, 2,030 acre -foot per year of dmi water rights for the City of San Juan, and 1,202 acre -foot per year of dmi water rights for the City of Alamo.

The District also contracts with the City of McAllen, City of Pharr, City of San Juan, City of Alamo, City of Edinburg, and the North Alamo Water Supply Corporation, a rural water supplier, to deliver raw water for dmi use.

The District currently serves 39,731 acres of farmland and has 1,399 active irrigation accounts. The current average annual irrigation water demand is 50,231 acre - foot per year. The current annual domestic, municipal, and industrial water demand is 28,044 acre - foot. The District projects a slow decrease in the demand of irrigation water due to the continuous conversion of farmland to residential, commercial, and/or industrial development within the District's boundaries. The projected irrigation water demand by 2020 is 45,062 acre - foot per year. The population of the Rio Grande Valley is projected to double over the next 50 years; therefore, the District projects an increase in the demand of raw water for municipal and industrial use. The projected municipal and industrial water demand by 2020 is 34,480 ac – ft / yr.

Water rights for the Lower Rio Grande were adjudicated by the State of Texas in the late sixties to domestic, municipal, industrial, and agricultural users. Year round, surface water from the Rio Grande is high in demand for domestic, municipal, industries and irrigation (agriculture) use. The surface water from the Rio Grande is always in **potential for shortfall**. In the mid nineties, and again in 2011 through the present, the State of Texas suffered a state-wide drought. As an alternative to surface water, the municipalities of the Rio Grande Valley became interested in ground water. For the most, ground water in the Rio Grande Valley is brackish. Few municipalities in the Rio Grande Valley have access to a reliable source of ground water. Some municipalities have been able to make use of the brackish water by blending it with surface water to meet the regulating body

requirements for drinking water. Though this practice is only performed to meet the seasonal high demands (summer months). Based on the state approved 2016 Region M's Regional Water Plan, copy of which can be obtained from http://www.riograndewaterplan.org/ water plan the population within Region M is projected to double by 2070. Therefore, the surface water from the Rio Grande will continue to be in potential for shortfall for years to come.

The primary use of the District's water is for agriculture (irrigation) use. The main crops grown within the District consist of citrus (grapefruit and oranges), sugarcane, cotton, grain sorghum, vegetables (cabbage, onions, and carrots), and pasture.

The District major facilities consist of the following:

River Pumping Plant
Re-Lift Pumping Plant
Unit I – 7 Booster Pump Station
334.9 acre (1,800 acre – foot) Settling Basin
21 miles of lined canals
46 miles of earthen canals
227 miles of pipelines
74 miles of open drainage canals (drainage ditches)
80 miles of drainage pipelines

The District delivers an average annual volume of 40,000 ac - ft., thru the Lateral E Canal. The District uses an average of 7.8 MKW-HR / YR of power from the grid of which 4.5 MKW-HR /YR are utilized to deliver water to the Lateral E Canal. Water is lifted at two locations before it reaches the Lateral E Canal. First water is lifted from the Rio Grande at the River Pumping Plant thence at the Re-Lift Pumping Plant located at approximately 700 feet South of El Rancho Ave on the East side of 2nd Street in McAllen, TX.

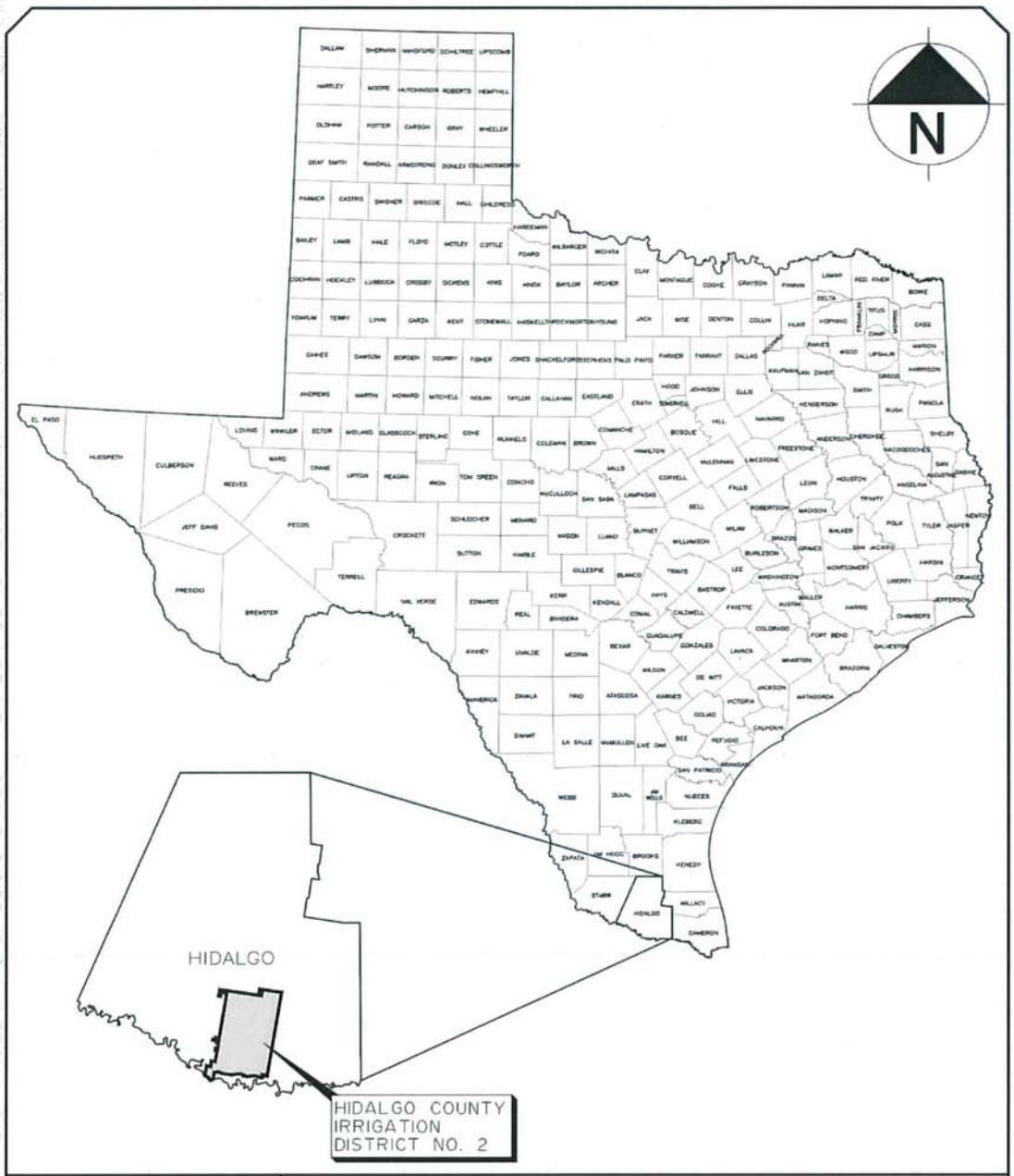
The District has had the opportunity in the past to work with the U.S. Bureau of Reclamation and firmly believes the District's proposal is eligible and satisfies all criteria under Funding Group II. Below is a list of the most recent projects on which the District has had the opportunity to work together with the U.S. Bureau of Reclamation.

Project Name	Status	Project Description
River Pump Station	Completed in 1983	Construction of the River Pump Station.
Wisconsin Canal Improvements	Completed in 2004	Replacement of the open canal with a 48" r.c.p. with flexible joints.
Re-lining of Lateral A Canal	Completed in 2005	Relining of the canal using 8-20-8 geocomposite liner covered with 3" of shotcrete.

Replacement of Unit I – 18	Completed in 2009	Replacement of an existing concrete mortar joint pipe-line with r.c.p. w/ flex-joints.
Rehabilitation of the Lateral E Canal	Completed in 2012	Replacement of the existing check gates with integrated Rubicon Flume ™ Gates to operate the canal facility in real time.
Rehabilitation of the Lateral A Canal	Completed in 2013	Replacement of the existing check gates with integrated Rubicon Flume ™ Gates to operate the canal facility in real time.
Rehabilitation of the Alamo Main Canal (Agreement R15AP00108)	Completed in 2017	Replacement of the existing check gates with integrated Rubicon Flume ™ Gates to operate the canal facility in real time, lining, and renewable energy.

3. D.2.2.4 PROJECT LOCATION

The Lateral E Canal begins in the East side of 2nd Street (Col. Rowe Blvd.) at approximately 3/4 (0.75) of a mile South of U.S. Expressway 83 in McAllen Texas. From this point the canal heads East 4.5 linear miles to end at the headgate of the Alamo Main Canal located approximately 1.3 miles South of U.S. Highway 83 (Business 83) and a quarter of a mile East of Nebraska Avenue in the City of San Juan Texas. The total canal length including bends is 5.1 miles. The water conservation project (lining project) will begin on the east side of S. Cynthia Street at approximately 1,300 linear feet east of 2nd Street in McAllen Texas and end at the headgate of the Alamo Main Canal all as indicated in Figure 4.



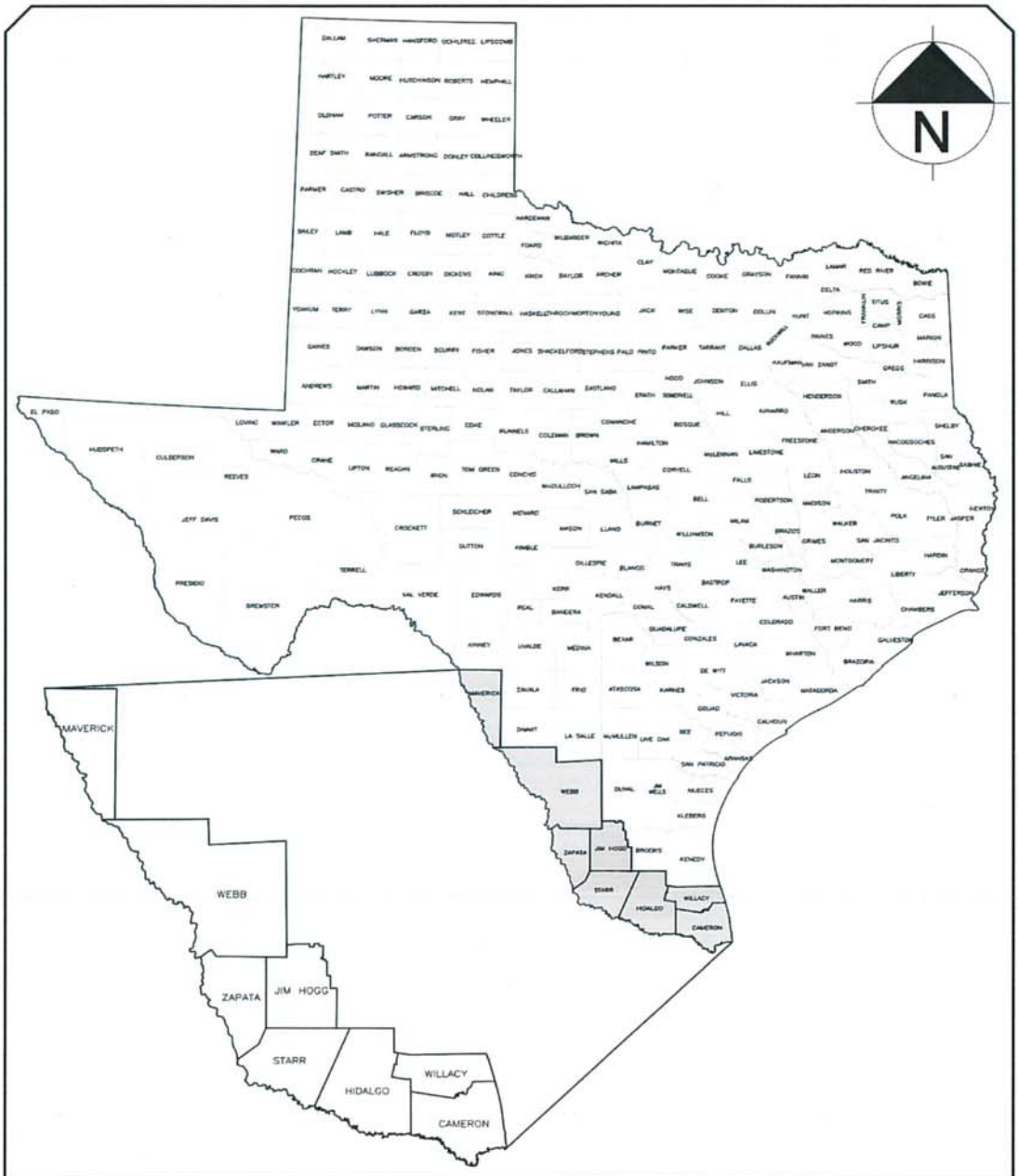
PCE
Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
809 Dallas Ave. McAllen, Texas 78501
(956) 631-4462

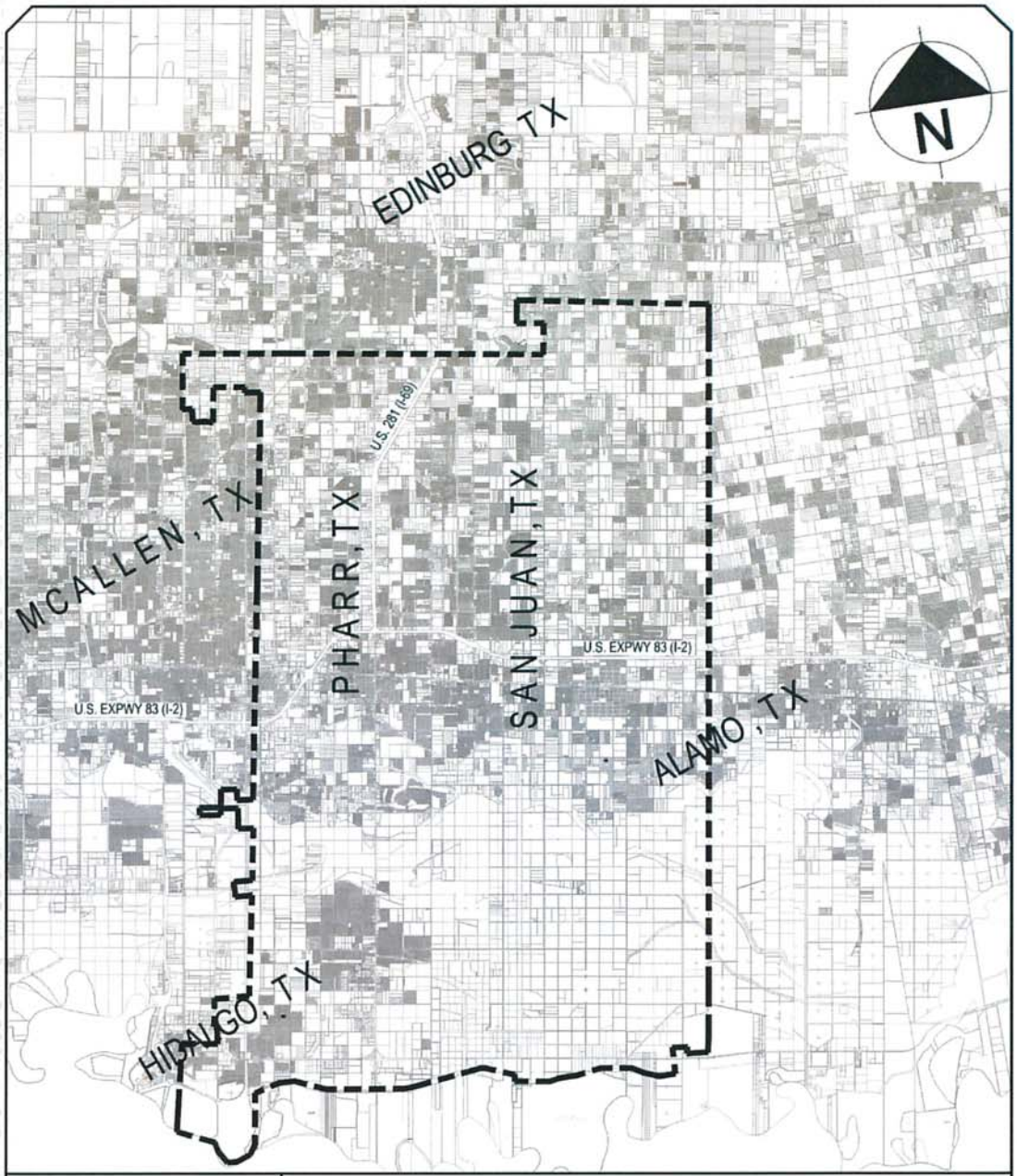
HIDALGO COUNTY, TEXAS

HIDALGO COUNTY IRRIGATION DISTRICT NO. 2

GENERAL LOCATION MAP OF DISTRICT BOUNDARY

FIGURE NO. 1


N
MAVERICK
WEBB
ZAPATA
JIM HOGG
STARR
HIDALGO
WILLACY
CAMERON
PCE
Perez Consulting Engineers
HIDALGO COUNTY, TEXAS
HIDALGO COUNTY IRRIGATION DISTRICT NO. 2
GENERAL LOCATION MAP OF REGION M
AND COUNTIES THAT COMPOSE IT
FIGURE NO. 2


N
EDINBURG TX
MCALLEN, TX
PHARR, TX
U.S. 281 (I-69)
SAN JUAN, TX
ALAMO, TX
U.S. EXPWY 83 (I-2)
U.S. EXPWY 83 (I-2)
HIDALGO, TX
PCE
Perez Consulting Engineers
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482
HIDALGO COUNTY IRRIGATION DISTRICT NO 2
SERVICE AREA MAP
FIGURE NO. 3

4. D.2.2.4 TECHNICAL PROJECT DESCRIPTION

The Lateral E Canal is the primary water conveyance facility for the District's Northeast Quadrant. Through the Lateral E Canal, the District has capacity to service 12,464 acres of farmland and deliver 20,555 acre-ft per year of domestic raw water. In 2017, the District conveyed 39,696 ac-ft a total water volume (combined irrigation and dmi water). It is estimated that in dry years the total water volume conveyed in the Lateral E Canal system can reach 50,000 ac-ft. The main laterals branching off the canal are as follows:

- The City of Pharr Reservoir. The District delivers water via a 36" pipe located 3,900 linear feet West of Cage Blvd. (U.S. 281) in Pharr, Texas.
- The South Main, a 42" pipeline located on the southeast side of S. San Antonio Ave. in San Juan TX.
- The Alamo Main Canal located at the end of the canal system.
- The Unit I-11, a 54" pipeline located at the end of the canal system.
- The North Main, a 42" pipeline located at the end of the canal system.

Water losses in the Lateral E Canal system manifest in several forms. The bulk volume is lost to seepage, followed by leaks through seasonal cracks or orifices in the earthen canal embankments. Indirect losses result from on- farm push water and occur out of the system **but are connected directly to reduced hydrostatic head (pressure) in the canal system**.

Seepage Losses

The Lateral E Canal embankments were constructed with the in-situ earthen material available adjacent to each side of the canal. At a later date, the interior side slopes and bottom of the canal were lined with three (3) inches of unreinforced concrete. The concrete liner has reached its service life and is currently found in deteriorated condition; refer to pictures 1 to 4. Horizontal cracks in the concrete liner stretch from the beginning to end of canal system. In some areas, the concrete liner is buckled, and some sections have broken, detached, and fallen to the bottom of the canal; refer to pictures 2 to 3. Water leaves the system through the fractures and cracks in the concrete liner. Once in contact with the earthen inner side slope, water seeps through the earthen embankments leaving the system.

Canal Leaks

With seasonal changes, fissures open in the earthen canal embankment with undesirable results. In numerous occasions, the adjacent land owners complain of dampness and standing water in their yard. When a leak is detected by the canal rider or reported by the adjacent land owner, the District is forced to reduce the hydrostatic pressure which is accomplished by lowering the operational water surface elevation in the canal; refer to picture 5. The canal hydrostatic pressure forces water through the small earthen orifices with scouring force to result in a severe leak; therefore, the District takes caution and reduces the operational water surface elevation in the canal pool until the leak is fixed. Lowering the hydrostatic pressure is also good conservation practice since it reduces the leakage rate. During high demand, the District operates up to three (3) weeks inefficiently, at low pressure. During the past 5 years, the district has repaired 42 leaks along the Lateral E Canal.

Push Water Losses

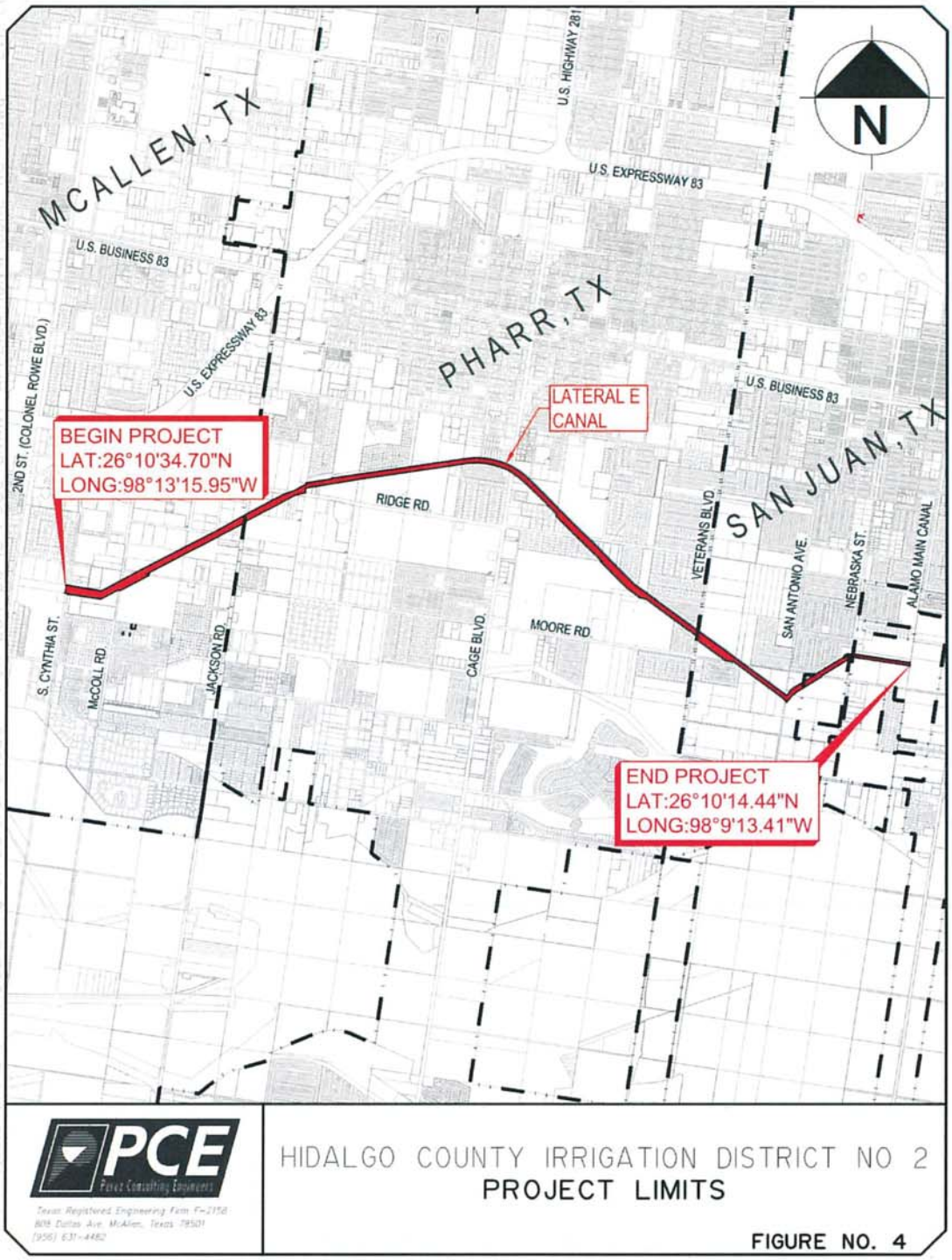
These are connected to the low canal pressure (hydrostatic head). Since the hydrostatic pressure has to be reduced to reduce the leakage rate, irrigation water users take longer to water their field

resulting in inefficient use of water resources. Water is pushed more efficiently through the field at higher canal pressure. The longer it takes the user to water the field the more water that seeps into the subsurface; therefore, resulting in water losses.

Proposed Improvements

To reduce water seepage losses and eliminate canal leaks, the District proposes to line the Lateral E Canal using **Canal 3 ® 8-20-8 geosynthetic membrane geocomposite** as manufactured by Huesker or equal. The geosyntetic membrane geocomposite consists of a top 8 oz polypropylene nonwoven geotextile bonded to 20-mils of a polyethylene geomembrane bonded to a bottom 8 oz polyester nonwoven geotextile. The top nonwoven polypropylene textile provides puncture resistance and the bottom 8 oz polyester nonwoven textile provides increased interface friction for improved adhesion to the existing canal surface. The existing unreinforced concrete liner will be power washed and cleaned. Exiting broken concrete liner sections and orifices will be patched to provide an even surface. The geocomposite liner will be installed over the cleaned surface and then covered with three (3) inches of reinforced concrete apron to secure it in place; **refer to Figure 5** Control joints will be constructed at every 10 feet, and expansion joints at every 50 feet. The reinforced concrete apron will protect the geocomposite from sharp objects and U.V. lighting. The canal will remain in service and the work area will be by-passed using portable pump units or other means. The work area will be pumped down and isolated with cofferdams. **The expected service life of the geosynthetic membrane geocomposite liner is fifty (50) years.** By lining the canal with **Canal 3 ® 8-20-8 geosynthetic membrane geocomposite (synthetic liner)**, the District will conserve water by significantly reducing seepage and the potential for canal blowouts. Water conserved will translate into energy savings by reduced pumping. The District has used **Canal 3 ® 8-20-8 geosynthetic membrane geocomposite** in the same manner with excellent results. In 2004, the District lined the Lateral A Canal with **Canal 3 ® 8-20-8 geosynthetic membrane geocomposite,** and in the spring of 2017 finished the lining of the Alamo Main Canal; both projects were completed with participation of the U.S. Bureau of Reclamation.

The District's lining proposal begins on the east side of S. Cynthia Street at approximately 1/3 of a mile east of 2nd St. (Col. Rowe Blvd.) and 3/4 of a mile south of U.S. Expressway 83 (Interstate 2) in McAllen, TX, and end at the headgate of the Alamo Main Canal located approximately 1/3 of a mile east of S. Nebraska Avenue and 1.8 miles south of U.S. Expressway 83 (Interstate 2) in San Juan, TX. Jackson Rd. to U.S. 281 (Cage Blvd. in Pharr, TX); refer to Figure 4. The project net lining length is estimated to be 23,655 linear feet long excluding road crossings.


MCALLEN, TX
PHARR, TX
SAN JUAN, TX
N
U.S. HIGHWAY 281
U.S. EXPRESSWAY 83
U.S. BUSINESS 83
2ND ST. (COLONEL ROWE BLVD.)
BEGIN PROJECT
LAT:26°10'34.70"N
LONG:98°13'15.95"W
LATERAL E CANAL
RIDGE RD.
VETERANS BLVD.
SAN ANTONIO AVE.
NEBRASKA ST.
ALAMO MAIN CANAL
S. CYNTHIA ST.
McCOLL RD.
JACKSON RD.
CAGE BLVD.
MOORE RD.
END PROJECT
LAT:26°10'14.44"N
LONG:98°9'13.41"W
PCE
Power Consulting Engineers
Texas Registered Engineering Firm F-2158
809 Dallas Ave. McAllen, Texas 78501
(956) 631-4482
HIDALGO COUNTY IRRIGATION DISTRICT NO 2
PROJECT LIMITS
FIGURE NO. 4

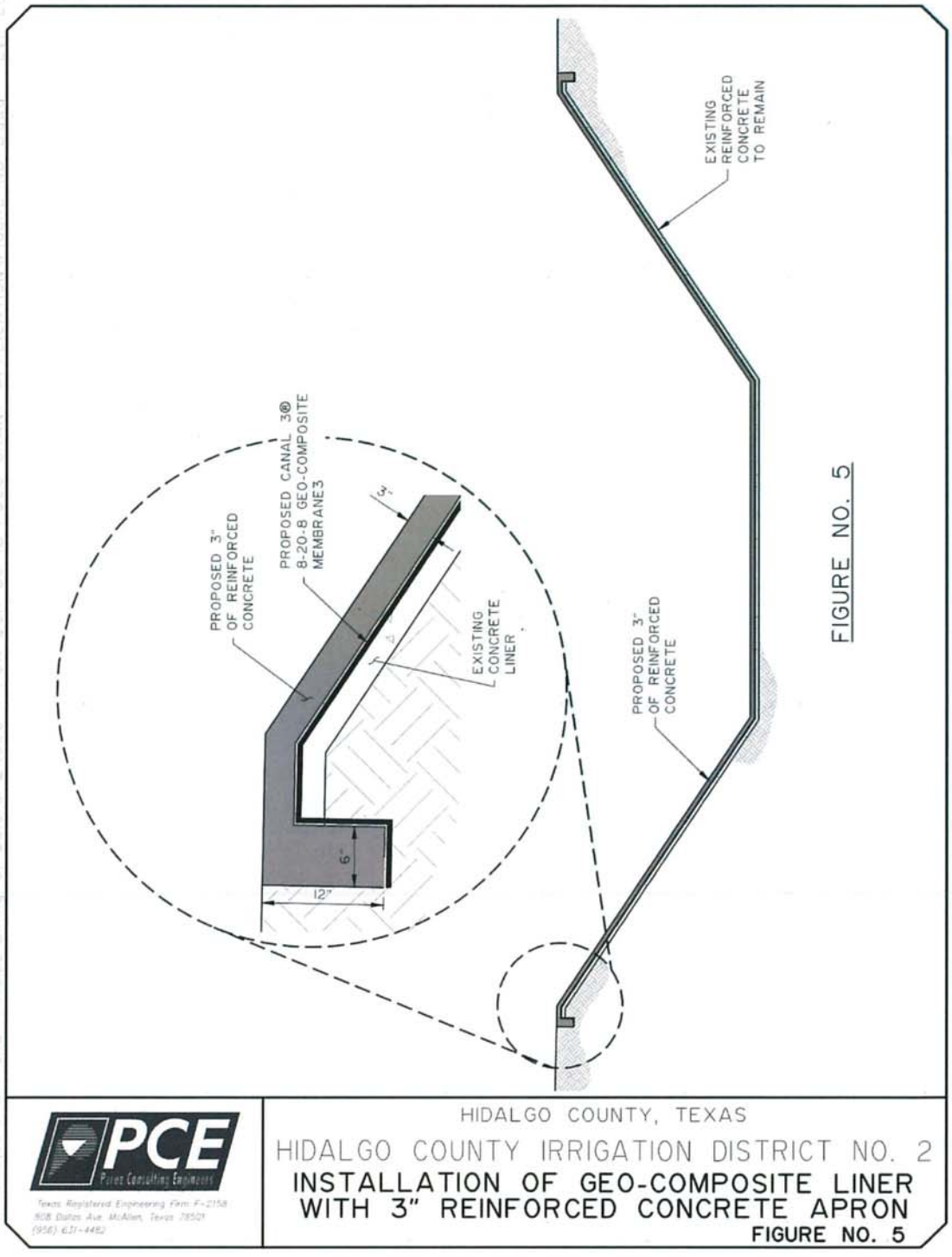
Picture 1. Visible horizontal cracks and an abandoned utility conduit.

Picture 2 Visible failure of unreinforced concrete liner.

Picture 3 Longitudinal crack and a buckled section of unreinforced concrete liner.

Picture 4 Broken section of liner.

Picture 5. April 9th, 2018 Lateral E Canal at approximately 1,200 linear feet southeast of Cage Blvd. (U.S. 281) in Pharr, Texas. Seen in the background, the District's repair crew working on a canal leak. The gray to white band in the concrete liner at approximately 12 inches below the grass line indicates the canal's operational water surface elevation.


EXISTING REINFORCED CONCRETE TO REMAIN
PROPOSED CANAL 3® 8-20-8 GEO-COMPOSITE MEMBRANE3
PROPOSED 3" OF REINFORCED CONCRETE
EXISTING CONCRETE LINER
PROPOSED 3" OF REINFORCED CONCRETE
6"
12"
FIGURE NO. 5
PCE
Parkes Consulting Engineers
Texas Registered Engineering Firm: F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482
HIDALGO COUNTY, TEXAS
HIDALGO COUNTY IRRIGATION DISTRICT NO. 2
INSTALLATION OF GEO-COMPOSITE LINER WITH 3" REINFORCED CONCRETE APRON
FIGURE NO. 5

5. E.1.1 EVALUATION CRITERION A - Quantifiable Water Savings

Estimated Water Savings
The estimated volume of water expected to be conserved as direct result of this project is **1,100 ac-ft / yr.** Below is a synthesis of the calculations.

Current Losses
Water system losses currently seep into the ground. In cases of a leak, water ponds adjacent to the canal, water is lost to evaporation and seepage. Excess leakage surface sheet-flow drains into the local storm drainage system. Water drained into the storm water system eventually reaches the Gulf of Mexico.

Support Documentation of Estimated Water Savings

a. The average annual water savings that will result from the project were determined by adding the estimated seepage losses plus losses to reduced hydrostatic head. Calculations and methods for determination of the calculated annual water savings are detailed in item b below.

b. *Seepage Losses:* The Lateral E Canal was constructed with sandy clay, the predominant soil in the region. In absence of a ponding test, the seepage rate used in calculating the water savings is 1.18 gal/ft^2-day corresponding to the seepage rate determined by Irrigation Technology Center, Texas A&M University System (ITC) after performing a ponding test at the Alamo Main Canal on November 20-22, 2003. The ponding test results are available at (http://idea.tamu.edu/documents/2004/tr324.pdf).

Exhibit A contains a copy of the NRCS Soil Survey map encompassing the Lateral E Canal lining project length. Exhibit B contains a copy of the NRCS Soil Survey map for the Alamo Main Canal ponding test location. Hidalgo sandy clay loam, map unit symbol 28, is the predominant soil at both locations. Based on this analogy, we anticipate that the average seepage rate at the Lateral E Canal be consistent with that calculated by the ITC at the Alamo Main Canal. Table 1 below provides a summary of the calculations used to determine the yearly volume of water to be saved by project.

Table 1. Lateral E Canal. Summary of estimated seepage losses.

Canal Length, ft	Avg. Wetted Perimeter, ft	Surface Area, ft^2	Seepage Rate Gal/ft^2-day	*Total Seepage Vol. Loss Gal/day	*Total Seepage Vol. Loss ac-ft/yr
23,655	32.0	756,960	1.18	893,213	1,001

*The Lateral E Canal operates year-round (365 days).

Losses to Reduced Hydrostatic Head (Pressure)
It is evident that the District incurs losses to canal leaks. Without means and methods to quantify these losses it is difficult to estimate the yearly water volume lost directly associated to canal leaks. However, there are means to estimate losses associated to canal leak losses. Since the hydrostatic pressure is reduced in the canal pool when a leak is detected, the delivery efficiency is affected as a direct result of the low canal pressure. When the canal is maintained at high operational pool level, also interchangeable with optimum pressure, the

user is assured constant water pressure (head pressure); thus, resulting in a more efficient use of the irrigation water. **The District estimates users can become 3% more efficient at high operational pool level.** The canal pressure helps deliver a higher volume of water which helps the user push the water faster thru the field resulting in a reduced volume of water penetrating the subsurface layer (wasted water). On average, the District takes one week to respond to a canal leak corresponding to one week of reduced hydrostatic pressure. The District experiences 9.4 leaks per year for an equivalent 66 days (9.4 X 7 days) of low pressure. The District conveys an average volume of 20,000 ac-ft/yr of irrigation water thru the Lateral E Canal corresponding to 55 ac-ft per day (20,000 / 365) for 3,630 ac-ft (55 X 66) of irrigation water conveyed at low pressure for 66 days. Three percent of the total volume managed at low pressure **is 109 ac – ft (3,630 X 3%)** of water that could be better managed and conserved by operating at optimum pressure (high pool level).

The estimated volume of water expected to be conserved as direct result of this project is: 1001 ac–ft/yr (seepage losses) + 109 ac–ft/yr (losses to reduced hydrostatic head) = 1,110 ac – ft / yr.

In 2012 the District upgraded the Lateral E Canal by adding automated overshot gates, SCADA, and a state of the art proprietary software that allows to control the canal system in real time from the District's Office. The addition of software, instrumentation, and equipment has made a remarkable difference for an efficient operation of the Lateral E Canal system. The District relies on this equipment and instrumentation to maintain the canal pool level in the Lateral E Canal at optimum pressure. Water losses have been reduced significantly to the better operation offered by the state of the art instrumentation and equipment. The District strives to improve their conveyance systems for 100 % reliability and make the most efficient use of the water resources. The Lateral E Canal is the most important facility downstream the Re-lift Pumping Plant and the proposed lining improvements will transform the Lateral E Canal into a state of the art facility.

c. Past evaluations performed by non-bias organizations demonstrate that synthetic liners with reinforced concrete cover perform exceptionally well by reducing water seepage losses to 94%. The Irrigation Technology Center, Texas A&M University System (ITC) performed a ponding test in the District's Lateral A Canal to evaluate the post project seepage after the canal was lined using **Canal 3 ® geosynthetic membrane geocomposite w/ 3" of reinforce concrete cover.** The documented test procedure and results can be obtained from a report titled "Evaluation of Canal Lining Projects in the Lower Rio Grande Valley" Dated July 2009 by Askar Karimov, Eric Leigh, and Guy Fipps. The document can be downloaded at http://oaktrust.library.tamu.edu/handle/1969.1/90514. Based on the evaluation findings, we can confidently apply a post project seepage loss rate of 0.09 Gal/ft^2-day. The expected post project seepage losses are 76.3 ac-ft/yr; all as summarized in Table 2 below.

Table 2. Lateral E Canal. Summary of expected post project seepage losses.

Canal Length, ft	Avg. Wetted Perimeter, ft	Surface Area, ft^2	Seepage Rate Gal/ft^2 -day	*Total Seepage Vol. Loss Gal/day	*Total Seepage Vol. Loss ac-ft/yr
23,655	32.0	756,960	0.09	68,126	76.3

d. The anticipated annual transit losses reductions are 1,100 / 4.48 miles = 245 ac – ft / mile – yr.

e. The actual canal loss seepage reductions can be verified by conducting a ponding test. The post improvements performance can be verified upon project completion as detailed in **E.1.6.2. Subcriterion F.2 – Performance Measures.**

f. The materials and methods to be implemented in the lining of the Lateral E Canal are **Canal 3 ® 8-20-8 geosynthetic membrane geocomposite** as manufactured by Huesker or equal covered with 3" of reinforced concrete cover; all as detailed in Section 4 Technical Project Description "*Proposed Improvements*" page 9 above.

6. E.1.2. EVALUATION CRITERION B - Water Supply Reliability

- Does the project promote and encourage collaboration among parties in a way that helps increase the reliability of the water supply?

  The District's project will promote and encourage collaboration among parties in a way that will help increase the reliability of the water supply. The Rio Grande Regional Water Planning Group is the local body responsible to provide comprehensive regional water planning and to carry out the related responsibilities placed on regional water planning groups consisting of municipalities, rural water suppliers, irrigation districts, ecological conservation groups, private groups, and other political subdivisions of the state. The Rio Grande Regional Water Planning Group, hereafter RGRWPG, was established by the Texas Water Development Board (TWDB) on February 19, 1998. The RGRWPG encompasses eight counties stretching from the shores of the Gulf of Mexico at Cameron County along the Rio Grande to Maverick County. The Hidalgo County Irrigation District 2 is a member of the RGRWPG. The TWDB designated letter M for the RGRWPG planning area; Figure 2 provides the map of Region M Planning Area. The waters of the Rio Grande with its tributaries and international water reservoirs are the primary source of water in Region M for the foreseeable future. **The District's project is consistent with the TWDB Approved 2016 Rio Grande Regional Water Plan as canal lining is one of the recommended water management strategies to meet current and future water needs in the region.** An electronic copy of the approved 2016 master plan may be obtained form: www.twdb.texas.gov/waterplanning/rwp/plans/2016/M/Region_M_2016_RWPV1.pdf

- Is there widespread support for the project? What is the significance of the collaboration/support?

  Water conservation efforts as the Lining of the Lateral E Canal have full support from all members of the RGRWPG and the Rio Grande Regional Water Authority (RGRWA) which was created by the Texas Legislature in 2003 as a conservation and reclamation district to serve a public use and benefit by bringing together regional water interests to

accomplish projects and services within Willacy, Cameron, Hidalgo, Starr, Zapata, and Webb counties (excluding the City of Laredo). The Hidalgo County Irrigation District 2 is a member of both entities. **Letters of support from members of both organizations may be mailed separately upon request.**

- Is the possibility of future water conservation improvements by other water users enhanced by completion of this project?

  The completion of the District's project will enhance future on-farm water conservation improvements. Within the past five (5) years the District has documented and repaired 42 leaks along the Lateral E Canal. The Lateral E Canal is the District's main conveyance system downstream of the Re-Lift Pumping Plant. With four municipalities dependent on the canal system and 12,464 acres of farm land, the District maintains the system charged year-round. When a water leak is reported, the District is forced to lower the normal operational water surface elevation to reduce the hydrostatic pressure in the canal for the period necessary until the repair crew can be scheduled to address the problem. Water leak repairs are scheduled after all users in the system are notified and prepared to be temporarily out of service. To make repairs, the District usually takes the canal out of service for a period not to exceed 48 hours. During periods of high demand and dry weather, the District may take more than a full month to repair a leak. On farm conservation measures are affected when the canal hydrostatic pressure is reduced. Based on the State approved 2016 Rio Grande Regional Water Plan, Section *E.S.4.6 On Farm Conservation* "the operational effectiveness and efficiency of the Irrigation Districts are necessary to reap the full benefits of on-farm measures. On-farm efficiency depends on timely delivery of water, adequate head to push water across a field, and an available supply whether on farm or from the Irrigation District". The Lateral E Canal system was upgraded in 2012 by introducing fully automated overshot gates and a licensed software to operate the system in real time. The automation improvements have made a remarkable difference. The District now has capability to maintain the operational water surface elevation in the system at maximum efficiency for optimum water conservation management. The lining of the Lateral E Canal will eliminate canal leaks and as a result the project will bring the system to the next level by assuring a 100% reliable facility. On-farm water conservation measures will be enhanced by the District's project for overall regional water conservation.

The District's project will make water available to address the regional water shortages.

- Explain and provide detail of the specific issue(s) in the area that is impacting water reliability, such as shortages due to drought, increased demand, or reduced deliveries.

  Located at approximately 70 miles downstream the Falcon International Reservoir, the communities of the Rio Grande Valley and neighboring Mexican communities fully depend on the availability of surface water from the Rio Grande. The regional surface water reliability is driven and impacted by multiple factors and interest with the most influential being availability of alternate water resources, binational water use agreement,

over appropriations, watershed yield, population and demand, climate risk and vulnerability, stakeholder conflicts.

Availability of alternate water resources

Far exceeding the quality of groundwater, the surface water from the Rio Grande is the primary source of water for agricultural, municipal, domestic, and industrial use in Region M. Based on quoted information obtained from Chapter 3 of the State approved 2016 Rio Grande Regional Water Plan "The TWDB initiated a study of the groundwater resources in the Rio Grande Valley under the Brackish Resources Aquifer Characterization System (BRACS). Most of the groundwater in the study area (parts of Cameron, Willacy, Hidalgo, and Starr Counties) has concentrations of dissolved solids greater than 1,000 milligrams per liter (mg/L TDS) and does not meet drinking water standards." Local stakeholders are convinced of the need to resource brackish water but hesitate to act due to the higher treatment costs involved in treating brackish groundwater compared to surface water treatment.

Binational water use agreement

Flows within the Rio Grande are dependent upon reservoir operations and surface run-off emanating from both the U.S. and Mexico. The waters of the Rio Grande are shared between the United States and Mexico per stipulations established in the 1944 U.S.-Mexico Water Treaty. The international reservoirs in the Rio Grande are managed by the International Boundary and Water Commission (IBWC) in charge of administering the U.S. corresponding volumes in the reservoirs. The Texas Commission and Environmental Quality (TCEQ) Rio Grande Watermaster Office in Harlingen, Texas is responsible for allocating, monitoring releasing flows, and controlling the use of surface water in the Rio Grande basin from Fort Quitman in Hudspeth County, Texas to the Gulf Coast. Water allocations rules and regulations for the Lower Rio Grande Valley are laid out in Subtitle B Chapter 11 of the Texas Water Code. Different from the rest of the State of Texas, the Rio Grande allotments below the Amistad International Reservoir are prioritized for municipal, industrial, and domestic uses over all other adjudicated water rights, including those for agriculture. "For water rights outside of the municipal, industrial, and domestic uses allocation, the water management plan apportions water in the Rio Grande below Amistad Reservoir according to a water right holder's total acreage and based on two classes of irrigation rights. The Rio Grande Valley is unique in Texas in that it has a thriving water market based on correlative surface water rights. Correlative rights are based on the fact that all rights are from the same water storage areas and are reduced proportionally if there is a shortage, rather than allocated based on priority."; quoted directly from A Texan's Guide To Water and Water Rights Marketing, published by the Texas Water Development Board.

Over appropriation

The waters of the Lower Rio Grande are over appropriated. "It is common knowledge that the Middle and Lower Rio Grande basins are over-appropriated with regard to existing water rights in Texas. The estimated firm annual yield of the United States share of Amistad and Falcon Reservoirs is not sufficient to fully supply the authorized diversions of existing water rights, should a severe drought occur such as that experienced throughout much of Texas during the 1950's. Certainly, the critical state of the currently available water supply in the Rio Grande reservoirs, for both the United

States and Mexico, and the continuing extremely dry conditions in much of the watershed have caused municipal and irrigation water users in the Middle and Lower Rio Grande basins of Texas to be especially concerned with regard to water availability in the immediate future." Obtained from THE INTERNATIONAL RESERVOIRS OPERATIONS AND DROUGHT CONTINGENCY PLANNING STUDY FOR THE MIDDLE AND LOWER RIO GRANDE VALLEY prepared in 1998 for the Water Policy and Management Council of the Lower Rio Water Committee, Inc. prepared by R. J. BRANDES COMPANY Austin, Texas in association with MICHAEL SULLIVAN & ASSOCIATES, INC. Austin, Texas.

Watershed Yield

The Rio Grande watershed encompasses approximately 182,200 square miles spread in parts of Colorado, New Mexico, and Texas in the United States side of the border and in the Mexican states of Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas. For what corresponds to the Texan watershed it encompasses approximately 49,387 acres. Despite being the largest river basin in Texas, the Lower Rio Grande Basin has relative small water shed yield with approximately 645,500 acre-feet per year. According to the Texas Water Development Board "The Rio Grande Basin has an extremely low average annual water-shed yield due to arid or semiarid climate conditions throughout much of the basin"; obtained from the TWDB webpage,
http://www.twdb.texas.gov/surfacewater/rivers/river_basins/index.asp

Population and Demand

Based on projections provided in the State approved 2016 Rio Grande Regional Water Plan, the population in the eight-county region is expected to grow from 1,960,738 in 2020 to 4.029,338 in 2070. The water plan also identifies that the combined water demand (municipal, domestic, agricultural, and industrial) or water user group demand will increase from 1,505,168 ac-ft/yr in 2020 to 1,605,919 ac-ft/yr in 2070, and the projected available supply 835,458 ac-ft in 2020 and 831,030 ac-ft/yr in 2070. Based on these projections it was determined that there are current and future water needs (deficiencies) in the region as follows: **717,386 ac-ft/yr in 2020 and 797,344 ac-ft/yr in 2070.** The Water Plan identified **canal lining as one of the water management strategies** to meet current and future water needs.

Climate Risk and Vulnerability

The regional water shortage is a well-documented fact that has capture the attention of stakeholders at all levels and it has served as catalysis to organize a plan of action in collective effort that will bring about assurance of water sustainability. The Rio Grande Regional Water Authority and the Rio Grande Regional Water Planning Group along with other stakeholders invested significant resources to develop strategies, plans, and agreements that will facilitate water sustainability. In 2013 the U.S. Bureau of Reclamation in collaboration with the Rio Grande Regional Water Authority completed a basin study titled "**2013 Lower Rio Grande Basin Study**", and on which the Hidalgo County Irrigation District 2 participated as a cost share partner. A copy of the study can be found at:
https://www.usbr.gov/watersmart/bsp/docs/finalreport/LowerRioGrande/LowerRioGrandeBasinStudy.pdf

The study documents and provides account of the water availability within the river basin and provides projections of the impact of climate risk and vulnerability can have over the future water resources. Climate vulnerability is a serious concern and in combination with a higher demand the projected effects look unfavorable for the region. "The magnitude and frequency of water supply shortages within the study area are severe, even before projecting the effects of climate change." The previous quotation is a direct abstraction from the 2013 LRG Basin Study. The Basin Study determined that climate change may likely increase the regional water shortage by an additional 86,438 ac-ft/yr.

Stakeholder Conflicts

In recent years several disputes have flared. The International Boundary and Water Commission (IBWC) emitted an official statement in late January this year, that Mexico had paid off a water debt for the period beginning October 2010 ending October 2015. In accordance with the 1944 Treaty between the U.S. and Mexico, the United States is entitled to one third (1/3) of the Rio Grande waters emanated from Mexican tributaries for a total volume of 1.75 million ac-ft in a period of 5 years or 350,000 ac-ft/year equivalent. During that period Mexico was short approximately 400,000 ac-ft. The deficit stressed the local farming community. The growers and communities of the Lower Rio Grande Valley were affected directly. The water user groups of the Lower Rio Grande Valley made a formal request to the IBWC and U.S to act. In 2013, the District pass a resolution requesting the IBWC and U.S. Department of State to pursue through appropriate Minute Orders and formal agreements restoration of corresponding water volume.

Early this year, Texas filed a complaint in the U.S. Supreme Court against New Mexico and Colorado alleging that New Mexico violated the terms of the Rio Grande Compact to which all three states are party. The United States subsequently moved to intervene in the proceedings citing both claims under the Rio Grande Compact and federal reclamation law. It is not clear how this issue will be resolved, and it may require many years in court to resolve it.

- Describe where the conserved water will go/ how it will be used. Will the project directly address a heightened compensation for finite water supplies and over-allocation (e.g., population growth)? Will be left in the river system?

  The District's project will address water supply shortages to increased population and demand, over-allocation, watershed yield, and arid climate. The water conserved can be available for all uses including domestic, municipal, mining, industrial, agricultural (irrigation), ecological preservation as wild life refuges, and recreational. **The conserved water will remain in the river basin; therefore, benefiting all water users.**

- Describe how the project will address the water reliability concern?

  The Lower Rio Grande is unique to the State of Texas. Early settlers lived primarily off farmland. The Rio Grande Valley (RGV) remains attached and dependent to the early works of private investors who constructed the backbone of the irrigation conveyance

system that exist today, and which remains in service. All irrigation conveyance systems in the RGV are similar on which these have a pump station to divert water from the Rio Grande, a main canal, a secondary lift, and a network of open canals that deliver the water via gravity flow to the fields. In the early part of the 20th century, most districts transformed to political subdivisions of the state and made improvements to modernize the delivery system. At a steady pace, over the years, the districts have made significant upgrades to the delivery system. Old steam driven pumps were replaced by fuel driven or electrical driven motors, some open earthen canals have been lined with concrete, others open canals are now closed and replaced by pipelines. As the RGV economy diversified and communities grew, the districts also diversified to convey and transport the raw water for municipal and industrial use. **Today the vast network of open canals and pipelines owned and operated by the local irrigation districts functions as the water conveyance and transportation system that delivers water to all users including municipalities, farm land, industries, schools, parks, wildlife refuges, golf courses, and aesthetic ponds**. The District experiences approximately 20% losses to push water, seepage, and evaporation in the conveyance system during transit to the user delivery point. **The District's project will reduce seepage losses in the conveyance system for improved water reliability for all users. Also, the project will make the Lateral E Canal a more reliable facility since water users will be able to benefit from optimum water pressure for more efficient use of irrigation water.**

- Will the project help to prevent a water-related crisis or conflict? Is there frequently tension or litigation over water in the basin?

  The project will help relieve tension in water-related crisis and conflicts. The Lower Rio Grande water user groups on both sided of the border are aware of the need to conserve water. Any action taken in the Lower Rio Grande with respect to water conservation efforts will have regional and out of region impact. Water conserved by the project will relieve tension for all groups in the basin since it will leave the conserved water in the basin available for other users.

- Provide a description of the mechanism that will be used, if necessary, to put the conserved water to the intended use.

  None, the water will remain in the basin.

- Describe the roles of any partners in the process. Please attach any relevant supporting documents.

  The District will undertake the project without assistance from others. Should the District's project be selected and approved for funding, the District will apply the grant resources towards the total sum for all amounts required for project completion as summarized in Table 6 "Summary of non-federal and federal funding sources".

- Indicate the quantity of conserved water that will be used for the intended purpose.

  1,100 ac-ft/yr

- Will the project benefit Indian tribes?

  The project will benefit the Rio Grande water users. One of these indirect beneficiaries could be the Kickapoo Traditional Tribe of Texas in Eagle Pass, Maverick County, Texas encompassed by Region M. The waters of the Rio Grande are the main source of water for this community.

- Will the project benefit rural or economically disadvantaged communities?

  The project will benefit economically disadvantaged communities. Based on statistical data released by the U.S. Census, 31.2% of the population in Hidalgo County is found in poverty with a median household income (in 2016 dollars) of $36,094 and per capita income in past 12 months (in 2016 dollars) of $15,240. **Census data can be furnished upon request.** Quoted directly from the Executive Summary page 6 of the State approved 2016 Rio Grande Regional Water Plan "In spite of growth in some sectors of the economy, Region M experiences lower income and higher unemployment than the rest of Texas (Table 2). According to the TWDB, seven out of the eight in Region M are labeled as eligible for funds through the Economically Distressed Areas Program."

- Will the project benefit species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance). Please describe the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project.

  The Jaguarundi (Felis Yagouaroundi Cacomilti), a native cat species federally recognized as an endangered species since the mid seventies, is believed to have inhabited the shrub lands of the Lower Rio Grande Valley before land was cleared for agricultural use. The U.S. Fish and Wildlife (FWS) Recovery Plan Action Status updated December 2013. (http://www.fws.gov/southwest/es/Documents/R2ES/GulfCoastJaguarundi_FinalRecoveryPlan_Dec2013.pdf)
  The Recovery Strategy involves the assessment, protection, reconnection, and restoration of sufficient habitat to support viable populations of the Gulf Coast jaguarundi in the borderlands of the U.S. and Mexico;

  The ocelot (*Leopardus pardalis*) is listed as endangered throughout its range in the western hemisphere where it is distributed from southern Texas and southern Arizona through Central and South America into northern Argentina and Uruguay. The ocelot is also listed as endangered by the State of Texas. In south Texas, the ocelot inhabits dense thornscrub communities on Laguna Atascosa National Wildlife Refuge (LANWR) and on private lands in three Texas counties. The ocelot requires dense vegetation. Habitat conversion, fragmentation, and loss comprise the primary threats to the ocelot today. Human population

growth and development continue throughout the ocelot's range. The Draft Recovery Plan by FWS is similar to the jaguarondi.
https://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/Ocelot/Ocelot_Final_Recovery_Plan_Signed_July_2016_new.pdf

The water required to create dense habitat necessary for the recovery of both species is delivered by the irrigation district in the area. The Santa Ana National Wildlife Refuge is a 2,000 acre tract of brush land that connects with the wildlife corridors that the U.S. Fish and Wildlife Service (USFWS) has along the banks of the Rio Grande. Wildlife corridors are tracts of land or habitat that are linked and allow wildlife to travel from one location to another to find food, shelter, a mate and a place to raise offspring. The Santa Ana National Wildlife Refuge is located outside and adjacent to the District's south boundary, and it stretches from U.S. Hwy. 281 to the banks of the Rio Grande . This USFWS refuge is home to approximately 400 bird species, 450 types of plants, half of all butterfly species found in North America, and such rarities as the indigo snake and Altamira oriole. The Santa Ana Wildlife refuge website states "Santa Ana is strategically located where subtropical climate, gulf coast, great plains and Chihuahuan desert meet. Here, next to the Rio Grande, you will find Sabal palms growing alongside prickly pear cactus, habitat for the ocelot and jaguarundi, two endangered cat species known to still prowl the deep forest."
http://www.fws.gov/refuge/Santa_Ana/wildlife_and_habitat.html

Other endanger species in Hidalgo County TX, are:
Northern aplomado falcon (E) Falco femoralis septentrionalis
Ocelot (E) Leopardus pardalis
Star cactus (E) Astrophytum asterias
Texas ayenia (E) Ayenia limitaris
Walker's manioc (E) Manihot walkerae

The refuge's staff states that water is critical to sustain the Jajuarundi's prey species. The District delivers on average 600 ac – ft / yr of water to the Santa Ana Wildlife Refuge via the Lateral A Canal. The water is used to maintain three ponds located within the Refuge. Water is needed to provide a stable habitat for prey species and as a result improve the habitat for the Jaguarandis' recovery. **Water conserved within the river basin assures sustainability for the U.S. Fish and Wildlife Service recovery efforts.**

North San Juan Park
The nature park was recognized by the National Wildlife Federation and the Texas Parks and Wildlife Department on February 20, 2008 as one of Texas' Best Backyard Wildlife Habitats. The park attracts species of wildlife as birds, insects, and mammals. Ninety (90) percent of the vegetation consist of native trees, shrubs, and flowers.

The District delivers 9 ac-ft per year to the North San Juan Park via the Alamo Main Canal. The water savings may remain available in the basin to support local parks as the North San Juan Park and other local conservative efforts.

- Will the project address water supply reliability in other ways not described above?

Drought Resiliency

The District's project will bring drought resiliency. As stated in the previous sections, surface water is in high demand in the Lower Rio Grande Valley, and most ground water is brackish. The Rio Grande Valley receives on average 24 inches of rainfall per year, and the average annual pan evaporation is approximately 60 inches. It is also known that the municipalities of the Rio Grande Valley will stress if another drought reoccurs.

The Lower Rio Grande Valley experienced an exceptional drought in 2012 and 2013. Recently, droughts in 2009 contributed to losses of $19 million for south Texas farmers. Dry land farming was most affected, although irrigated agriculture lost nearly $1.5 million. (Agrilife News, Texas A&M University, Nov. 13, 2009). Other reports have estimated the annual regional impact of agricultural water shortages costs the local economy $135 million and 4,130 jobs. (J. R. C. Robinson et al. / Water Policy 12 (2010) 114–128 Mitigating water shortages in a multiple risk environment). The economic impacts of unmet irrigation water demands directly contribute to reduced economic activity in other sectors and the slowing or reversal of job growth in the region. In the long term, an economic slowdown could result in water districts forgoing projects that could increase efficiency and provide adequate service to all users. With the shift to urbanization in the region, while continuing to rely on existing scarce supplies, these impacts can be expected to intensify in the future.

The 2013 Basin Study states "Another issue related to irrigation demand is the amount of "push water" needed to enable delivery of water from the river, through the irrigation system of canals and/or pipes, to its final destination of either agricultural or M&I delivery points. One of the concerns regarding the availability of water in the study area pertains to the delivery of water to municipal users during severe drought periods, when irrigation water use may be curtailed or completely eliminated as the total supply of U.S. water stored in Amistad and Falcon Reservoirs falls to low levels. Under the current Rio Grande operating rules, the available supply of water in the reservoirs for irrigation use is gradually depleted as irrigation diversions are made during periods when the inflows to the reservoirs are low. During extended periods of continued irrigation use and low reservoir inflows, the available quantity of irrigation water stored in the reservoirs can be reduced to zero.

Should such conditions occur, as they neared in 2013, no releases of irrigation water would be made from Falcon Reservoir. This would mean that deliveries of municipal water from the reservoir to entities in the Lower Rio Grande Valley would have to be made without the normal "carrying water" provided by the irrigation water deliveries. Under these circumstances, the normal water losses due to such factors as seepage and evaporation could be proportionally substantial and could potentially disrupt the ability of municipal users to obtain their water. Another concern under these conditions is whether or not the existing diversion facilities on the Lower Rio Grande would be able to physically withdraw water from the river because of the potentially lower river levels. "

Increasing the delivery system efficiencies will increase the likelihood that the District will be able to deliver municipal water during periods of droutght. The District fared well in 2013 when other districts were running low on supply. As mentioned previously, this District has accomplished several conservation projects which enable it to provide water to its 6

municipal water users without any threat of running out. Our agricultural producers were also able to irrigate as needed and without restriction.

All the Lower Rio Grande Valley Water Right holders have a collective interest in water conservation. Water conserved is available for future use or remains in the Rio Grande system to be distributed to other users. In addition, conserved water results in power conservation. For example, since the District is a non-profit public entity, power cost savings and conservation efforts will benefit all the end users including the farmers, and the municipal customers, including North Alamo Water Supply Corporation, citizens of Alamo, McAllen, Pharr, San Juan and Edinburg.

7. E.1.3. EVALUATION CRITERION C - Implementing Hydropower

The District comprehensively assessed the implementation of hydropower and determined that the geographical conditions and key components for successful implementation of hydropower technology are unavailable. With a mean elevation of 104 feet above sea level, the District's encompasses approximately 71,000 gross acres of relatively flat land that lays over the alluvial plains of The Rio Grande. The District operates high volumes of water at low head (pressure) for low flow velocity in the network of canals. Without impoundments that will offer the required potential energy to make efficient use of a traditional Kaplan turbine, the District considered and performed a feasibility analysis for the implementation of modern technology that utilizes the kinetic energy in the canal stream (flow velocity). The District considered utilizing a premanufactured self-contained portable hydro-turbine unit as manufactured by Emrgy Inc. from Atlanta, Georgia. The District found this technology suitable and inclined towards its use knowing that the units offered by Emrgy Inc. have low hydraulic impact and require minimal civil work for reduced installation costs. The District's engineer determined that the District's Basin headgate offered the best conditions for this application. With five (5) feet average pressure differential from the Basin's water surface elevation to the Main Canal's water surface elevation, this location offers above average flow velocities compared to other locations in the system. The District's Basin headgate is located at approximately 2,300 linear feet south of U.S. 281 and 2,700 linear feet east of 15th St. in Hidalgo Texas, refer to Figure 6A. The District considered the hydro turbine be installed in the downstream side of the Basin's Head-gate; refer to Figure 6B. The District operates and controls the Basin's discharge using an automated gate. The basin's headgate structure also has two manual gates that are utilized only during high demands. Since the automated gate is operated year-round it offered the best location for hydropower implementation. The District engineer made available to Emrgy's design team the automated gate's discharge jet flow velocities at various locations downstream of the headgate. Emrgy determined that a single unit was most optimum for this location and analysis results estimated the proposed hydropower unit offered 8KW-DC power capacity or 70,000 KWh/yr DC equivalent. **Emrgy's analysis and proposal is attached as Exhibit C.** Emrgy's proposal includes an inverter and appurtenances to place the power harvested at the location into the power grid.

The District evaluated the hydropower implementation. The first option was the automated gate's motor. The gate's motor consists of a 230 Volt 60hz electric motor. After thorough review of power statements, the District determined the motor's annual power usage is 19 KWh/yr for minimal demand compared to the hydropower unit's capacity. The District's engineer contacted the power

service provider and confirmed the unavailability of buy back credits for the surplus harvested power. The second option was the District's River Pump House. Located at approximately one and one half mile south of the headgate the pump house is equipped with an office. For this application it is required to install 8,100 linear feet of 100 amp cable and conduit to power the office; refer to Figure 7. At an estimated installed in place unit price of $15.00 per linear, the conduit and power cable placed this option out of reach. In addition to the $45,000.00 capital investment, the operation and maintenance cost is a component necessary for a consistent evaluation versus power rates currently paid by the District. Table 3 below provides the summary of all cost components for option 2.

Table 3 Option 2. Summary of capital investment and O & M projected costs

Description	Unit Price	Quantity	Unit	Total Amount
Hydropower Unit			Lump Sum	$ 45,000.00
Cable and Conduit	$15.00	8,100	LF	$ 121,500.00
Operation and Maintenance	$1,200.00	25	YR	$ 30,000.00
			Total Amount	$ 196,500.00

Past five (5) years power usage records and corresponding billing demonstrated that the District power usage cost is nine (9) cents per KWh inclusive of carrier and transmission fees. When comparing this rate to the 70,000 KWh/yr, or equivalent 1,750,000 KWh spread over the 25year equipment life expectancy, the expected hydropower dollar value yield is $157,500.00. When this figure is compared versus the Total Option 2 Capital Investment and O&M costs, Table 3, the hydropower yield provides a return that will not offset the Total Capital and O&M investment making this option unfeasible.

In 2017, the District locked in a rate with a power service provider at 3.4 cents per KWH. With an average annual demand of 7.8 Million KWh/yr, the District expects to receive this attractive rate for years ahead.

The District does expect **158,400 KWH / YR** energy savings resulting from the volume of water to be conserved by the project improvements; supportive calculations can be found in Evaluation Criterion E. E.1.5 "Department of Interior Priorities" 2.a "Utilizing our Natural Resources"

Figure 6A. HCID 2 Basin Headgate

Figure 6B. Hydro Power Assessment

Figure 7. Hydropower Turbine
Option 2: Alignment for Electrical Conduit to Pump House.

8. E.1.4. EVALUATION CRITERION D - Complementing On-Farm Irrigation Improvements

The 2013 LRGV Basin Study states that "According to the Texas Project for AgWater Efficiency, 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 micro-irrigation, 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."

The District has assisted landowners that have been awarded Environmental Quality Incentives Program (EQIP) funds from the Natural Resource Conservation Service (NRCS) for on-farm conservation measures. The District has participated with the construction of pipelines in lieu of open field canals.

The improvements in efficiencies from this project will increase the opportunities for in the installation of on the farm improvements in irrigation technologies.

- Describe any planned or ongoing projects by framers/ranchers that receive water from the applicant to improve on-farm efficiencies
    - Provide a detailed description of the on-farm efficiency improvements.

      Local farmers rely on push water to irrigate. By far, local on-farm efficiency practices consist of poly-pipe us which rely on irrigation outlets. Poly-pipe is used in lieu of open earthen field canals where serious water losses occur. Most common poly-pipe sizes are 12" to 15". Open canals as the Lateral E Canal feed other open canals or pipe laterals. Farm outlets are connected to open lateral canal(s) or lateral pipe-lines. When the pressure is maintained in the main canal, Lateral E Canal in this case, then the pressure can be sustained in the network of laterals and branches, and that is how the user can benefit from the sustained system pressure.

    - Have the farmers requested technical or financial assistance from NRCS for the on-farm efficiency projects, or do they plan to in the future?

      Based on information furnished by the local NRCS office most local applicants apply for irrigation pipe and land leveling assistance.

    - If available, provide documentation that the on-farm projects are eligible for NRCS assistance, that such assistance has or will be requested, and the number or percentage of farms that the plan to participate in available NRCS programs

    - Applicants should provide letters of intent from farmers/ranchers in the affected project areas.

- Describe how the proposed WaterSMART project would complement any ongoing or planned on-farm improvement.

  - Will the proposed WaterSMART project directly facilitate the on-farm improvement? If so, how?

    Sustained pressure facilitates the use of field pipe and in some cases drip irrigation.

  - Will the proposed WaterSMART project complement the on-farm project by maximizing efficiency in the area? If so how?

    In 2011 the Hidalgo County Irrigation District No. 2 received assistance from the U.S. Bureau of Reclamation to retrofit the Lateral E Canal with fully integrated flume gates and SCADA to operate the canal system in real time. The fully automated system allows the District capability to operate the canal at maximum water surface elevation assuring constant pressure head for the users; thus, providing capability for the user to irrigate faster. While the system has performed exceptionally well, the District has experienced 42 canal leaks in a 5 year period for 9.4 leaks per year average. From the time the leak is detected or reported it takes one week on average to address the problem. The lining project will upgrade the Lateral E Canal to 100% efficiency into a state of the art facility with flexibility and capability to accommodate for conservation irrigation methods as drip irrigation.

- Describe the on-farm water conservation or water use efficiency benefits that would result from the on-farm component of this project.

  - Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.

    109 ac ft / yr; all as detailed in Section 5. E.1.1 EVALUATION CRITERION A - Quantifiable Water Savings under paragraph titled "*Losses to Reduced Hydrostatic Head (Pressure)*" pages 15 and 16 above.

9. E.1.5. EVALUATION CRITERION E - Department of the Interior Priorities

1. *Creating a conservation stewardship legacy second only to Teddy Roosevelt*
   a. Utilize science to identify best practices to manage land and water resources and adapt to changes in the environment;

      State funded and Federal funded entities as the Texas A&M University Irrigation Technology Center, Texas Cooperative Extension, Texas Water Resource Institute, RGRWPG, RGRWA, and U.S.D.A. have invested and funded investigation projects to identify water conservation practices. Canal ponding tests performed in early 2000s provided an assessment of canal performance with regards to water containment and served as supportive benchmark to confirm the volumes of water lost in transit. For years the local districts had utilized a transit loss factor ranging

from 15 % to 25%. Studies produced from the above referenced entities also assisted in determining post performance results confirming the effectiveness of various products and methods employed in open canal water conservation projects. Thanks to cost effective and environmental friendly materials offered by the private market as the geocomposite considered for this project, it is possible to implement and utilize this innovative product to water conservation practices. Post ponding test has demonstrated how effective the use of geocomposites in this application are. A water-tight open canal offers water conservation, improved on-farm irrigation efficiency, drought resiliency, and more water available in the basin for other users.

b. Examine land use planning processes and land use designations that govern public use and access;

c. Revise and streamline the environmental and regulatory review process while maintaining environmental standards.

d. Review DOI water storage, transportation, and distribution systems to identify opportunities to resolve conflicts and expand capacity;

The recent law suit between Texas, New Mexico, Colorado, and the U.S. over the Rio Grande Compact light up the alarm bells and serves as clear sign of the importance of water conservation efforts. The District's project will ease tension in the Rio Grande Basin and help expand the water resources.

e. Foster relationships with conservation organizations advocating for balanced stewardship and use of public lands;

The District's project will foster the relation ship with federal, state, and local conservation organizations. The District furnish on average 600 ac-ft of water to the U.S. Fish and Wildlife Service – Santa Anna National Wildlife Refuge. In addition, the District also delivers an average of 1,280 ac - ft / yr of water to municipal parks, golf courses, and private aesthetic ponds.

f. Identify and implement initiatives to expand access to DOI lands for hunting and fishing;

g. Shift the balance towards providing greater public access to public lands over restrictions to access

2. *Utilizing our natural resources*

a. Ensure American energy is available to meet our security and economic needs;

After improvements, the canal will be more reliable and efficient. Energy efficiencies are expected to result from the water conserved. The Lateral E Canal is located downstream of the District's Re-Lift Pumping Plant. The District lifts the water first at the River Pumping Plant (Diversion Point) thence at the Re-Lift Pumping Plant before it is delivered into the Lateral E Canal. The River Pumping Plant counts with

ten (10) 400 horsepower vertical mixed flow propeller pumps, and the re-lift has six (6) 400 horsepower vertical mixed flow propeller pumps.

Base on power usage data and volume pumped for the periods 2008 to 2010, the District used on average 144 KWH / ac-ft to deliver water to the Lateral E Canal. **Base on this supportive data, the expected yearly energy savings to result from water conservation are 158,400 KWH / YR which was calculated as follows:**

Energy Savings (KWH/Yr) = Yearly water savings (ac - ft) X KWH / ac - ft

Energy Savings = 1,100 ac – ft / YR X 144 KWH / ac – ft **= 158,400 KWH / YR**

Power usage data and corresponding pumped volume for the periods 2008 to 2010 may be furnished upon request.

b. Ensure access to mineral resources, especially the critical and rare earth minerals needed for scientific, technological, or military applications;

c. Refocus timber programs to embrace the entire 'healthy forests' lifecycle.

d. Manage competition for grazing resources.

3. *Restoring trust with local communities*

a. Be a better neighbor with those closest to our resources by improving dialogue and relationships with persons and bordering our lands;

The District's project will eliminate canal leaks. This will help eliminate dampness and ponding in areas adjacent to the canal. Standing water is breeding grounds for mosquitos. Standing water is by far the most frequent complaint brought out to the District by the adjacent land owners to the Lateral E Canal.

b. Expand the lines of communication with Governors, state natural resource office, Fish and Wildlife offices, water authorities, county commissioners, Tribes, and local communities.

The District is an active member of the Rio Grande Regional Water Planning Group, Rio Grande Regional Water Authority, Texas Irrigation Council, Texas Water Conservation Association, Lower Rio Grande Committee, Inc., Rio Grande Watermaster Advisory Committee, and the Lower Rio Grande Water District Manager's Association. The District promotes stewardship, leadership, and maintains a good working relationship with all water groups, customers, water conservation groups, and political subdivisions of the state including municipalities, county, state, and federal.

4. *Striking a Regulatory Balance*

a. Reduce the administrative and regulatory burden imposed on U.S. industry and the public;

The District conducts business in a as practical and efficient manner to reduce burden on clients, privates, and political subdivisions of the state. Privates may consist of land developers, private utility companies, or others that in some form or fashion require approval from the District to complete their interests.

b. Ensure that Endangered Species Act decisions are based on strong science and thorough analysis;

5. *Modernize our infrastructure*

a. Support the White House Public/Private Partnership Initiative to modernize U.S. infrastructure;

The Lateral E Canal has been in service since the early 1900s. Thru its service life, the structure has received several upgrades in tune with corresponding times. In recent years the canal was upgraded with fully actuated overshot gates. SCADA was added to control the system remotely in real time. While the automation improvements have made a significant improvement in the system operation, there is more work required to fully modernize it. The proposed lining improvements will transform the Lateral E Canal into a must needed state of the art facility. The District's project is consistent with the White House Public/Private Partnership Initiative to modernize U.S. infrastructure.

b. Remove impediments to infrastructure development and facilitate private sector efforts to construct infrastructure projects serving American needs;

The District will exercise its rights as a political subdivision of the state to, advertise, procure, and solicit bids from general construction contractors for the construction work needed for a complete in-place installation. The District will select the most qualified bidder offering the most advantageous price. The project will bring opportunity to the private sector and the final product will be available to service America's needs.

c. Prioritize DOI infrastructure needs to highlight:

1. Construction of infrastructure;
2. Cyclical maintenance;
3. Deferred maintenance;

10. E1.6 EVALUATION CRITERION F- Implementation and Results

E.1.6.1. Subcriterion F.1 -- Project Planning

Does the applicant have a Water Conservation Plan and/or System Optimization Review (SOR) in place?

Provide the following information regarding project planning:

(1) Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, Drought Contingency Plan or other planning efforts done to determine the priority of this project in relation to other potential projects.

List of Approved and Adopted Water Conservation Plans
District's Water Conservation Plan filed with the Texas Commission on Environmental Quality (TCEQ) and the Rio Grande Regional Water Planning Group in 2014.

District's Drought Contingency Plan filed with the Texas Commission on Environmental Quality (TCEQ) and the Rio Grande Regional Water Planning Group in 2014.

2016 Rio Grande Regional Water Plan Volume 1 approved by the Texas Water Development Board. The electronic copy of the approved 2016 Rio Grande Water. An electronic copy of the plan may be downloaded from: www.twdb.texas.gov/waterplanning/rwp/plans/2016/M/Region_M_2016_RWPV1.pdf

2013 Lower Rio Grande Basin Study prepared by the U.S. Bureau of Reclamation Under the Authority of the SECURE Water Act (Public Law 111-11) Great Plains Region, Oklahoma-Texas Area Office. An electronic copy of the study may be obtained from: https://www.usbr.gov/watersmart/bsp/docs/finalreport/LowerRioGrande/LowerRioGrandeBasinStudy.pdf

(2) Describe how the project conforms to and meets the goals of any applicable planning efforts, and identify any aspect of the project that implements a feature of an existing water plan(s)

Water conservation improvements for the Lateral E Canal have been in the District's scope of work since 2000. The Lateral E Canal is the District's primary facility used to convey water to the Northeast quadrant of the District. The District's proposal of lining the canal is consistent with the District's own Water Conservation Plan and Drought Contingency Plan. **Copies of the plans may be available upon request.**

The District's project is consistent with the TWDB Approved 2016 Rio Grande Regional Water Plan in two accounts. Canal lining is one of the recommended water management strategies to meet current and future water needs in the region; this can be found in Chapter 5 Section 5.2.1 Water Infrastructure and Distribution Systems Page 5-3 of the Plan. Second, the project is consistent with On-Farm Conservation. Quoted directly from ES.4.6 On-Farm Conservation Page 25 of the plan, "On-farm efficiency depends on timely delivery of water, adequate head to push water across the field, and an available supply whether on-farm or from the ID".

The District's project is consistent with the U.S. Bureau of Reclamation 2013 Rio Grande Regional Water Plan with respect to efficiency of the delivery system for improved on-farm efficiency. Quoted directly from Chapter 3, Section 3-10 4th paragraph, "According to the Texas Project for AgWater Efficiency, 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 micro-irrigation, 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."

E.1.6.2. Subcriterion F.2 – Performance Measures

The District will schedule a ponding and seepage test eight (8) to twelve (12) months after improvements are complete to test the performance of the synthetic liner. The test can be conducted by a non-bias organization as the Irrigation Technology Center, Texas A&M University System or an independent testing laboratory. Test results can be compared and verified against pre-improvements estimated water losses.

11. E.1.7 EVALUATION CRITERION G - Nexus to Reclamation Project Activities

- Is the proposed project connected to Reclamation project activities? If so, how? Please consider the following:
  - Does the applicant receive Reclamation project water? No
  - Is the project on Reclamation project lands or involving Reclamation facilities? No
  - Is the project in the same basin as a Reclamation project or activity? Yes
  - Will the proposed work contribute water to a basin where a Reclamation project is located? Yes

- Will the project benefit any tribe(s)? Yes. Since the conserved water from the project will remain in the Lower Rio Grande basin, the project will benefit the Rio Grande water users. One of these indirect beneficiaries could be the Kickapoo Traditional Tribe of Texas in Eagle Pass, Maverick County, Texas encompassed by Region M. The waters of the Rio Grande are the main source of water for this community.

12. E.1.8. EVALUATION CRITERION H - Additional Non-Federal Funding

The District has capability to fund 85.80% of the project from resources out of the District's Capital Improvements Fund without assistance from other Non-Federal Funds. Should the District's project be selected and approved for funding, the remaining 14.20% will be funded from the grant resources.

Non-federal funding $ 6,040,831.10
Total Project Cost $ 7,040,831.10 = 85.80% non-federal funding

13. D.2.2.5. PROJECT BUDGET

Funding Plan and Letters of Commitment

The District has capability to commit 85.80% of the total project cost using resources from the District's Capital Improvements Fund. The District will advertise and solicit bids from private general construction contractors for a complete in-place installation of the liner and associated materials and services all as specified in the engineering plans and contract documents. The District will complete the project without in-kind contributions. The Board of Directors will consider, and act, on a Letter of Commitment during a Regular Board Meeting to be held on May 16, 2018, at the District's office in San, Juan, TX. A copy of the approved Letter of Commitment will be mail by the HCID 2 separately as soon as it becomes available.

There will be no other Federal, State, Local, and or third party(ies) partnering with the District to contribute funds towards the District's 85.80% percent cost share.

The District does not have any pending funding requests that have not yet been approved.

Table 4 contains the Summary of non-Federal and Federal funding sources.

Budget Proposal

The District proposes to undertake the project in a single phase to eliminate administrative and mobilization costs involved in subsequent phases. The estimated construction duration is **270** calendar days with completion in early 2020. To accomplish this task the District will have to begin with the engineering design in the Fall of 2018 and follow with its construction beginning in mid to late summer 2019 to complete the project in early 2020.

Table 4. Summary of non-Federal and Federal funding sources.

Funding Sources	Funding Amount
Non-Federal Entities	
1. Hidalgo County Irrigation District No. 2	$ 6,040,831.10
Non-Federal Subtotal:	$ 6,040,831.10
Other Federal Entities	
1. N/A	$0
Other Federal Subtotal:	$0
Requested Reclamation Funding:	$1,000,000.00
Total Project Amount:	$ 7,040,831.10

The District will purchase the synthetic liner separate and outside construction services. The District will publicly solicit competitive seal bids following the State of Texas competitive procurement law. Interested vendors will submit their bid and the District will select the most qualified vendor that proves to have capability to furnish the specified material meeting specified standards. The unit price used to estimate the cost for 8-20-8 geosynthetic membrane geocomposite, corresponding to line item M1 under the Supplies and Materials Section of Table 5 Project Budget Proposal Form in the next page, was obtained from a bid tabulation of a competitive bid received in the spring of 2016 for material utilized in the Alamo Main Canal. The unit price includes material, insurance, and freight costs deliver to the District's yard in San Juan Texas from manufacturer's plant.

The District will solicit construction services following the State of Texas competitive procurement laws for the installation of the 8-20-8 geosynthetic membrane geocomposite, corresponding to line items A1 to A15 under Contractual/Construction Section of Table 5 Project Budget Proposal Form in the next page. The District will publically solicit competitive seal bids from interested contractors that prove to have capability to furnish the specified work and services in connection to the install of the geosynthetic membrane geocomposite in the Lateral E Canal. The unit prices used to estimate all components to install the 8-20-8 geosynthetic membrane geocomposite, corresponding to line items A1 to A14, were obtained from record of actual bid prices submitted by general contractors for the Alamo Main Canal lining project. The unit prices include all components to install in place the geosynthetic membrane geocomposite and three (3) inches of reinforced concrete cover including but not limited to contractor's profits, overhead, and costs which may including but shall not be limited to construction material, contract and plan(s) specified equipment, tools, construction equipment, rentals, fuel, freight, payroll, salaries, wages, commissions, payment and performance bond fees and subcontract services fees required to complete in place each separately identified bid item.

The itemized breakdown of the project cost can be found in Table 5 "Project Budget Proposal Form" in the next page.

Table 5. Project Budget Proposal Form.

BUDGET ITEM DESCRIPTION	Unit Price	Quantity	Unit	Total Cost
Salaries and Wages				
Employee 1	0	0	hr	$ -
Fringe Benefits				
Full-Time Employee	0	0	hr	$ -
Part-Time Employee	0	0	hr	$ -
Travel				
Trip 1	0	0	mile	$ -
Equipment				
Item A	0	0	hr	$ -
Supplies and Materials				
8-20-8 Canal 3 ® Geocomposite Synthetic Liner	7.00	112,613	SY	$ 788,291
Contractual/Construction				
A. Construction Services				
A1. Sediment removal and power wash.	$ 10.50	23,655	LF	$ 248,378
A2. Concrete apron crack repair with flexible sealant.	$ 3.00	70,965	LF	$ 212,895
A3. Broken concrete apron repair allowance.	$ 70.00	5,000	SY	$ 350,000
A4. Remove, detail, and re-install active gate.	$ 2,250.00	10	EA	$ 22,500
A5. Remove gate and plug abandoned lateral.	$ 1,250.00	10	EA	$ 12,500
A6. Remove abandoned reinforced concrete check structure.	$ 6,500.00	4	EA	$ 26,000
A7. Detail around existing utility aerial crossing.	$ 700.00	6	LF	$ 4,200
A8. Remove and re-install trash rack.	$ 4,000.00	1	EA	$ 4,000
A9. Install 8-20-8 geocomposite liner.	$ 4.50	112,613	SY	$ 506,759
A10. Construct 36" anchor trench.	$ 3,500.00	30	EA	$ 105,000
A11. Install 3" reinforced concrete cover.	$ 29.00	99,471	SY	$ 2,884,659
A12. Irrigation water diversion, by-pass, and management.	$ 32.00	23,655	LF	$ 756,960
A13. Clear and Restore Right of Way.	$ 2.00	23,655	LF	$ 47,310
A14. Traffic Control Management and Temporary Signs.			Lump Sum	$ 9,350
A15. Contingency at 10% Construction and Supplies.				$ 597,880
B - E. Engineering and Other Professional Services				
B1. Surveying Services			Lump Sum	$ 70,450
C1. Consulting Engineering Services			Lump Sum	$ 326,400
D1. Environmental and Regulatory Compliance			Lump Sum	$ 2,500
E1. Construction Material Testing Services			Lump Sum	$ 64,800
Other				
Other				$ -
TOTAL DIRECT COSTS				$ 7,040,831
Indierect Costs				$ -
Type of rate				$ -
TOTAL ESTIMATED PROJECT COSTS				**$ 7,040,831**

14. D.2.2.6. ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

Below are direct answers to the outline of questions found under Section D.2.2.6 Environmental and Cultural Resources Compliance of FOA BOR-DO-18-F006.

- The construction activities will have no impact to the surrounding environment. Construction work will take place within the existing canal without need to disturb ground. The geocomposite geomemebrane will be installed over the exiting concrete liner; thence, covered with three (3) inches of reinforced concrete. The existing canal embankment will remain in place. The District will maintain the canal facility on-line while the lining work takes place. The work area will be isolated with cofferdams and by-passed utilizing pump units and portable pipe. The temporary cofferdams may be constructed with sand bags with material obtained from a local supplier(s), or with an Aquadam ™ or equal synthetic barrier filled and stabilized with canal water. Should earthen material be used, it will be hauled offsite after construction completion.

- The construction work will have no impact to known species listed or proposed to be listed as a Federal threatened or endangered species or designated critical habitat. Construction work will be confined within the canal alignment.

- There are no wetlands or other surface waters inside the project boundaries that potentially fall under Federal Clean Water Act jurisdiction as "Waters of the United States".

- The Lateral E Canal was constructed circa 1915. The original structure consisted of an unlined earthen canal. The existing concrete liner was added at a later time.

- The construction work will have no impact to individual features as gate structures. Construction work will take place within the existing canal without altering its geometry or individual features.

- The District is listed on the National Register of Historic Places.

- There are no known archeological sites in the proposed project area.

- The project will not have a disproportionately high and adverse effect on low income or minority populations.

- The project will not limit access to ceremonial use of Indian sacred sites or result in other impacts on 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

15. D.2.2.7. REQUIRED PERMITS OR APPROVALS

All work will be performed within the District's canal right of way; therefore, no necessary permits or easements will be required for completion of the work. It is anticipated that the contractor will have to cross equipment at canal to local road intersections. The engineer and contractor will coordinate with the local road authorities prior to any work takes places. Any required traffic control plan and temporary traffic control signs will be incorporated within the contract amounts for this purpose.

16. D.2.2.8. LETTERS OF SUPPORT

The District has full support from the members of the Rio Grande Water Authority and the Rio Grande Regional Water Planning Group (Region M). **Letters of support will be mailed separately.**

17. D.2.2.9 OFFICIAL RESOLUTION

The Board of Directors adopted the Official Resolution during Regular Board Meeting held April 5th, 2018. **A copy of the official resolution is attached as Exhibit D.**

EXHIBIT A1

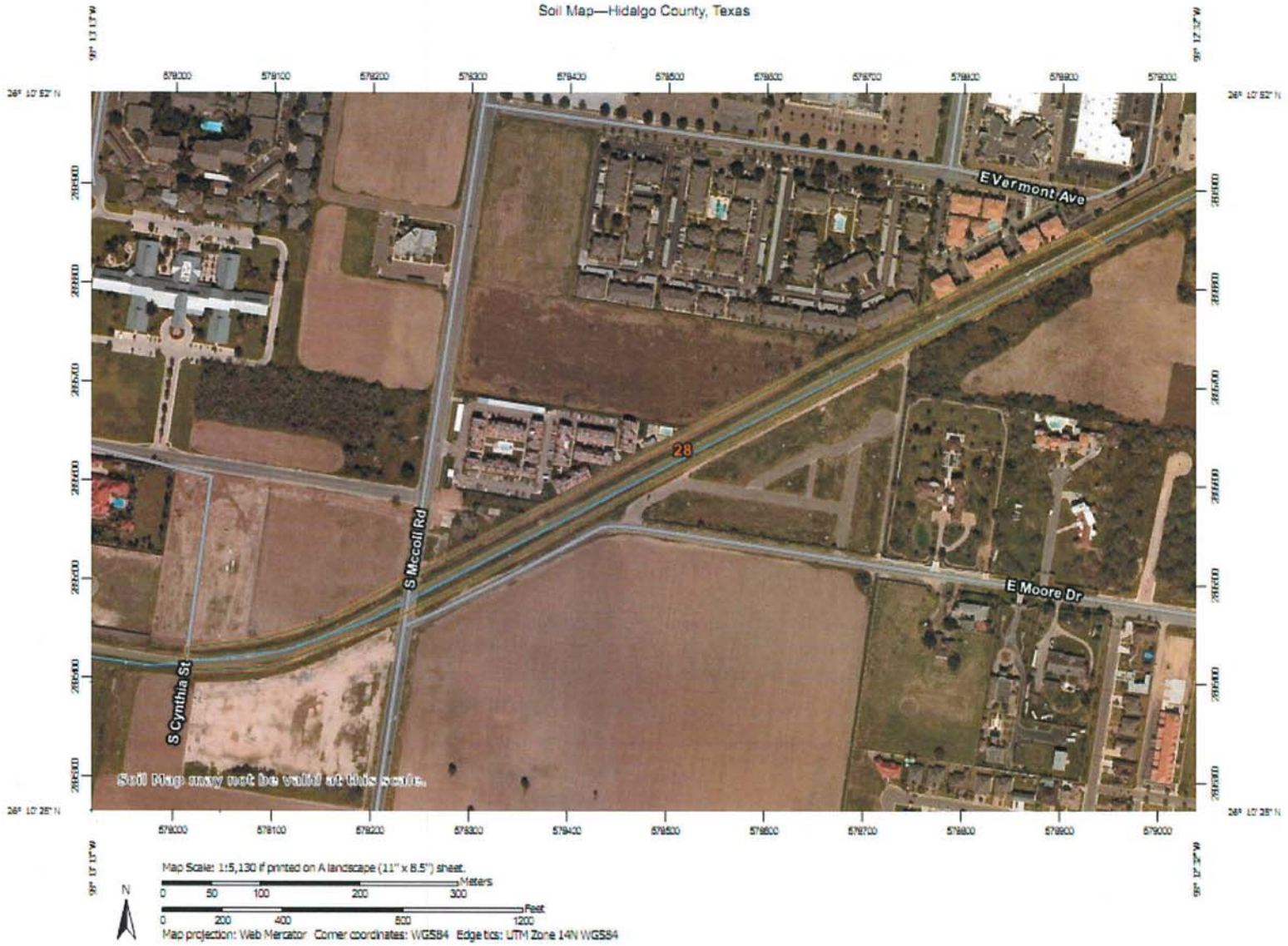

Soil Map—Hidalgo County, Texas
E Vermont Ave
S Mccoll Rd
S Cynthia St
E Moore Dr
28
Soil Map may not be valid at this scale.
Map Scale: 1:5,130 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

EXHIBIT A2

Soil Map—Hidalgo County, Texas

Map Scale: 1:6,080 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

EXHIBIT A3

Soil Map—Hidalgo County, Texas

Map Scale: 1:6,960 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 100, 200, 400, 600

Feet: 0, 300, 600, 1200, 1800

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

EXHIBIT A4

Soil Map—Hidalgo County, Texas

Map Scale: 1:6,430 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

EXHIBIT A5


Soil Map—Hidalgo County, Texas
98° 10'52"W
98° 9'59"W
26° 10'46"N
26° 10'15"N
581900
582000
582100
582200
582300
582400
582500
582600
582700
582800
582900
583000
583100
583200
E Garrison Dr
E Smith Dr
S Ironwood St
S Kumquat St
Ridge
Ridge Rd
S I Rd
28
E Noemi St
E Moore Rd
Soil map may not be valid at this scale.
Map Scale: 1:6,800 if printed on A landscape (11" x 8.5") sheet.
Meters
0
100
200
400
600
N
Feet
0
300
600
1200
1800
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
4/9/2018
Page 1 of 3

EXHIBIT A6

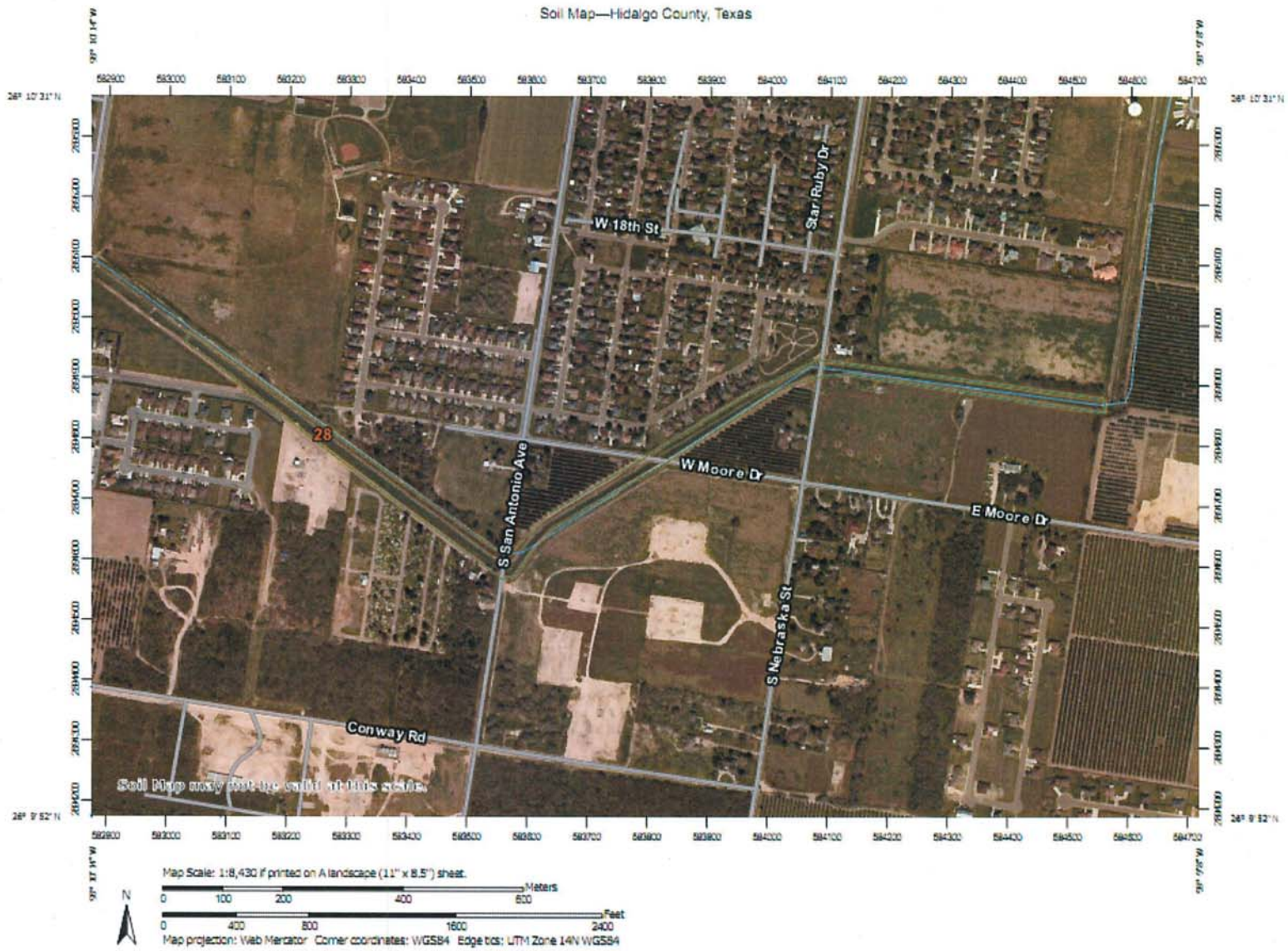

Soil Map—Hidalgo County, Texas
W 18th St
Star Ruby Dr
28
S San Antonio Ave
W Moore Dr
E Moore Dr
S Nebraska St
Conway Rd
Soil Map may not be valid at this scale.
Map Scale: 1:8,430 if printed on A landscape (11" x 8.5") sheet.
Meters
0 100 200 400 600
Feet
0 400 800 1600 2400
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
4/9/2018
Page 1 of 3

EXHIBIT B1

Texas A&M Agrilife-Alamo Main Canal Ponding Test Limits Report No. TR-324-2008

Soil Map—Hidalgo County, Texas

Map Scale: 1:5,990 if printed on A landscape (11" x 8.5") sheet.

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

Distributed Hydropower Solutions

Prepared for:

Hidalgo County Irrigation District No. 2

Prepared by:

Madeleine White

Project Engineer

Background and Introduction.

Emrgy Inc. ("Emrgy") is a Woman-Owned Business Enterprise ("WBE") that has developed innovative technology to harvest kinetic energy from existing waterways for distributed clean power generation. Hidalgo County Irrigation District No. 2 ("HCID No. 2" or "the District") provides an adequate, reliable source of water for irrigation, municipal, industrial and domestic uses, and affords drainage insofar as reasonably possible to the lands located within the District boundaries.

Emrgy and HCID No. 2 have partnered to investigate the viability and attractiveness of utilizing Emrgy's energy generators within the HCID No. 2 canal network as a source of low-cost, reliable, clean energy to off-set on-site demand. Investing into on-site power generation will enable the District to reduce overall power costs and ensure viability for generations to come.

Emrgy's Power Generation Technology.

Emrgy's hydropower technology is specifically designed for canal applications where no impoundments or dams are necessary. Typically, these waterways are shallow and/or slow moving, so conventional methods of hydropower have been largely deemed unsuitable or cost prohibitive. Emrgy has developed a portable, modular approach in which entire water-to-wire systems can be installed seamlessly in these areas to harvest energy continuously as water flows.

Emrgy's adoption of modular and flexible principles for hydropower, as seen in the solar industry, dramatically reduces or eliminates environmental permitting requirements, deployment timelines, and installation costs. Emrgy's turbines are simply placed into existing waterways for immediately dispatchable and reliable distributed energy production, enabling customers to create new revenue, reduce grid energy reliance, and lower electricity expenditures.

Hidalgo ID No. 2 Benefits.

Emrgy's solution represents a unique value to the District today and as HCID No. 2 evolves in coming years:

Reduce on-site energy cost - The District utilizes a single, automated gate which is employed year-round for Main Canal access to Carlson Lake and the Rio Grande. The automated gate is operated with an electric motor that feeds into the grid, making it subject to high District costs and vulnerability to market trends. Investing into self-generating assets like Emrgy's technology will lock-in power rates and protect the District against future price volatility in the energy markets.

Enhancing energy reliability - Today, HCID No. 2 is dependent on energy produced and transmitted via a retail electric provider. Grid outages, line maintenance and other activities that impact the District's generation to operate critical infrastructure are outside of control, which represents financial and environmental risk.

Emrgy enables the District to develop economical, long-term power resources that can provide resiliency to grid-connected systems and/or off-grid power within their existing infrastructure. As Emrgy's electricity generation will be continuous as the Main Canal operates, the benefit of the system will coincide with peak operational seasons and power needs, so the system will be reliable and predictable in times of highest need.

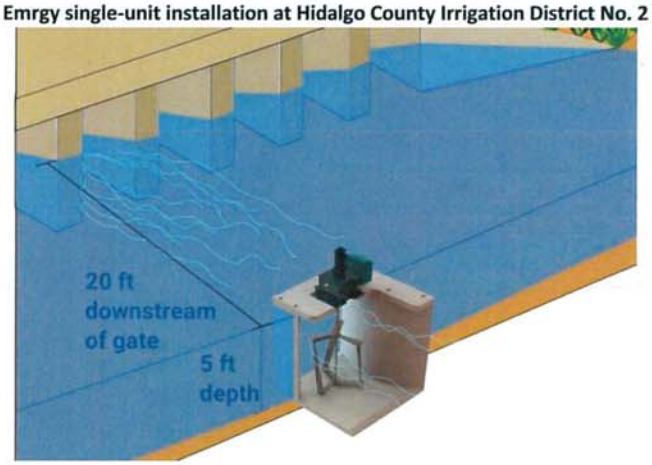
Creating a new revenue stream – The District's system has 46 miles of earthen canal, and 21 miles of lined canal. Emrgy's technology is standard in design, which means it can easily be deployed at nearly any point within the network to capture excess power that would otherwise be wasted.

EXHIBIT C2

As both a single-unit and multi-unit array installation, Emrgy's solution represents a new way for the District to monetize existing water assets, and, as a new revenue stream, increases financial stability and long-term organizational viability. The assets will catalyze new customer engagement and development and may lead to growth of the District's revenues.

Hidalgo County Irrigation District No. 2 Distributed Hydroelectric Power	
Power Rating	**10,000 W-DC**
Peak Power	10,000 W-DC
Average Power	8,000 W-DC
Capacity Factor	80%
Estimated annual generation	**70,000 kWh**
Equipment Cost	$22,000
Installation & Interconnection	$23,000
Total Capital Cost	**$45,000**

Emrgy single-unit installation at Hidalgo County Irrigation District No. 2



RESOLUTION

WaterSMART
Water and Energy Efficiency Grants

WHEREAS, the Hidalgo County Irrigation District No.2 (District) is applying with the United States Department of Interior-Bureau of Reclamation for grant financial assistance through the WaterSMART (Sustain and Manage America's Resources for Tomorrow) program, Funding Opportunity Announcement No. BOR-DO-18-F006; and,

WHEREAS, Sonny Hinojosa, General Manager of the District, is hereby authorized to submit an application and enter into agreement on behalf of the District for the WaterSMART: Water and Energy Efficiency Grants; and,

WHEREAS, the District's Board of Directors supports the application submitted; and,

WHEREAS, the District has sufficient funds in its Capital Improvements Fund to satisfy its portion of the cost share as specified in the funding plan; and,

WHEREAS, the District is committed to cooperate with the United States Department of Interior-Bureau of Reclamation to meet established deadlines for entering into cooperative agreements.

NOW, THEREFORE, BE IT RESOLVED that the Hidalgo County Irrigation District No.2 prays it is awarded the WaterSMART: Water and Energy Efficiency Grant and is fully committed to executing lining of the Lateral E Canal with an impermeable membrane as expeditiously as possible to conserve energy and water and help increase future water supplies for agriculture, municipal uses, and the environment.

Passed and adopted this fifth day of April, 2018.
HIDALGO COUNTY IRRIGATION DISTRICT No.2

Karl Obst
Karl Obst, President

Fred Schuster
Fred Schuster, Secretary

EXHIBIT D1