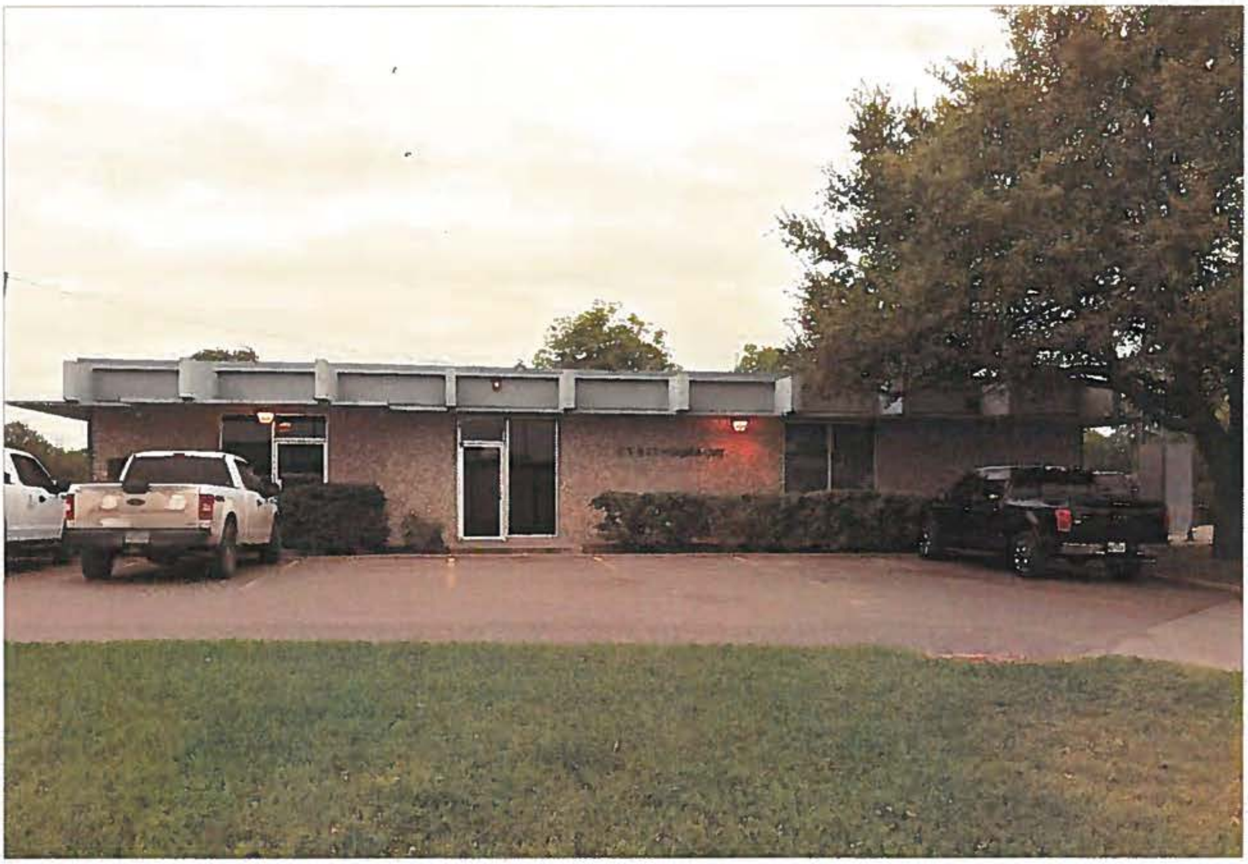
# H.I.D.C.C. NO 1 PIPING OF THE WYRICK CANAL

March 19, 2019

**APPLICANT:**

Harlingen Irrigation District Cameron County No. 1
301 E Pierce
Harlingen, TX 78550



H.I.D.C.C. No.1 District Office in Harlingen, Texas.

**PROJECT MANAGER:**

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**Exhibits**

## 1. D.2.2.4 EXECUTIVE SUMMARY

**March 15, 2019**

The Harlingen Irrigation District Cameron County No. 1, hereby the applicant, seeks consideration for approval of Funding Opportunity Announcement (FOA) BOR-DO-19-F004 **under Section B.2.1. Funding Group I** to implement the funds towards a Water Conservation Project. With its main office in Harlingen, Texas, **the Harlingen Irrigation District Cameron County No. 1, hereinafter, the District,** encompasses approximately 56,576 acres of land in the Lower Rio Grande Valley within the east-central portion of Cameron 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, and Lower Rio Grande Water Committee, Inc.

The District proposes to pipe the Wyrick Canal using PVC low head pressure pipe to eliminate water losses to seepage, evaporation, leaks, and improve the system efficiency. **The canal piping project will begin at approximately 1,300 linear feet south of FM 508 and 7,900 linear feet east of U.S. Expressway 77 (I-69E) in Harlingen Texas at the existing canal headgate and end at Templeton Road located at approximately 6,750 linear feet north of the point of beginning; refer to Figures 3 and 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. The District will implement the Federal funding reimbursement amounts towards the total project cost including but not limited to purchase of construction materials and supplies, equipment cost, professional services, and incidentals needed for the completion of the project.

The District's proposal will conserve an estimated **112.18 ac-ft / yr of water volume.** The District assessed the implementation of hydropower and determined that the geographical conditions and key components for successful implementation of hydropower technology are unavailable. However, the District's proposal will conserve an estimated **3,304.82 KWH / YR** of electrical power not needed from the grid to lift and deliver the conserved water into the Wyrick Canal. By this means the District seeks consideration for the District's proposal and the expected energy savings that will result out of its implementation.

The District proposes to undertake the project in a single phase to reduce administrative and mobilization costs involved with procurement policy and construction respectively. To accomplish the goal, the District will have to begin with the engineering design in the summer of 2019 and follow with construction beginning in mid to late summer 2019 to complete the project in early 2020. The total estimated project cost is $ 1,023,688.00. The District has capability to commit 70.69% of the of total project cost using funds from the District's Capital Improvements Fund. The District plans to apply $300,000.00 from grant monies in FY 2020.

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

## 2. D.2.2.4 BACKGROUND DATA

The Harlingen Irrigation District Cameron County No. 1, hereinafter, the District, was established May 13, 1914, by the Cameron County Commissioner's Court as Cameron County Irrigation District Number 1, pursuant to Section 13, Chapter 172, Acts of the Regular Session of the 33rd Legislature of the State of Texas. On January 14, 1915, a deed from Harlingen Land and Water Company to Cameron County Irrigation District Number 1, was filed for record and recorded January 29, 1915, Vol. 38, Pages 146 - 158, Cameron County Deed Records, Cameron County, Texas. On May 31, 1919, the District was converted to and renamed Cameron County Water Improvement District Number 1, under existing statutes. In 1945 it was renamed as Cameron County Water Control and Improvement District Number 1. In 1978, under the provisions of Sections 51 and 58 of the Texas Water Code, the District became Harlingen Irrigation District Cameron County Number 1. In 1995, the 74th Texas Legislature established Section 49 of the Texas Water Code and this section now also applies to the operations of the District.

The District is located within the Lower Rio Grande Valley in the east-central portion of Cameron County, Texas; refer to the District's General Location Map Figure 1. Cameron 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 a gross area of 56,576 acres of land around the City of Harlingen; refer to the Service Area Map Figure 3.

The District holds water rights to divert from the Rio Grande 97,484.7 acre -foot per year for irrigation purposes, and 692 acre-foot per year for domestic, municipal, and industrial (dmi) use.

In addition, the District is contracted to deliver 22,920 acre -feet per year of dmi water rights for the City of Harlingen, 429 acres -feet per year of dmi water rights for the City of Combes, 400 acre -feet per year of dmi water rights for the City of Primera, 312 acre -feet per year of dmi water rights for the City of Palm Valley, 350 acre-feet for East Rio Hondo Water Supply Corp and 877 acre-feet for the Military Highway Water Supply Corp.

The District currently serves 32,500 acres of farmland and has 3,300 active irrigation accounts. The current average annual irrigation water demand is 63,410 acre – foot per year. The current annual domestic, municipal, and industrial water demand is 22,500 acre - foot. The amount of cropland within the District is declining due to the continuous conversion of farmland to residential, commercial, and/or industrial development within the District's boundaries. However, the District does not project a decrease in the demand of irrigation water over the next five to ten years due to the planting of higher water use crops such as sugar cane. The projected irrigation water demand by 2020 is 65,000 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 25,000 acre-foot

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 during the 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 sugarcane, cotton, grain sorghum, corn, specialty crops (fava beans, carinata, garbonzo beans), citrus, and pasture.

The District major facilities consist of the following:

River Pumping Plant
Re-Lift Pumping Plant
3 Reservoirs
20 miles of lined canals
40 miles of earthen canals
+200 miles of pipelines

The District delivers an average annual volume of 4,427.5 ac - ft., thru the Wyrick Canal. The District uses an average of 2.23 MKW-HR / YR of power from the grid of which 130,611 KW-HR /YR are utilized to deliver water to the Wyrick Canal. Water is lifted once at the Rio Grande; thence, it flows by gravity in the Main Canal for approximately16.8 miles to the headgate of the Wyrick Canal located at approximately 1,300 linear feet south of FM 508 and 7,900 linear feet east of U.S. Expressway 77 (I-69E).

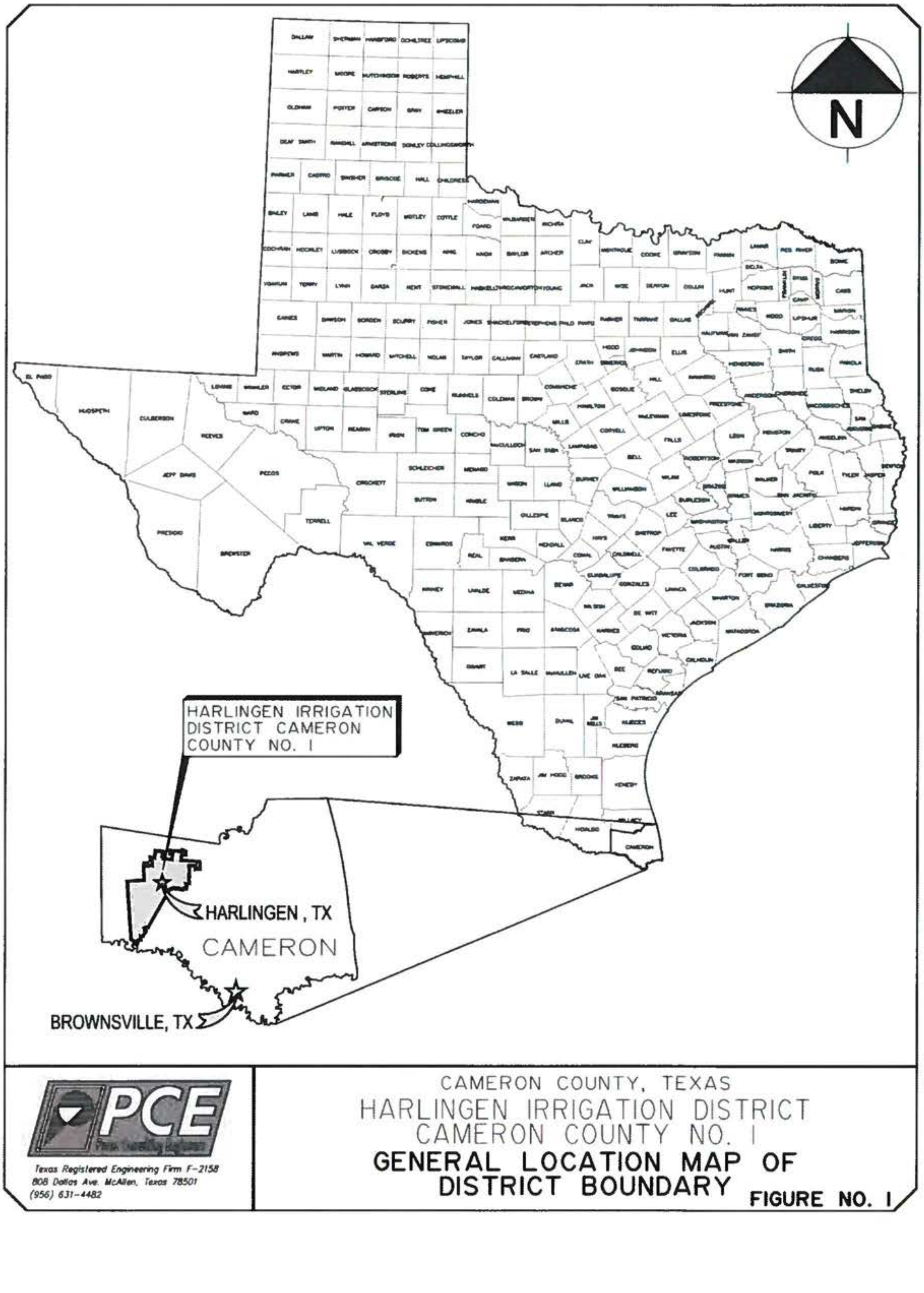
The District has had the opportunity in the past to work with the U.S. Bureau of Reclamation and is confident the District's proposal is eligible and satisfies all criteria under Section B.2.1. Funding Group I. Below is a list of the most recent projects on which the District has had the opportunity to work together with the U.S. Bureau of Reclamation.

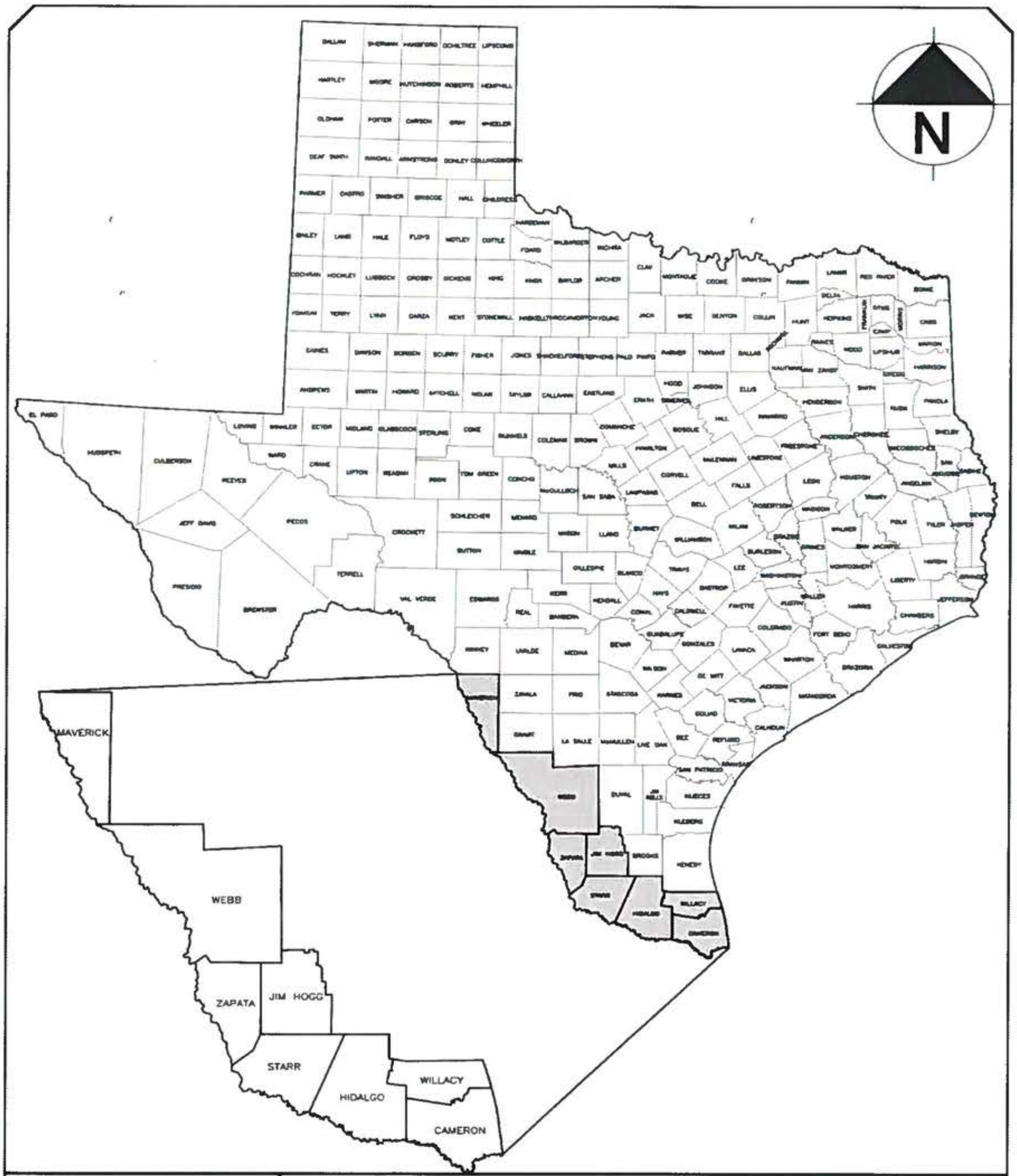
| Project Name | Status | Project Description |
|---|---|---|
| Tyler Canal | Completed in 2005 | Replacement of open canal with PVC pipe. |
| Citrus Canal | Completed in 2005 | Replacement of open canal with PVC pipe. |

| | | |
|---|---|---|
| Telemetry & Flow | Completed in 2005 | Installation of SCADA instrumentation and flow measuring devices at the River and Re-Lift Pumphouses |
| Wyrick Laterals | Completed in 2007 | Replacement of open lateral canals with pipe. |
| 2025 On Farm Metering | Completed in 2007 | Installation of on-farm metering devices as well as design and installation of related radio telemetry units. |
| Canal Automation and Telemetry | Completed in 2011 | Installation of automated remote controlled sluice gates at all of the District's open canal check structures. |
| System Optimization Review | Completed in 2012 | Preparation of map, model, and engineering analysis of the District's major deliveries. |

## 3. D.2.2.4 PROJECT LOCATION

The Wyrick Canal begins at approximately 1,300 linear feet south of FM 508 and 7,900 linear feet east of U.S. Expressway 77 (I-69E) in Harlingen Texas. From this point the canal heads north for approximately 2.7 miles where it transitions from an open canal to closed conduit (42" PVC pipe) for a short distance; thence, it makes a turn east reduced to a 36" pipeline. The total open canal length including bends and road crossings is 2.7 miles. The water conservation project (piping project) will begin at the canal's headgate located at approximately 1,300 linear feet south of FM 508 and 7,900 linear feet east of U.S. Expressway 77 and end at Templeton Rd. approximately 6,850 linear feet north from the point of beginning; all as indicated in Figure 4.


N
HARLINGEN IRRIGATION DISTRICT CAMERON COUNTY NO. I
HARLINGEN, TX
CAMERON
BROWNSVILLE, TX
PCE
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482
CAMERON COUNTY, TEXAS
HARLINGEN IRRIGATION DISTRICT
CAMERON COUNTY NO. I
GENERAL LOCATION MAP OF
DISTRICT BOUNDARY
FIGURE NO. I




PCE

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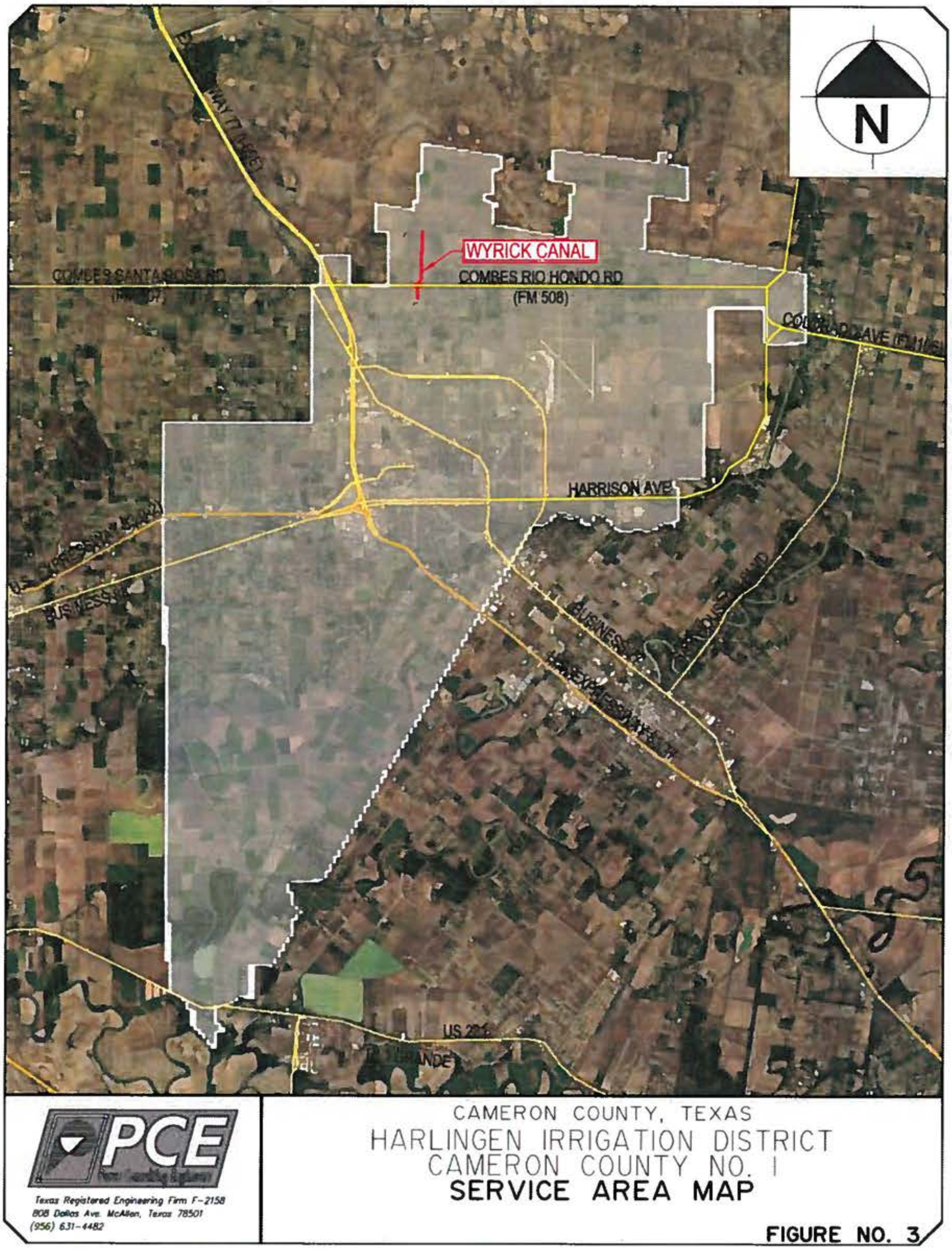
GENERAL LOCATION MAP OF REGION M AND COUNTIES THAT COMPRISE IT

FIGURE NO. 2


N
WYRICK CANAL
COMBES RIO HONDO RD
(FM 508)
HARRISON AVE
US 281
PCE
Texas Registered Engineering Firm F-2158
808 Dallas Ave. McAllen, Texas 78501
(956) 631-4482
CAMERON COUNTY, TEXAS
HARLINGEN IRRIGATION DISTRICT
CAMERON COUNTY NO. 1
SERVICE AREA MAP
FIGURE NO. 3

## 4. D.2.2.4 TECHNICAL PROJECT DESCRIPTION

The Wyrick Canal is a main lateral branch off the Main Canal to service the District's Northwest Quadrant. Through the Wyrick Canal, the District has capacity to service 1,375 acres of farmland. In 2017, the District conveyed a volume of 4,427.5 ac-ft of irrigation water. It is estimated that in dry years the District can convey an annual water volume exceeding 5,000 ac-ft. The canal has 11 pipe laterals and 11 field services in its 2.7 miles stretch.

Water losses in the Wyrick Canal system manifest in several forms. The bulk volume is lost to seepage and evaporation followed by leaks. Most leaks occur at pipe lateral penetrations; refer to picture 5 where a typical pipe lateral was captured. 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 & Evaporation*

The Wyrick 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 reached its service life in the late nineties, and in 2004, the District installed a polyurethane liner with the objective of reducing seepage losses. Exposed to the weather and elements, the short-lived polyurethane liner was removed by the District in its entirety to re-expose the broken concrete liner; refer to pictures 1 to 5. Longitudinal cracks in both interior side slopes stretch from beginning to end of the 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. Most leaks in the Wyrick Canal are reported at lateral pipe penetrations; refer to pictures 3 and 5. 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 3. 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 of the hydrostatic pressure is a good conservation practice since it helps by reducing the leakage rate. When a leak is reported during high demand, the District operates up to three (3) weeks inefficiently, at low pressure. During the past 5 years, the district has repaired approximately 12 leaks along the Wyrick Canal.

*Push Water Losses*

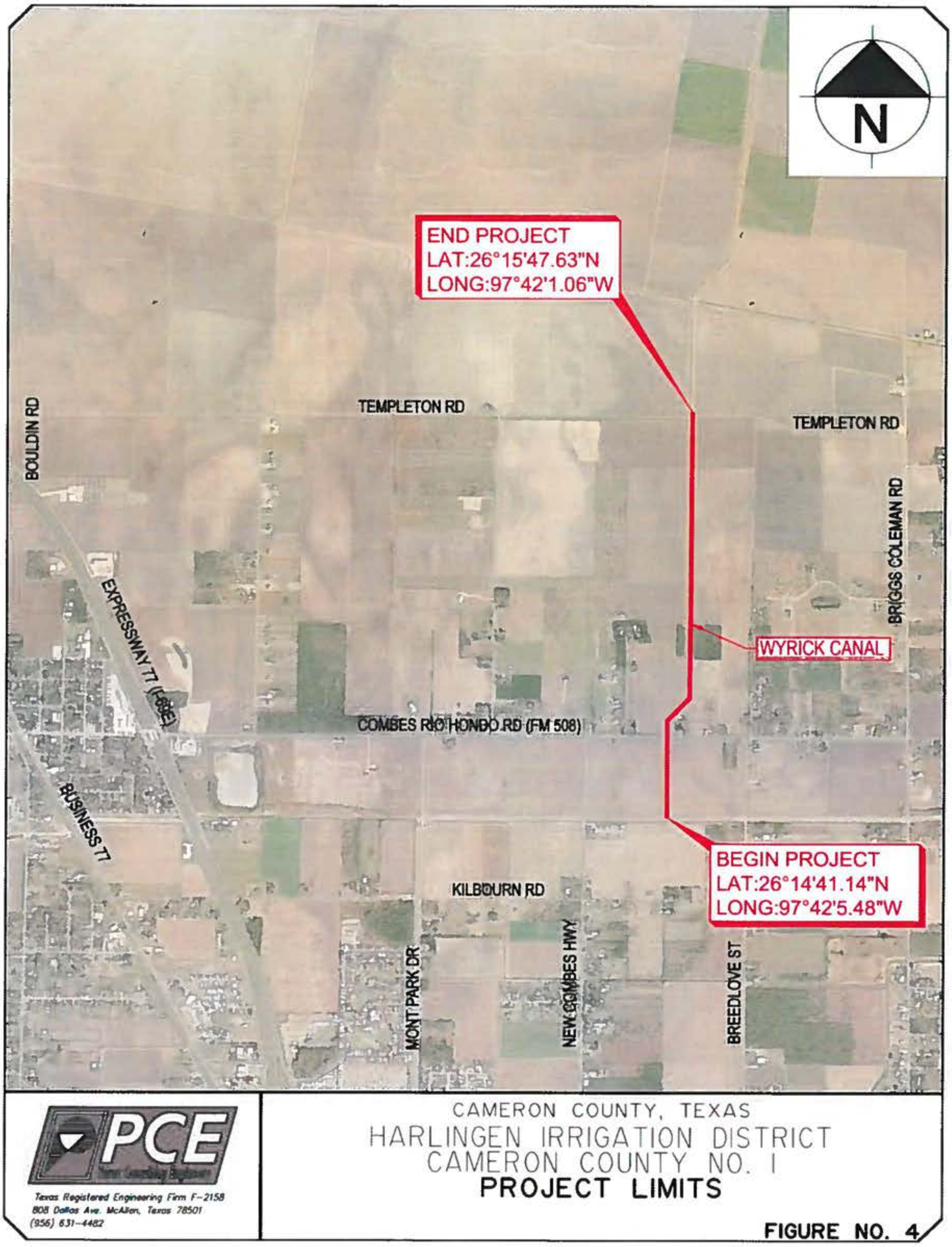
These are connected to the low canal pressure (hydrostatic head). Since the canal hydrostatic pressure is reduced to reduce the leakage rate, irrigation water users take longer to water their field resulting in inefficient use of water resources. Water is pushed more efficiently through the field at 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 pipe the Wyrick Canal using a **48"** nominal diameter ASTM F949 or ASTM F794 corrugated **PVC** pipe with interior smooth wall with gasketed joints meeting ASTM D3212 designed for low head pressure, or closed profile PVC pipe meeting ASTM F 1803 standard requirements manufactured with gasketed joints meeting ASTM D3212 standard requirements, or solid wall PVC pipe meeting AWWA C 900 DR 41 or higher dimension ratio (DR) beginning at the canal headgate and ending on Templeton Road **for a proposed 6,750 linear feet piped segment length.** The gross project length is 6,850, but for calculation purposes a net segment length of 6,750 linear feet is used. This length subtracts a 100 feet long siphon across FM 508. The 48" PVC pipe will be installed adjacent to the exterior toe of the existing canal embankment as indicated in Figure 5. The estimated trench dimensions will be 7'-6" in depth by 7'-0" in width. Cohesionless material will be used for bedding and hunching to the spring line of pipe; refer to Figure 5 Typical Pipe Installation Detail. The remaining of the trench will be backfilled using the in-situ excavated material placed in 8-inch loose lifts compacted to 6-inches. The canal will remain in service while the pipe-line is installed, and only be placed out of service for a period not to exceed 72 hours to perform the tie-ins. This will allow for the elimination of a canal by-pass. Large, 18 inch to 36 inch, laterals will be connected using PVC pre-manufactured fittings and coupling adaptors. Smaller field services 12 inch to 15 inch will be connected using a flexible fitting Insert-Tee ® or equal flexible connector. Inline gates Model H-30 Waterman ® or equal will be installed at each lateral to control the flow. Vent pipe or air release valves will be used as needed.

By piping the Wyrick Canal using PVC pipe, the District will conserve water by significantly reducing water losses to seepage, evaporation, leaks, and by assuring the system pressure for more efficient use of the water resource. Water conserved will translate into energy savings by reduced pumping. The District has used PVC pipe in the past in the same manner with excellent results. In 2007, the District completed the piping of the Wyrick Lateral A and Lateral B; both projects were completed with participation of the U.S. Bureau of Reclamation.

**Picture 1. (Background) Visible horizontal crack in the east side slope. Horizontal cracks extend for the entire canal length on both interior side slopes.**


N
END PROJECT
LAT:26°15'47.63"N
LONG:97°42'1.06"W
TEMPLETON RD
TEMPLETON RD
BOULDIN RD
BRIGGS COLEMAN RD
EXPRESSWAY 77
WYRICK CANAL
COMBES RIO HONDO RD (FM 508)
BUSINESS 77
BEGIN PROJECT
LAT:26°14'41.14"N
LONG:97°42'5.48"W
KILBOURN RD
MONT PARK DR
NEW COMBES HWY
BREEDLOVE ST
PCE
Texas Registered Engineering Firm F-2158
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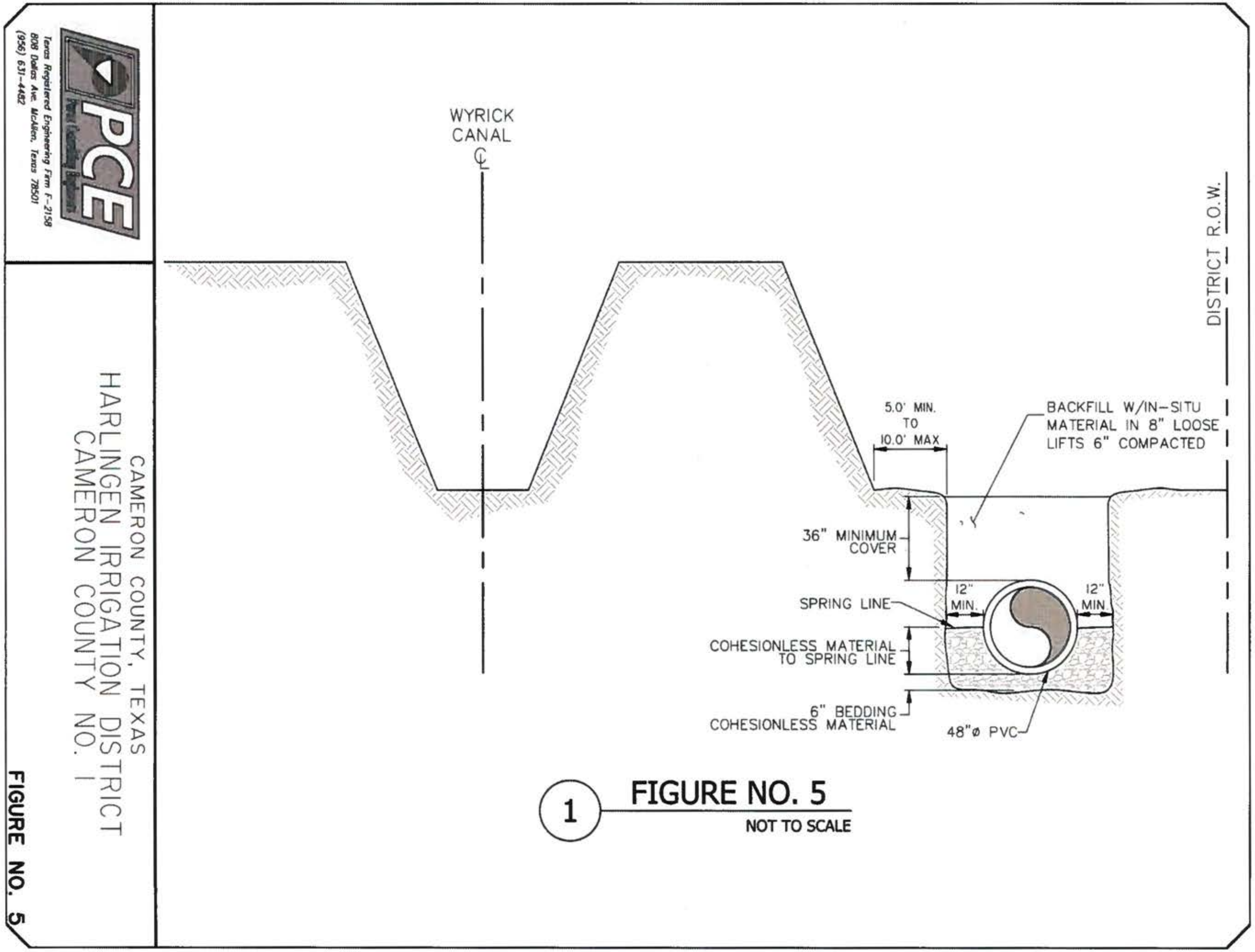
CAMERON COUNTY, TEXAS
HARLINGEN IRRIGATION DISTRICT
CAMERON COUNTY NO. 1
PROJECT LIMITS
FIGURE NO. 4

**Picture 2 Visible buckling and structural movement.**

**Picture 3 Failure at a service lateral west side slope (right side). The gray to white band in background at approximately 12 inches below the grass line indicates the canal's operational water surface elevation.**

**Picture 4. Left half of the picture – Recent Repair.**

**Picture 5. Typical field outlet pipe laterals.**


WYRICK CANAL
DISTRICT R.O.W.
5.0' MIN. TO 10.0' MAX
BACKFILL W/IN-SITU MATERIAL IN 8" LOOSE LIFTS 6" COMPACTED
36" MINIMUM COVER
12" MIN.
12" MIN.
SPRING LINE
COHESIONLESS MATERIAL TO SPRING LINE
6" BEDDING COHESIONLESS MATERIAL
48"ø PVC
1
FIGURE NO. 5
NOT TO SCALE
PCE
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CAMERON COUNTY, TEXAS
HARLINGEN IRRIGATION DISTRICT
CAMERON COUNTY NO. 1
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 **112.18 ac-ft / yr.** Below is a synthesis of the calculations performed to determine the estimated amount of water expected to be conserved as a direct result of this project.

**Current Losses**
Water system losses are mainly attributed to canal seepage and a smaller percentage is lost to evaporation, leakage, and inefficiency. Water leaving the system by leakage usually pond in a shallow pool adjacent to the canal embankment and is lost to seepage and evaporation. In case of a sever leak, water sheet-flows into the adjacent lateral drain to eventually reach the Gulf of Mexico. When the system is put out of service to repair a leak, the canal is drained completely. Water drained out of the system is discharged into to the adjacent lateral drain to eventually reach the Gulf of Mexico.

**Calculated Water Savings and Corresponding Support Documentation**

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

b. *Seepage Losses:*
The Wyrick Canal was constructed using in-situ earthen material adjacent to the canal and which consists of either clay loam, sandy clay loam, or fine sandy loam. Exhibit A contains a copy of the NRCS Soil Survey map encompassing the Wyrick Canal and corresponding soils. In absence of a ponding test, the seepage rate used in calculating the water savings is **1.17 gal/ft$^2$-day** corresponding to a composite (weighed) seepage rate using values published by Irrigation Technology Center (ITC), Texas A&M University under the direction of Dr. Guy Phips in a document titled "Potential Water Savings in Irrigated Agriculture for the Rio Grande Planning Region – Updated May 6$^{th}$, 2005"; **copy of the report may be furnished upon request.**

The NRCS Soil Survey identifies three different soil types along the 6,750 linear feet of the Wyrick Canal proposed for replacement as follows: RE – Raymondville clay loam, RE-Racombes sandy clay loam, and Willacy fine sandy loam; refer to **Exhibit A.** The soil distribution composition along the 6,750 linear feet stretch is as follows: 67.55% RE, 18.52% RA, and 13.93% WAA. In accordance with seepage values published in Table 11c of the subject ITC report, test results demonstrated that one of the District's canals on sandy clay loam and fine sandy loam had a seepage rate of 2.28 gal/ft$^2$-day, and a second test also conducted on a District canal, but on clay loam had a seepage loss rate of 0.63 gal/ft$^2$-day. In accordance with the subject ITC report both canals had concrete liner as the Wyrick canal.

Based on this analogy, we anticipate that the composite seepage rate at the Wyrick Canal is consistent with the seepage rates determined by the ITC for canals with similar geometry and physical characteristics. Table 1 below provides a summary of the calculations used to estimate the yearly volume of water expected to be conserved by eliminating the seepage losses.

Table 1. Wyrick Canal. Summary of estimated annual seepage losses.

| [1a]Canal Length, ft | [1b]Avg. Wetted Perimeter, ft | [1c]Surface Area, ft² | Seepage Rate Gal/ft²-day | [1d] Annual Seepage Vol. Loss Gal/day | [1d] Annual Seepage Vol. Loss ac-ft/year |
|---|---|---|---|---|---|
| 6,750 | 10.1 | 68,175 | 1.17 | 79,764.75 | 89.35 |

Table Notes:

1a.) *The project gross total length is 6,850 linear feet. Table 1 accounts for an existing siphon crossing under FM 508.*

1b.) *Calculated at operational water surface elevation.*

1c.) *Water surface area in contact with the canal base and side slopes. Calculated at operational water surface elevation.*

1d.) *The Wyrick Canal operates year-round (365 days).*

*Evaporation Losses:*

Table 2 below provides a summary of the calculations used to estimate the yearly volume of water expected to be conserved by eliminating the evaporation losses.

Table 2. Wyrick Canal. Summary of estimated annual evaporation losses.

| [2a]Canal Length, ft | [2b]Avg. Water surface width, ft | [2c]Water Surface Area, ft² | Evaporation Rate inch/year | [2d]Annual Evaporation Vol. Loss ac-ft/year |
|---|---|---|---|---|
| 6,750 | 8.9 | 60,075 | 61 | 7.01 |

Table Notes:

2a.) *The project gross total length is 6,850 linear feet. Table 2 accounts for an existing siphon crossing under FM 508.*

2b.) *Ambient exposed water surface width. Calculated at operational water surface elevation.*

2c.) *Ambient exposed water surface area. Calculated at operational water surface elevation.*

2d.) *The Wyrick Canal operates year-round (365 days).*

*Leakage Losses:*

The District experiences most leak losses at the location where existing pipe laterals penetrate the inner side slope of the canal embankment. Precise record of water losses attributed to leakage is unavailable; however, there are means to estimate water losses directly attributed to leak repairs, and these involve placing the canal out of service to make the repair(s). The District drains the canal to make repairs. On average the District experiences 2.5 leaks per year. Table 3 below provides a summary of the calculations used to estimate the yearly volume of water expected to be conserved by eliminating the leakage losses.

Table 3. Wyrick Canal. Summary of estimated annual water losses attributed to repairs.

| [3a]Canal Length, ft | [3b]Avg. Water surface width, ft | Avg. Canal base, ft. | Avg. Canal depth, ft. | [3c]Hydraulic Cross Sectional Area, $ft^2$ | [3d]Annual Water Vol. Loss ac-ft/year |
|---|---|---|---|---|---|
| 14,244 | 8.9 | 1.8 | 2.14 | 11.45 | 9.36 |

Table Notes:

*3a.)* *The District drains the entire open canal length from the headgate to its end at approximately 14,244 linear feet north from the headgate.*
*3b.)* *Water surface width. Calculated at operational water surface elevation.*
*3c.)* *Canal cross sectional area. Calculated at operational water surface elevation.*
*3d.)* *Calculated at 2.5 times of downtime per year to repair a leak.*

<u>*Losses to Reduced Hydrostatic Head (Pressure)*</u>
The hydrostatic pressure is reduced in the canal pool when a leak is detected, and as a direct result the delivery efficiency is affected. When the canal is maintained at the operational water surface elevation, 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 2.5 leaks per year for an equivalent 17.5 days (2.5 X 7 days) of low pressure. The District conveys an average volume of 4,500 ac-ft/yr of irrigation water thru the Wyrick Canal corresponding to 12.3 ac-ft per day (4,500 / 365). The volume of irrigation water conveyed at low pressure for 17.5 days is 215.25 ac-ft (12.3 X 17.5). Three percent of the total volume managed at low pressure **is 6.46 ac – ft (215.25 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: 89.35 ac–ft/yr (seepage losses) + 7.01 ac-ft/yr (evaporation losses) + 9.36 ac-ft/yr (leakage losses) + 6.46 ac–ft/yr (losses to reduced hydrostatic head) = 112.18 ac – ft / yr.**

In 2011 the District upgraded the Wyrick Canal head gate by adding automated sluice gates at the canal check structures, SCADA, and 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 Wyrick Canal system. The District relies on this equipment and instrumentation to maintain the canal pool level in the Wyrick Canal at optimum pressure. Water losses have been reduced significantly to the better operation offered by the automation instrumentation and equipment. The District strives to improve their conveyance systems for 100 % reliability and make the most efficient use of the water resources. Piping of the Wyrick Canal will transform the water conveyance facility into a state-of-the-art facility.

c. Acceptable leakage industry standards used to evaluate the performance of installed low head pressure rated pipe vary upon application, pipe material, and gasket rating. Most common field test procedure in the State of Texas implemented to test the performance of installed PVC pipe manufactured with joints meeting ASTM D3212 standard requirements is established by 30 TAC Chapter 217. PVC pipe meeting AWWA C900 standard is tested following hydrostatic testing procedures established by AWWA C 605 which are more stringent than those established for low head pressure pipe.

Other industry test methods are established by ASTM as ASTM F2487 which is intended for corrugated high-density polyethylene and polypropylene pipe, and ASTM C969 which is intended for pre-cast reinforced concreter pipe manufactured meeting ASTM C361 standard for low head pressure pipe.

Upon the pipe selected for the project, the District will perform a field hydrostatic test (exfiltration test) which is best applicable to the pipe gasket rating.

For practical purposes the **expected post-project** leakage losses should not exceed 13.8 ac-ft/ yr as calculated below and is based on an allowed leakage of 200 gal/(inch-pipe dia.- mile – day) which is a lenient figure acceptable by referenced ASTM standards for low head pressure pipe.

200gal X 48-inch X 6,750ft X 365 days/year ÷ (5,280 ft/mile X 7.48 gal/ cf X 43,560 cf/ac-ft)

The District expects better results being PVC pipe offers a tighter joint than other pipe materials used in the manufacturing of low head pressure pipe and should be proven after field hydrostatic test results are available.

d. The anticipated annual transit losses reductions are 112.18/1.28 miles = 87.64 ac – ft / mile – yr.

e. The actual canal loss seepage reductions can be verified by conducting a field hydrostatic test as stated above. 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 to be employed to convert the Wyrick Canal from open canal to pipeline are as specified in paragraph 4. D.2.2.4 TECHNICAL PROJECT DESCRIPTION above.

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

1. Will the Project address a specific water reliability concern?

   - Explain and provide detail of the specific issue(s) in the area that is impacting water reliability.

     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, a 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 invest in desalinization projects for the higher treatment costs in contrast 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 relatively 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 piping 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 Harlingen Irrigation District Cameron County 1 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 January 2018, 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 early 2018, 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 how the project will address the water reliability concern?

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.**

- 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 available for other users.

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

  **112.18 ac-ft/yr**

2. Will the project make water available to achieve multiple benefits or to benefit multiple water users?

   - Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)?

     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 water use also diversified from agricultural to municipal, industrial, and recreational. **Today the vast network of open canals and pipelines owned and operated by the local irrigation districts serves as the primary water conveyance and delivery system for 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 open canals during transit to the user's 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 Wyrick 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 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)?

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

Other endangered species in Cameron County TX, are:
Hawksbill sea turtle
Kemp's Ridley sea turtle
Leatherback sea turtle
Norther aplomado falcon
South Texas ambrosia
Texas ayenia
West Indian manatee

The water required to create dense habitat necessary for the recovery of both cat species is delivered by the irrigation district in the area. The U.S. Fish and Wildlife service owns an 871 acres wildlife corridor north of the District's reservoir. 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 brushed corridor supports native bird species, plants, insects, and other native wildlife. Most important the corridor supports the habitat for the recovery of the Jaguarundi and Ocelot.

The District has available several deliveries to this tract of land. The U.S. Fish and Wildlife has used water from the District in past years to fill a Resaca with the corridor. 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.**

The District also deliver water to municipal parks for irrigation and recreational use. The District delivers to the City of Harlingen Sports Complex at Wilcox Rd., Victor Park, and the Golf Course.

- Will the project benefit a large initiative to address water reliability?

- Will the project benefit Indian tribes?

  The project will benefit the Rio Grande water users. Since the water **conserved by the project will remain in the river basin,** one of the 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, 27.7% of the population in Cameron County is found in poverty with a median household income (in 2017 dollars) of $36,095 and per capita income in past 12 months (in 2017 dollars) of $16,085. **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 counties in Region M are labeled as eligible for funds through the Economically Distressed Areas Program."

3. 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 Harlingen Irrigation District Cameron County 1 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 piping 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 Piping of the Wyrick 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 Harlingen Irrigation District Cameron County 1 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 four years the District has documented and repaired 10 leaks along the Wyrick Canal. The Wyrick Canal is the District's main conveyance system to the northwestern quadrant. With 1,375 acres of farm land on the Wyrick Canal, 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 for the repair crew can 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 postpone repairs until the demand is reduced. From the time the leak is detected or reported it takes one week on average to address the problem. 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 piping of the Wyrick Canal will eliminate canal leaks and provide reliable pressure. **On-farm water conservation measures will be enhanced by completion of the District's project.**

- 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 Rio Grande basin available for other users.

- 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".

4. 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. Cameron County receives on average 26 inches of rainfall per year, and the average annual pan evaporation is approximately 61 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 demand 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 destination 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 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 it 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 the existing diversion facilities on the Lower Rio Grande would be able to physically lift the 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 drought. 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 deliver water to 4 municipalities and 2 rural water suppliers without any threat of running out. The District's agricultural producers were also able to irrigate as needed 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, water conservation efforts transform to power conservation. Since the District is a non-profit public entity, power cost savings and conservation efforts can be pass on to the user.

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

Implementation of Hydropower is excluded by the project.

## 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 provides labor and equipment for installation of pipelines on customer's farms at no cost to the customer except for the materials. The District works with producers to utilize USDA NRCS, Texas Soil and Water Conservation Board, EPA (319) and any other funds available for the installation of facilities for water quality and quantity improvements. The District has designed turnouts specifically to accommodate and encourage the various methods of water conservation available.

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

a. 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 Wyrick 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 canal, Wyrick Canal for 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. The District's proposal of **piping the Wyrick Canal** will assure sustained pressure for user.

   - 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 plan to participate in available NRCS programs

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

b. 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 2004, the District installed a polyurethane liner in the Wyrick Canal with the objective of reducing seepage losses. At the time, the liner was placed over a deteriorated concrete liner and tuck at the inner canal crown. The polyurethane liner has reached its service life due to its exposure to the weather and elements and ultra violet radiation attribute to its short life. The District has experienced an increase of down time to attend to leaks. Most repairs happen at outlet locations. The District's proposal to pipe the Wyrick Canal will ascertain 100% reliability and efficiency with flexibility and capability to accommodate for conservation irrigation methods as drip irrigation.

c. 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.

  **6.46 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)*" **page 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 materials offered by the private market as PVC pipe considered for this project, it is possible to reduce in-transit water losses. The implementation of the Wyrick Canal piping project will assure 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 relationship with federal, state, and local conservation organizations. The District has available several deliveries available for U.S. Fish and Wildlife service in a wildlife corridor north of the District's reservoir. The District also deliver water to municipal parks for irrigation and recreational use. **Water conserved within the river basin assures sustainability for balanced stewardship and use of public land.**

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 piped canal will be more reliable and efficient. Energy efficiencies are expected to result from the water conserved. The District lifts the water at the River Pumping Plant (Diversion Point) before it is delivered into the Wyrick Canal. The River Pumping Plant counts with six (6) electric powered pumps. Base on three year average power usage and volume pumped for the periods 2016 to 2018, the District used on average 29.46 KWH / ac-ft to deliver water to the Wyrick Canal. **Base on this supportive data, the expected yearly energy savings to result from water conservation are 3,304.82 KWH / YR which was calculated as follows:**

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

Energy Savings = 112.18 ac-ft /yr X 29.46 KWH / ac – ft = **3,304.82 KWH / YR**

Power usage data and corresponding pumped volume for the periods 2016 to 2018 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 allow for decommissioning of the existing open canal. Once the pipeline is in service the open canal will be taken down and leveled. The pipeline will take less space, and the adjacent land owners will enjoy the benefit of the additional space for farmland.

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 Wyrick Canal has been in service since the early 1900s. Thru its service life, the facility has received several upgrades in tune with corresponding times. In recent years the canal was upgraded with fully actuated slide 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 piping improvements will modernize the Wyrick Canal making the District's project 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 material suppliers and local vendors. The District will specify native equipment and materials and select the equipment and supplies meeting the specified requirements offered at 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 Documents for Water Diversion and Deliveries filed with the Texas Commission on Environmental Quality (TCEQ) and the Rio Grande Regional Water Planning Group in 2009.

District's System Inventory, Water Conservation Plan, and Water Conservation Implementation Report filed with the TCEQ in April 2009.

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 Wyrick Canal have been in the District's scope of work since 2000. The Wyrick Canal is the main facility used to convey water to the Northwest quadrant of the District. The District's proposal of piping the canal is consistent with the District's own Water Conservation Policy 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 piping 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 field hydrostatic test after project completion. The test will be conducted by an acceptable established standard field leakage test method as stated in paragraph 5.E.1.1.1.c above, and can be conducted either in house, or by a third party non-bias public organization as the Irrigation Technology Center, Texas A&M University System, or by a private engineer consultant (testing laboratory). Test results can be compared and verified against pre-improvements to confirm the post improvements water losses.

**E.1.6.3. Subcriterion F.3 – Readiness to Proceed**

The District stands ready to proceed. All construction will take place within District right of way without need to obtain permit from political subdivisions of the state or private entities or need to obtain easements from private land owners. Preliminary engineering design and concepts have been explored. The District sought engineering consulting services to assist with sizing of the proposed 48-inch PVC pipe and explore conceptual alignment and construction techniques for cost effective alternatives. There will be no policies or administrative actions required to implement the project. The District will contract the services of the local Reclamation office to assist with environmental compliance.

Time permitting, the District could begin with the construction activities during the last week of August 2019 and end in late February 2020 as outlined below:

| | |
|---|---|
| June 3, 2019 to June 7, 2019 | Filed Survey. |
| June 17, 2019 to July 26, 2019 | Engineering Design and Preparation of Construction Plans, Material and Supplies Purchase Contract and Agreement Documents. |
| August 1, 2019 to August 22, 2019 | Advertise. |
| August 22, 2019 to September 20, 2019 | Award, Execute Materials and Supplies Agreement, and Issue Notice to Proceed. |
| October 7, 2019 to October 14, 2019 | Receive Materials & Supplies and Mobilize. |
| October 15, 2019 to December 20, 2019 | Construction Begins – Installation of 48" PVC Pipe. |

| | |
|---|---|
| January 6, 2020 to February 21, 2020 | Installation of Lateral Fittings and Valves, perform tie-ins, charge and test pipeline, and dress up. |
| February 24, 2020 | Demobilize. |

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

d. 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

e. 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 70.69% 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 29.31% will be funded from the grant resources.

**Non-federal funding $ 723,688.00**
**Total Project Cost $ 1,023,688.00** **= 29.31% non-federal funding**

## 13. D.2.2.5. PROJECT BUDGET

***Funding Plan and Letters of Commitment***

The District will perform the construction activities in-kind. The District owns the required power equipment, tools, and counts with the assistance of qualified personnel that will provide the needed labor.

The District has capability to commit 70.69% of the total project cost using resources from the District's Capital Improvements Fund. The Board of Directors will consider, and act, on a Letter of Commitment during a Regular Board Meeting to be held on March 27th, 2019 at the District's office in Harlingen, TX. A copy of the approved Letter of Commitment will be mailed by the District separately as soon as it becomes available.

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

Table 4 below provides a summary of the 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 **180** calendar days with completion in early 2020. To accomplish this task the District will have to begin with the engineering design in late spring/early summer 2019 and follow with its construction beginning in mid to late summer 2019 to complete the project in early 2020.

**Table 4. Total Project Cost.**

| SOURCE | AMOUNT |
|---|---|
| Costs to be reimbursed with the requested Federal funding | $ 300,000.00 |
| Costs to be paid by the applicant | $ 723,688.00 |
| Value of third party contributions (NONE) | $ 0.00 |
| **TOTAL PROJECT COST** | $ 1,023,688.00 |

**The itemized budget proposal can be found in page 38.** The budget proposal identifies all items of cost. The District will implement the Federal funding reimbursement amounts towards the total project cost including but not limited to purchase of construction materials and supplies, equipment cost, professional services, and incidentals needed for the completion of the project.

**Budget Narrative**

*Salaries and Wages*

The District counts with the support of experienced personnel. The District plans on utilizing a single construction crew made of two laborers, one crew leader, a construction superintendent, a designated equipment operator upon piece of heavy equipment required for each construction task, and a project manager. All crew members are employees of the District. The estimated needed labor time was derived from estimated net work days required to complete construction of the proposed improvements. Equipment operator times vary upon needed piece of equipment.

The project status will be under the supervision of the project manager Mr. Randy Horkman a full-time employee of the District who will report to the District General Manager, Mr. Tom McClemore.

*Fringe Benefits*
Fringe benefits are identified in the budget proposal and correspond to 20% of wage rate to cover for various state and federal benefits, health insurance, and retirement fund.

*Travel*
None anticipated.

*Equipment*
The District owns the heavy equipment required for the construction of the proposed improvements. The District anticipate utilizing a wheeled excavator, wheeled loader, backhoe, dump truck, motor grader, and tractor truck with lowboy trailer to mobilize and demobilize the various pieces of heavy equipment demanded upon construction task. The estimated needed equipment time was derived from estimated net work days required to complete the construction task. Equipment rates were obtained from the United States Army Corps of Engineers (USACE) Construction Equipment Ownership and Operating Expense Schedule manual for Region VI, EP 1110-1-8 Volume 6, Dated November 2016. The itemized budget proposal provides reference to the USACE id. Number as published for Region VI, EP 1110-1-8 Volume 6, Dated November 2016.

The District also anticipates the need to utilize a sheep foot trench compactor. This equipment will be rented. The rent rate was obtained from local vendor. The equipment time was derived from estimated net work days required to complete the construction task.

A portable toilet will be required. The service will be obtained for local vendor. The estimated service time was derived from estimated net work day required for duration of the construction activities.

*Materials and Supplies*
The District will purchase the needed construction materials and supplies by publicly soliciting 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 construction materials and supplies cost were obtained from various sources including recent budgetary figures submitted by established vendors, and listed manufacturer prices. **Sources of unit price can be furnished upon request.** The unit price includes material and associated freight costs for delivery to the District's yard in Harlingen TX. or project site.

*Contractual*
The District retains engineering professional services from local qualified local civil engineering consultant. Procurement and solicitation methods abide to state and professional engineering solicitation practices. Fees presented under table row titled Professional Services are estimates from past similar projects that required the listed services. The itemized budget proposal separates engineering and other needed professional services for transparency. The District will solicit and review a proposal from the retained qualified local civil engineer consultant for the needed services inclusive of field surveying services and services required to clear the project with the Texas

Historical Commission for Section 106 Review. Geotechnical and material testing services will be solicited from local professionals and will be awarded to the most qualified professional.

The District will contact the local Reclamation Office to solicit assistance with Environmental and Regulatory Compliance. Fees in connection to environmental and regulatory compliance are estimates for cost associated to achieve completion of this task.

*Third Party In Kind Contributions*
None anticipated.

*Environmental and Regulatory Compliance Costs*
Refer to second paragraph under Contractual.

| A. SALARIES AND WAGES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Item No. | Description | Wage Rate | Fringe Rate | Total Rate | Unit | Quantity | | Total Amount |
| A 1. | Crew Laborer | 12 | 2.4 | $ 14.40 | HR | 454 | $ | 6,537.60 |
| A 2. | Crew Laborer | 12 | 2.4 | $ 14.40 | HR | 454 | $ | 6,537.60 |
| A 3. | Crew Leader | 18.8 | 3.76 | $ 22.56 | HR | 454 | $ | 10,242.24 |
| A 4. | Backhoe Operator | 12.5 | 2.5 | $ 15.00 | HR | 176 | $ | 2,640.00 |
| A 5. | Excavator Operator | 18 | 3.6 | $ 21.60 | HR | 278 | $ | 6,004.80 |
| A 6. | Motor Grader Operator | 18 | 3.6 | $ 21.60 | HR | 40 | $ | 864.00 |
| A 7. | Construction Superintendent | 25.83 | 5.17 | $ 31.00 | HR | 454 | $ | 14,074.00 |
| A 8. | Project Manager | 24.8 | 4.96 | $ 29.76 | HR | 250 | $ | 7,440.00 |
| TOTAL ITEM A | | | | | | | $ | 54,340.24 |

| B. EQUIPMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Item No. | Description | | USACE ID. No. | Avg Rate | Unit | Quantity | | Total Amount |
| B 1. | Freightliner 120SD Highway Tractor Truck | | T50XX031 | $ 43.49 | HR | 18 | $ | 782.82 |
| B 2. | Lowboy Trailer 50 Ton | | T45EA007 | $ 11.61 | HR | 18 | $ | 208.98 |
| B 3. | Doosan Wheel Excavator Model DX 190W | | H30CA005 | $ 53.74 | HR | 274 | $ | 14,724.76 |
| B 4. | CASE Wheeled Loader Model 721G | | L40CS013 | $ 62.32 | HR | 274 | $ | 17,075.68 |
| B 5. | Mack 77 Dump Truck 10 CY | | T50XX032 | $ 28.73 | HR | 334 | $ | 9,595.82 |
| B 6. | CASE Backhoe Model 580 SN WT | | L50CS008 | $ 34.08 | HR | 176 | $ | 5,998.08 |
| B 7. | CAT Motor Grader Model 140H | | G15CA004 | $ 60.80 | HR | 40 | $ | 2,432.00 |
| B 8. | 350 Highway Crew Truck 4X2 Gas 1Ton | | T50XX009 | $ 18.83 | HR | 454 | $ | 8,548.82 |
| B 9. | 350 Highway Crew Truck 4X2 Gas 1Ton | | T50XX009 | $ 18.83 | HR | 454 | $ | 8,548.82 |
| B 10. | 32" Sheetfoot Trench Roller | (RENTAL) | N/A | $ 2,381.50 | Month | 2 | $ | 4,763.00 |
| B 11. | Portable Toilet | (RENTAL) | N/A | $ 100.00 | Week | 12 | $ | 1,200.00 |
| TOTAL ITEM B | | | | | | | $ | 73,878.78 |

| C. SUPPLIES & MATERIALS | | | | | | |
|---|---|---|---|---|---|---|
| Item No. | Description | Unit Price | Unit | Quantity | | Total Amount |
| C 1. | 48" PVC Closed Profile ASTM F1803/ ASTM D3212 | $ 99.97 | | 6750 | $ | 674,797.50 |
| C 2. | 48" X 18" Manufactured PVC TEE. | $ 6,473.60 | | 2 | $ | 12,947.20 |
| C 3. | 18" Inline Gatevalve Waterman Model HD30 or Equal. | $ 3,332.00 | | 2 | $ | 6,664.00 |
| C 4. | 15" Inline Gatevalve Waterman Model HD30 or Equal. | $ 1,538.40 | | 6 | $ | 9,230.40 |
| C 5. | 12" Inline Gatevalve Waterman Model HD30 or Equal. | $ 1,438.40 | | 4 | $ | 5,753.60 |
| C 6. | 18" PVC PIP CL 100 Pipe. | $ 11.30 | | 60 | $ | 678.00 |
| C 7. | 15" PVC PIP CL 100 Pipe. | $ 7.66 | | 160 | $ | 1,225.60 |
| C 8. | 12" PVC PIP CL 100 Pipe. | $ 4.88 | | 120 | $ | 585.60 |
| C 9. | 18" Manufactured PVC CL 100 45 Degree Gasketed Bend. | $ 1,632.24 | | 4 | $ | 6,528.96 |
| C 10. | 15" Manufactured PVC CL 100 45 Degree Gasketed Bend. | $ 959.73 | | 12 | $ | 11,516.76 |
| C 11. | 12" Manufactured PVC CL 100 45 Degree Gasketed Bend. | $ 650.13 | | 8 | $ | 5,201.04 |
| C 12. | 18" AWWA C219 Coupling Adaptor Smith Blair or Equal. | $ 1,429.68 | | 2 | $ | 2,859.36 |
| C 13. | 15" AWWA C219 Coupling Adaptor Smith Blair or Equal. | $ 1,265.63 | | 6 | $ | 7,593.78 |
| C 14. | 12" AWWA C219 Coupling Adaptor Smith Blair or Equal. | $ 1,047.66 | | 4 | $ | 4,190.64 |
| C 15. | 15" Inserta-Tee Flexible Connector. | $ 531.00 | | 6 | $ | 3,186.00 |
| C 16. | 12" Inserta-Tee Flexible Connector. | $ 432.60 | | 4 | $ | 1,730.40 |
| C 17. | Class III Pipe Embedment. | $ 4.50 | | 1350 | $ | 6,075.00 |
| C 18. | Grade 60 ASTM A615 Steel Reinforcement. | $ 0.75 | LB | 2000 | $ | 1,500.00 |
| C 19. | 8' X 20' X 6X6-W1.4 X W1.4 Galvanized Welded Wire Fabric Sheet. | $ 80.00 | EA | 20 | $ | 1,600.00 |
| C 20. | 4000 psi Portland Cement Concrete Ready Mix. | $ 40.00 | CY | 117 | $ | 4,680.00 |
| C 21. | Sikaflex Control and Expansion Joint Sealant 10 oz. | $ 1.00 | Box | 85 | $ | 85.00 |
| C 22. | ADEKA Ultra Seal P201 Hydrophilic Paste 11 oz Tube. | $ 1.00 | Box | 294 | $ | 294.00 |
| TOTAL ITEM C | | | | | $ | 768,922.84 |

| D. PROFESSIONAL SERVICES | | | | |
|---|---|---|---|---|
| D 1. | Surveying Services | Lump Sum | $ | 8,750.00 |
| D 2. | Consulting Engineering Services | Lump Sum | $ | 71,750.00 |
| D 3. | Environmental and Regulatory Compliance | Lump Sum | $ | 2,500.00 |
| D 4. | Geotechnical Engineering Services | Lump Sum | $ | 2,850.00 |
| D 5. | Construction Materials Testing | Lump Sum | $ | 2,250.00 |
| TOTAL ITEM D | | | $ | 88,100.00 |

| E. OTHER | | | |
|---|---|---|---|
| E 1. | Supplies & Materials Contingency at 5% | $ | 38,446.14 |
| TOTAL ITEM E | | $ | 38,446.14 |

| | |
|---|---|
| TOTAL DIRECT COST (ITEMS A,B,C,D,and E) | $ 1,023,688.00 |
| Indirect Costs | 0 |
| Type of Rate | 0 |
| **TOTAL ESTIMATED PROJECT COSTS** | **$ 1,023,688.00** |

## 14. D.2.2.6. 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.

## 15. D.2.2.7. 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.**

## 16. D.2.2.8. OFFICIAL RESOLUTION

The Board of Directors considered and acted in favor of execution of Official Resolution in support of the application during Regular Board Meeting held on February 27, 2019, at the District's office in Harlingen, TX. A copy of the approved Resolution letter can be found in **Exhibit B.**

Soil Map—Cameron County, Texas




EXHIBIT A1

EXHIBIT A2

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cameron County, Texas
Survey Area Data: Version 15, Sep 14, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Dec 11, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| HO | Hidalgo sandy clay loam, 0 to 1 percent slopes | 14.1 | 5.0% |
| RA | Racombes sandy clay loam | 71.6 | 25.7% |
| RE | Raymondville clay loam | 139.2 | 50.0% |
| RO | Rio clay loam, ponded | 1.8 | 0.6% |
| TC | Tiocano clay, 0 to 1 percent slopes, occasionally ponded | 2.6 | 0.9% |
| WAA | Willacy fine sandy loam, 0 to 1 percent slopes | 48.6 | 17.4% |
| WAB | Willacy fine sandy loam, 1 to 3 percent slopes | 0.5 | 0.2% |
| **Totals for Area of Interest** | | **278.3** | **100.0%** |



EXHIBIT A3

# Cameron County, Texas

## RA—Racombes sandy clay loam

### Map Unit Setting

*National map unit symbol:* d6fc
*Elevation:* 20 to 400 feet
*Mean annual precipitation:* 23 to 30 inches
*Mean annual air temperature:* 70 to 73 degrees F
*Frost-free period:* 280 to 350 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Racombes and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Racombes

#### Setting

*Landform:* Delta plains
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Parent material:* Calcareous loamy alluvium

#### Typical profile

*H1 - 0 to 13 inches:* sandy clay loam
*H2 - 13 to 44 inches:* sandy clay loam
*H3 - 44 to 74 inches:* sandy clay loam

#### Properties and qualities

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Negligible
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
*Depth to water table:* About 42 to 72 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 15 percent
*Salinity, maximum in profile:* Nonsaline to slightly saline (1.0 to 4.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 6.0
*Available water storage in profile:* High (about 10.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 2w
*Land capability classification (nonirrigated):* 2w
*Hydrologic Soil Group:* B
*Ecological site:* Clay Loam (R083DY025TX)



EXHIBIT A4

*Hydric soil rating:* No

**Minor Components**

**Raymondville**

*Percent of map unit:* 5 percent
*Ecological site:* Clay Loam (R083DY025TX)
*Hydric soil rating:* No

**Willacy**

*Percent of map unit:* 5 percent
*Hydric soil rating:* No

**Hidalgo**

*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Rio**

*Percent of map unit:* 1 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

## Data Source Information

Soil Survey Area: Cameron County, Texas
Survey Area Data: Version 15, Sep 14, 2018



EXHIBIT A5

# Cameron County, Texas

## RE—Raymondville clay loam

**Map Unit Setting**

*National map unit symbol:* d6ff
*Elevation:* 20 to 200 feet
*Mean annual precipitation:* 23 to 33 inches
*Mean annual air temperature:* 72 to 73 degrees F
*Frost-free period:* 300 to 340 days
*Farmland classification:* Prime farmland if irrigated

**Map Unit Composition**

*Raymondville and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Raymondville**

**Setting**

*Landform:* Delta plains
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Calcareous clayey alluvium

**Typical profile**

*H1 - 0 to 14 inches:* clay loam
*H2 - 14 to 37 inches:* clay
*H3 - 37 to 78 inches:* clay

**Properties and qualities**

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Moderately well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 10 percent
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 8.0
*Available water storage in profile:* Moderate (about 9.0 inches)

**Interpretive groups**

*Land capability classification (irrigated):* 2s
*Land capability classification (nonirrigated):* 2s
*Hydrologic Soil Group:* C
*Ecological site:* Clay Loam (R083DY025TX)



EXHIBIT A6

*Hydric soil rating:* No

**Minor Components**

**Hidalgo**

*Percent of map unit:* 5 percent
*Hydric soil rating:* No

**Racombes**

*Percent of map unit:* 5 percent
*Ecological site:* Clay Loam (R083DY025TX)
*Hydric soil rating:* No

**Willacy**

*Percent of map unit:* 5 percent
*Hydric soil rating:* No

## Data Source Information

Soil Survey Area: Cameron County, Texas
Survey Area Data: Version 15, Sep 14, 2018



EXHIBIT A7

# Cameron County, Texas

## WAA—Willacy fine sandy loam, 0 to 1 percent slopes

### Map Unit Setting

*National map unit symbol:* d6ft
*Elevation:* 30 to 750 feet
*Mean annual precipitation:* 26 to 34 inches
*Mean annual air temperature:* 72 to 73 degrees F
*Frost-free period:* 270 to 365 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Willacy and similar soils:* 90 percent
*Minor components:* 10 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Willacy

#### Setting

*Landform:* Delta plains
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Loamy alluvium

#### Typical profile

*H1 - 0 to 14 inches:* fine sandy loam
*H2 - 14 to 74 inches:* sandy clay loam

#### Properties and qualities

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Well drained
*Runoff class:* Negligible
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 10 percent
*Salinity, maximum in profile:* Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
*Sodium adsorption ratio, maximum in profile:* 4.0
*Available water storage in profile:* High (about 9.6 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 1
*Land capability classification (nonirrigated):* 2c
*Hydrologic Soil Group:* B
*Ecological site:* Sandy Loam (R083DY023TX)
*Hydric soil rating:* No



EXHIBIT A8

**Minor Components**

**Racombes**

*Percent of map unit:* 5 percent
*Ecological site:* Clay Loam (R083DY025TX)
*Hydric soil rating:* No

**Hidalgo**

*Percent of map unit:* 5 percent
*Hydric soil rating:* No

## Data Source Information

Soil Survey Area: Cameron County, Texas
Survey Area Data: Version 15, Sep 14, 2018



EXHIBIT A9

HARLINGEN
IRRIGATION DISTRICT
Delivering Water Since 1914.

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956-423-7015

# RESOLUTION

February 27, 2019

**A Resolution** to authorize the District's General Manager, Tom McLemore, to submit a Fiscal Year 2019 Water and Energy Efficiency Grant application to the United States Department of Interior Bureau of Reclamation under the WaterSMART program, and take any administrative action required to complete the application on behalf of the Harlingen Irrigation District Cameron County No. 1, hereinafter, the District; for which, if approved, funds will be implemented towards construction costs in connection to the conversion of the Wyrick Canal to pipeline, hereinafter, the project.

**Whereas,** the District was established May 13, 1914, by the Cameron County Commissioner's Court as Cameron County Irrigation District Number 1, pursuant to Section 13, Chapter 172, Acts of the Regular Session of the 33rd Legislature of the State of Texas. On January 14, 1915, a deed from Harlingen Land and Water Company to Cameron County Irrigation District Number 1, was filed for record and recorded January 29, 1915, Vol. 38, Pages 146 - 158, Cameron County Deed Records, Cameron County, Texas. On May 31, 1919, the District was converted to and renamed Cameron County Water Improvement District Number 1, under existing statutes. In 1945 it was renamed as Cameron County Water Control and Improvement District Number 1. In 1978, under the provisions of Sections 51 and 58 of the Texas Water Code, the District became Harlingen Irrigation District Cameron County Number 1. In 1995, the 74th Texas Legislature established Section 49 of the Texas Water Code and this section now also applies to the operations of the District.

**Whereas,** the Board of Directors hereby authorizes the District's General Manager to take any needed administrative action required to complete a Fiscal Year 2019 Water and Energy Efficiency Grant application, hereinafter the application, for which approved funds will be utilized towards construction improvements costs in connection to the conversion of the Wyrick Canal, a District facility, from open canal to pipe-line with the objective of saving water and energy during the delivery process of the District's waters; and

**Whereas,** the Board of Directors herby authorizes the District's General Manager to submit the application to the U.S. Department of Interior Bureau of Reclamation; and

**Whereas,** the District has the corresponding funds and capital resources available to cover for the District's cost share as detailed and specified in the funding plan; and,

**Whereas,** if the District's application is approved for funding, the District will work with the U.S. Bureau of Reclamation to meet established deadlines for entering into a grant or

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cooperative agreement.

**Now Therefore, if the District's application is approved for funding,** the Board of Directors hereby resolves to authorize the District's General Manager to negotiate, resolve, and execute on behalf of the District a Cooperative Agreement with the U.S. Bureau of Reclamation, if such agreement is acceptable to the District's Board of Directors, the approved funds will be implemented towards project costs.

The aforementioned resolution was unanimously passed at the regular Board Meeting of February 27, 2019

Harvey Adams, President

Jose Ricardo Guerrero, Secretary

EXHIBIT B2