Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

WaterSMART: Water and Energy Efficiency Grants for Fiscal Year 2018
Funding Opportunity BOR-DO-18-F006
May 10, 2018
Funding Group II

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Executive Summary

Date: May 10, 2018
Applicant Name: Delta Lake Irrigation District
City, County, State: Edcouch, Hidalgo County, Texas

The Delta Lake Irrigation District is requesting 2018 WaterSMART: Water and Energy Efficiency Grant funds to improve water conservation and delivery reliability along the 4.46 miles of our A-20 Canal located in northeastern Hidalgo County. The project is expected to conserve 1,832.86 acre/feet of water annually. It is part of a larger commitment to make conservation improvements throughout the District, some of which have been accomplished through partnerships with the Bureau of Reclamation, the Texas Water Development Board, and others. Not only does the A-20 Canal serve to irrigate 1,880 acres of agricultural land, it acts as a conveyance for the North Alamo Water Supply Corporation which serves residents of northeast Hidalgo, Willacy, and northwest Cameron Counties. The A-20 Canal is currently a concrete-lined, open channel with lateral lines extending from it to additional agricultural producers. At many points the canal walls have failed, and the water and nutria are eroding the soil. The greatest effect of this project will result from the conversion of the entire 4.46-mile A-20 system to pipe. Converting the channel to pipe will reduce seepage, leakage, breaks, and evaporation to conserve water. It will also reduce concentrations of pollutants and salinity that reach agricultural fields. Two variable frequency drive motors and pumps will replace the outdated pump to provide on-demand water. This will include the conversion from diesel motors to more reliable and cleaner electricity from nearby transmission lines. Meters will be added to the system to eliminate over-delivery and over-irrigation and help to limit runoff of fertilizers and pesticides into surface waters. A SCADA system will be installed for better control of the system, and to automatically shut down the system in case of a catastrophic bank failure or other break. The project will take place entirely on land owned by the District and completion is expected within two years of the award agreement date. According to the 2016 Rio Grande Regional Water Plan, “Irrigation districts carry over eighty-five percent of the water that is used from the Rio Grande system in Region M.” Significant population growth has put greater pressure on the limited water supply and a population increase of 142 percent is anticipated between 2010 and 2060. Water conservation must become a much larger factor in the future with agriculture and irrigation districts shouldering the majority of the burden. The proven conservation technologies in this project can result in a water savings of up to forty percent. The District will encourage landowners to install on-farm irrigation improvements for a greater conservation impact. The project will effectively manage water supplies, promote sustainability and water conservation, and give agricultural producers the reliability and enhanced feasibility they need to develop on-farm irrigation improvements. Quantifiable water conservation, reliable water management, community cooperation, and infrastructure modernization ensure that the project meets the priorities of the Department of the Interior, the Bureau of Reclamation, and the WaterSMART Program.

Background Data

Originated in 1911 and originally known as Union Irrigation District and over the years changing its name to Hidalgo-Willacy Counties Water Control and Improvement District No.1, Willacy County Water Control and Improvement District No. 1 and in 1980 it became Delta Lake Irrigation District (DLID or the District) operating under Chapter 58, Title 4, Texas Water Code and under Article XVI, Section 59 of the Constitution of Texas. The District is located in Northern Hidalgo County and Western Willacy County in the Lower Rio Grande Valley of South Texas. It covers 148.95 square miles or 95,328.8 acres, consisting primarily of agricultural land and rural communities. The District is within 62 miles from the Rio Grande River at the U.S./Mexico border making it the only source of water for the district to divert for irrigation, municipal and domestic use within the district boundaries. The District's main landmark is Delta Lake Reservoir, with the capacity of 10,669 acre-feet of water and a surface area of 2,371 acres. The reservoir was constructed in 1938 for the storage of water diverted from the Rio Grande River to regulate and assure adequacy of water for irrigation requirements. The reservoir assures a more reliable availability of water to meet the District's needs, considering the four-day travel time from Falcon Reservoir. The reservoir is divided by a roadway (FM 88) into the West Reservoir (smallest) and East Reservoir (largest). The District currently serves over 69,500 irrigable acres, primarily for fruits, vegetables, and row crops, and diverts municipal water to the City of Raymondville, La Sara, Monte Alto and the City of Lyford.

The population of the region is one of the fastest-growing in the nation and water demands continue to escalate. As this occurs, conservation within the irrigation and agricultural communities becomes increasingly critical. The proposed activities will: improve management and conservation of water, reduce evaporation, reduce seepage loss, and lower operation and maintenance costs. Water from the Rio Grande is diverted at the District's main pumping station close to the Hidalgo and Cameron County line. Water pumped from the river then flows by gravity through the main canal for approximately 32 miles until it reaches the southeast corner of Delta Lake. The water supply system for DLID consists of 302 miles of pipelines, 143 miles of lined laterals, and 65 miles of unlined laterals.

Delta Lake Irrigation District has the **largest area** of the 26 Districts in the Rio Grande Valley, with authorized irrigation water rights of 174,776 acre feet, 3,999 irrigation accounts and 69,500 acres in irrigation. Municipal and industrial water rights are 9,520 acre feet annually. The district provides water to the cities of Raymondville, Hargill, La Sara, Monte Alto and Lyford. The 5-year water diversion average was 125,000 acre-feet for 2010-2015. The District's 5-year diversion for municipal and domestic water use 5,240 acre-feet per year. The District reported estimated water delivery efficiency is approximately 60%.

In 2012, the District received and successfully completed a WaterSMART grant (#R11AP60059) for the conversion of Canal A-9 from open channel to pipe. District General Manager Troy Allen is a Board Member of the Rio Grande Regional Water Authority (RGRWA). The District

participated in the RGRWA "Lower Rio Grande Basin Study" with a variety of state and Federal partners which was financed in 2011 by Bureau of Reclamation funds.

Project Location

The Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements Project is located in Hidalgo County in Texas, approximately seven mile north-northeast of the City of Edcouch.

Canal A-20 begins at 26° 22' 54.7644'' N and 97° 55' 24.9312'' W (26.381879, -97.923592). It ends at 26° 21' 21.7584'' N and 97° 56' 51.3456'' W (26.356044, -97.947596).

See attached maps and photos in Appendix D

Technical Project Description

The Delta Lake Irrigation District A-20 Canal includes approximately **23550** linear feet (4.46 miles) of concrete lined canal and add flow measurement and control equipment. The intent of the project is to replace the open channel with pipeline and add flow meters to the lateral lines, add a Supervisory Control and Data Acquisition (SCADA) system, and replace the outdated pump and motor with two Variable Frequency Drive (VFD) motors and more efficient pumps. Goals of the project are water conservation, better water management, improved reliability in delivery of water to users, and enhanced feasibility for on-farm irrigation improvements. The anticipated water savings of the project is 1,832.86 acre/feet per year.

Water quantities that seep through the bed and sides of the canal are significant. It is not uncommon to see transmission losses upwards of 30 to 40%. Transmission losses, which include seepage losses, leakage losses, operational losses, evaporation losses, among others, depend on a number of factors. Some of these factors can be quantified. Seepage loss from canals is governed by hydraulic conductivity of the subsoils or lining, canal geometry, and location of water table relative to the canal, among others. Canals are lined to control seepage, but the linings deteriorate with time and sites along channels can fail. Significant seepage losses continue to occur even from a lined canal. Delta Lake Irrigation District's A-20 Canal currently concrete lined canals experience transmission losses from all these factors. At one site along the project area, a small occasional pond has developed in the borrow ditch at the edge of an agricultural field due to seepage from the A-20 Canal.

Water delivery in the A-20 Canal has been accomplished through manual control and timing the pumping of water. This is an inaccurate metric that leads to over-deliveries and other waste. Lack of flow measurement can mean that breaks in the channel go undetected as water leaks or crops are flooded. This project addresses these losses.

In addition to the conservation of water, the charged system of the project will allow the District to tie into the main "A" system to pump water to an additional 2,250 acres of agricultural production, in the case of a catastrophic failure of that system.

The Delta Lake Irrigation District is ready to proceed with this project upon the award of a financial assistance agreement with the Bureau of Reclamation.

Tasks:

- **Survey and Engineering/Design**. The initial step in this project is to survey the project area and develop the engineering/design plan. A qualified engineering firm will work with the District to accomplish this step. Completion of this task is expected within six months of the award agreement.
- **Environmental Compliance and Permits**. The project will be constructed in the footprint of the existing A-20 channel. If the old channel is left open it becomes a site for illegal dumping. Any required local, state, or Federal permits will be obtained. Completion of this task is expected within six months of the award agreement.
- **Installation**. Following the approved construction plans, the project will be built. Pipeline will be installed in the existing channel of the entire 4.46 miles of the A-20 Canal. Eight flow meters will be installed at eight lateral line intersections. The SCADA system will be installed and the computer-controlled system will be set up. Two electric VFD motors and two efficient pumps will replace the outdated diesel motor and pump. Nearby transmission lines will provide the electricity necessary for the VFD motors. Completion of this task is expected within twenty-four months of the award agreement.
- **Outreach**. Working in partnership with the Texas Water Resources Institute, AgriLife, RGRWA, the NRCS, and others, the District will promote educational events and technical and financial assistance opportunities for agricultural producers to maximize the water conservation potential of the project. Outreach will be ongoing.
- **Monitoring and Recordkeeping**. Operational effectiveness will be measured after the project is constructed to verify water savings. This task will be ongoing.
- **Reporting to Bureau of Reclamation**. The District will prepare reports as required for submittal to the Bureau of Reclamation. This task will be ongoing.

Evaluation Criteria

Evaluation Criterion A – Quantifiable Water Savings

Quantifiable water savings will result from both types of infrastructure improvements included in the project: the pipeline conversion and the irrigation flow measurement and control.

PIPELINE CONVERSION

The AgriLIFE Extension Service Texas A&M System study "Measuring Seepage Losses from Canals Using the Ponding Test Method" found measured seepage loss rates ranging from 23 to 1,690 acre-feet per mile (per year), for lined and unlined canals, in the Lower Rio Grande Valley of Texas.

Table 1. Results of canal seepage loss tests in the Lower Rio Grande River Basin.

Test ID	Width (ft)	Depth (ft)	Loss rate	
			gal/ft²/day	ac-ft/mi/yr
Lined				
LF1	12	5	1.77	152.9
LF2	10	6	4.61	369.1
MA4	12	5	8.85	529.7
SJ4	15	4	1.17	111.2
SJ5	14	5	1.38	145.5
UN1	12	6	2.32	217.7
UN2	8	3	2.09	121.2

1. *From "Measuring Seepage Losses from Canals Using the Ponding Test Method" by the AgriLIFE Extension Texas A&M Systems, by Guy Fipps, Ph.D, PE, and Eric Leigh.*

Average seepage rate from Table 1 is 235.30 acre-ft/mile/year for Lined canals.

Texas A&M AgriLIFE publication "Ponding Test Results; Seepage and Total Losses; Main Canal B, Hidalgo County Irrigation District No. 16", by Guy Fipps, Ph.D, PE, and Eric Leigh, dated Feb. 17, 2004, included the following table.

Table 8. Results of total loss tests in lined canals (leaking gates and valves may have contributed to measured loss rates) conducted by Texas Cooperative Extension in the Lower Rio Grande River Basin.

Test ID	Year	Canal Width (ft)	Canal Depth (ft)	Class	Loss Rate	
					gal/ft2/day	ac-ft/mi/yr
Lined						
16HC1	03	14	5	M	1.89	192.4
BV1	99	10	5	M	7.97	510.5
BV2	99	9	4	M	8.53	451.5
DL1	00	20	6	M	0.16	18.8
DL2	00	7	4	S	4.12	236.2
DO1	03	5	3	S	1.68	65.2
DO2	03	6	4	S	2.18	121.5
DO3	03	6	3	S	2.71	107.2
ED1	00	6	4	S	34.32	1519.6
ED2	00	6	4	S	21.5	858.2
ED3	00	3	2	T	10.22	308.2
ED4	00	4	3	S	18.72	567.7
ED6	99	9	4	M	8.53	451.5
HA2	00	10	4	M	2.26	135.2
HA3	98	15	2	S	0.64	45.5
ME1	98	38	7	M	1.26	281.9
ME2	98		4	M	1.88	163.5
SJ1	99	12	5	M	2.58	126.8
SJ6	03	12	3	M	1.88	1.63
SJ7	03	19	4	M	1.98	227.1
UN3	02	12	6	M	2.02	154.3

Classification of canal: M = main, S = secondary, T = tertiary

The average seepage loss rate for the above tests in concrete lined canals is 311.62 ac.ft/mi/yr.

Another study was conducted in on a portion of the "A" Canal system in the Delta Lake Irrigation District, the same canal system as the A-20 on which this project will take place. The Texas A&M AgriLIFE publication "Canal Ponding Test Results, Delta Lake Irrigation District, Edcouch, TX", prepared by Guy Fipps, Ph.D, PE, and Eric Leigh in July 2000 included the following table. The publication can be found in Appendix F.

Table 1. Ponding Test Results for Delta Lake Irrigation District

Test	Segments	Canal Type	Soil Type	Canal[1] Rating	Top Width (ft)	Length (ft)	Seepage Rate (gal/ft²/day)	Total Loss in Canal (ac-ft/mile) per day	per year[2]
1	A & A-12	lined	fine sandy loam	6.1	18	11405	3.63	0.98	293.79
2	A-11	lined	fine sandy loam	4.9	6	2552	5.32	1.03	308.55

[1] on a scale of 10 to 1.
[2] based on 300 days of operation per year.

The average seepage loss rate for the above tests in concrete lined canals is 301.17 ac.ft/mi/yr.

Delta Lake Irrigation District is located in quadrant 1011. The Texas Water Development Board studied the quadrant and found an evaporation loss rate of 60.11 in/yr in 2016. An average of the annual evaporation from 2005 to 2016 yields an average annual loss of 62.03 in/yr.

Table 2		
Water Conservation Estimate		
Approx. Total Combined Length	23550.00	ft
Approx. Surface Area	3.78	acres
Avg. Top Width	7.00	ft
Avg. Depth	3.00	ft
Seepage Rate for Concrete Lined [2]	301.17	ac.ft/mi/yr
Estimated Seepage Loss	1343.22	ac.ft/yr
Evaporation Rate for TWDB quadrant 1011	60.11	in/yr
Estimated Evaporation Loss	18.96	ac.ft/yr
TOTAL WATER LOSS ESTIMATE	**1362.18**	ac.ft/yr

2. *Seepage rate from average of values calculated by "Measuring Seepage Losses from Canals Using the Ponding Test Method" by the AgriLIFE Extension Texas A&M Systems, for concrete lined canals (Table 1). The more conservative of the two averages was used.*

Replacement of the deteriorated open canals with 30-inch and 24-inch diameter A-2000 PVC pipeline will mitigate ninety-nine percent these losses for a total water conservation estimate of 1348.56.

IRRIGATION FLOW MEASUREMENT AND CONTROL

The A-20 Canal currently has no metering and all controls are manual. Because there is no accurate baseline data, it is difficult to calculate the precise amount of water savings that will result from this component of the project. The District measures irrigation delivery in the amount of time water is pumped into the system. Over-delivery is estimated at ten percent of the

approximately 1,093 acre feet required along the A-20 Canal annually, or 109.3 acre feet per year. The canal must remain charged much of the year for irrigation use and to prevent drying and cracking of the aging canal, which can lead to additional catastrophic failure. When the channel is not charged, it must be recharged before water delivery can occur. Variable frequency drive (VFD) motors and efficient pumps, working with the pipeline conversion, SCADA, and flow meters, will provide on-demand water in precise quantities and alleviate the need for over-delivery.

Additionally, significant bank failures have occurred as recently as 2017. With a manual system, a break may not be detected for hours. It is not uncommon for the district to average a loss of up to 250 acre feet during a bank failure and the A-20 averages one to two significant bank failures per year. The average loss each year is estimated to be 375 acre feet. A SCADA system, along with the pipeline conversion, will prevent these catastrophic failures and will provide remote sensing of an unanticipated water loss and automatic shut-off in such an event.

Accurate water flow and quantity information and a charged system of on-demand delivery will enhance the feasibility of on-farm irrigation improvements and additional water conservation.

1348.56 + 109.3 + 375 = 1,832.86 acre feet per year in water conservation.

Evaluation Criterion B – Water Supply Reliability

In the 1920s, as agricultural producers were lured to this subtropical area from farming communities to the north, the Lower Rio Grande Valley of South Texas was known as the "Magic Valley." The fertile soils of the Rio Grande River Delta make this an especially productive area for fruits, vegetables, row crops, and specialties like sugar cane. The limiting factor has always been water availability and reliability.

According to the 2016 Rio Grande Regional Water Plan, "Irrigation districts carry over eighty-five percent of the water that is used from the Rio Grande system in Region M." The Plan shows a population growth in the region of 142 percent between 2010 and 2060, most of which will take place in Hidalgo and Cameron Counties in which the Delta Lake Irrigation District is located. Significant population growth in the past has already put greater pressure on the limited water supply, most of which is transmitted by irrigation districts through open channels. Water conservation must become a much larger factor in the future. The Plan shows how irrigation districts and agriculture will shoulder over fifty percent of this burden.

The Lower Rio Grande Basin Study, funded by the Bureau of Reclamation, states that "the magnitude and frequency of water supply shortages within the study area are severe" with an expected annual shortfall of 592,000 acre feet by 2060, "about thirty-five percent of the total water demand." It notes that climate change may increase that shortage by an additional 86,438 acre feet per year by that time. Shortfalls will affect over $250 million in agricultural production, and it will hit municipal and industrial users and the unique wildlife of the area, including sixty-nine rare, threatened, or endangered species.

- The A-20 Canal Project has widespread support (see Appendix A - Letters of Support) from agricultural producers, water planning agencies, local leaders, other water supply entities, and agricultural education/research providers, among others. An enclosed, charged, on-demand, accurate water delivery system makes on-farm irrigation improvements feasible and cost-effective, reduces the potential for catastrophic failures that result in a discontinuity of service, and provides a foundation for long-term management and water conservation. It will enhance the effectiveness of outreach efforts to promote on-farm irrigation improvements to conserve water, improve productivity, and protect water quality.
- The Delta Lake Irrigation District is a partner in local planning efforts, studies, and outreach. The A-20 Canal Project addresses the water reliability, water shortfalls, and increased demand outlined in the 2016 Rio Grande Regional Water Plan and the Lower Rio Grande Basin Study.
- The Delta Lake Irrigation District is located in rural parts of Hidalgo, Cameron, and Willacy Counties. The U.S. Census Bureau (2016 American Community Survey) in Hidalgo County, 32.8% of the population lives below the Federal poverty level. In Cameron County, that number is similar at 33.0%. In Willacy County, where the population is much smaller and more rural, the number is 37.2%. The project will benefit these rural and economically disadvantaged communities.
- The Lower Rio Grande Valley is one of the most biodiverse areas in the United States and ecotourism contributes over $463 million annually to the local economy. Water savings will protect water allocation for local habitats and benefit a variety of rare, threatened, endangered, and economically important species, such as sea turtles and piping plovers. The project will reduce irrigation runoff that carries soil, fertilizers, pesticides, and other pollutants, to protect surface water quality for habitat, wildlife, and ecotourists. The area is the focal point for two of the four major bird migration flyways in the Western Hemisphere, the wintering site for hundreds of thousands of waterfowl, and a harbor for dozens of tropical species which cannot be seen elsewhere in the United States. Species found on nearby Laguna Atascosa National Wildlife Refuge and tracts of the Lower Rio Grande Valley National Wildlife Refuge include: Ocelot, Peregrine Falcon, Northern Aplomado Falcon, and other rare species. One of only five hypersaline bays in the world, and one of the most productive ecosystems known, the Lower Laguna Madre is located between the Lower Rio Grande Valley mainland and South Padre Island, a coastal barrier island. The bay is worth over $400 million annually to Texas in sport fishing and recreational use and produces over 50% of the state's fish catch.
- With reduced evaporation and seepage, salinity and the concentration of other pollutants reaching agricultural fields will be reduced. Additionally, the charged system of the project will allow the District to tie into the main "A" system in such a way as to pump water to an additional 2,250 acres of agricultural production, in the case of a catastrophic failure of that system. This adds reliability for many more landowners.

Evaluation Criterion C – Implementing Hydropower

Not applicable. While the project will include the installation and use of solar power to augment some energy demands for lights, automated systems, gates, and other small project electrical components, the use of hydropower is not feasible for this project. Due to the requirements of the variable frequency drive pump motors, this project will also include the conversion to electricity from nearby transmission lines and the removal of a diesel tank and motor which contribute to air and water pollution and use fossil fuels.

Evaluation Criterion D – Complementing On-Farm Irrigation Improvements

In 2012, the Texas Water Resources Institute (TWRI) received a $2,964,000, five-year Regional Conservation Partnership Program (RCPP) Grant from the NRCS to encourage and support on-farm irrigation improvements eligible for NRCS technical and financial assistance in the Lower Rio Grande Valley of South Texas (HUCs 12110208 and 13090002). Project partners, including the AgriLife Extension Service, promote practices associated with irrigation water management, irrigation systems, land leveling, irrigation pipeline and other NRCS-eligible on-farm irrigation improvements. Since 2016, 22 participants in the RCPP program have received NRCS assistance for irrigation land leveling on 501.5 acres in Hidalgo County with $207,423.10 in NRCS financial assistance and NRCS technical assistance. An additional 112 participants are installing 64,912.7 feet of pipeline, including surface and subsurface irrigation, water conveyance projects, and other irrigation improvements in Hidalgo County with $1,407,174.10 in NRCS financial assistance and NRCS technical assistance. Some of these on-farm irrigation improvements are in the Delta Lake Irrigation District. The enclosed, charged, on-demand, accurate water delivery system provided by the pipeline conversion and flow metering and control of the project will facilitate additional eligible on-farm improvements in the future, making them more feasible and effective to conserve thousands of acre-feet of water annually in addition to the conservation achieved by the A-20 Canal Project. Due to the A-20 Canal project, TWRI will target the Delta Lake Irrigation District area for future educational programs, technical support, and financial assistance from NRCS through the RCPP grant, the Environmental Quality Incentives Program (EQIP), or similar programs.

Please see Appendix C – Letters Regarding NRCS Technical or Financial Assistance.

Evaluation Criterion E – Department of the Interior Priorities

Creating a conservation stewardship legacy second only to Teddy Roosevelt is a significant aspiration, but the Delta Lake Irrigation District and this project support this priority. As a leader and partner in local water planning and outreach efforts, the District utilizes science-based best management practices (BMPs) to conserve water and provide the best service to water users in the area. Those BMPs include the pipeline conversion and flow measurement and control that comprise the A-20 Canal Project. In the development of the 2016 Rio Grande Regional Water Plan, the Lower Rio Grande Basin Study, the Arroyo Colorado Watershed Protection Plan, and the District's own planning efforts, a variety of tools and resources are used and plans address a

issues that will impact water demand and water conservation in the future. These include: current and future land use planning and land use designations, environmental and regulatory review and the maintenance of environmental standards, the identification of opportunities to resolve conflicts and expand capacity, and fostering relationships with conservation organizations and other partners which may have opposing viewpoints but common goals.

The Delta Lake Irrigation District has always had a philosophy of community and neighbors helping neighbors. This project helps to strengthen trust and collaboration with local communities. Working with our partners at TWRI and the NRCS, the A-20 project will help landowners and agricultural producers develop on-farm irrigation improvements that will conserve water and private fiscal resources, increase productivity, and protect surface water resources from excessive agricultural runoff and other pollutants. As a leader and partner in many planning efforts, water conservation events and forums, and water agencies and organizations, the District has regular communication with state and Federal natural resource offices, the Texas Water Development Board, the Texas Soil and Water Conservation Board, the U.S. Fish and Wildlife Service, Texas Parks and Wildlife, county commissioners, local leaders and communities, and state legislators and other leaders. This project will help facilitate and expand future communications and outreach efforts.

This project will modernize the infrastructure of the A-20 Canal and enhance the feasibility of infrastructure improvements on private land. It is part of a larger plan to modernize the infrastructure throughout the District to provide for greater water conservation and more reliable water delivery.

Evaluation Criterion F – Implementation and Results

Subcriterion F.1 – Project Planning

In addition to participating in regional planning efforts, the Delta Lake Irrigation District has completed its own planning efforts for capital improvements and other projects. These will eventually become part of the 2018 Rio Grande Regional Water Plan. Resources used in District planning efforts include the 2016 Rio Grande Regional Water Plan, the Lower Rio Grande Basin Study, the agricultural outreach implementation measures from the Arroyo Colorado Watershed Protection Plan, and other state and regional plans and tools. Since the 1970s, modernization and conservation improvements have been primary concerns in the District's planning process. This process includes preliminary designs, studies, surveys, cost estimates, and benefit estimates. Pipeline conversion is a high priority for the District because of the great potential for water savings, efficiency, and improved maintenance scheduling. Automated flow measurement and control is also a high priority for management capacity, accuracy, and dependability. The A-20 Canal Project ranks high in the District's planning efforts because of these priorities. The project implements objectives of regional and state plans, as well as the District's plans.

Please see Appendix D – Maps and Photos which includes a map of proposed capital improvement pipeline projects in the Delta Lake Irrigation District. The A-20 Canal Project is

identified. Please also see Appendix E – Delta Lake Irrigation District Conservation Policy and Drought Policy

Subcriterion F.2 – Performance Measures

Performance Measure 1 – Quantifiable Water Savings

Using standard rates of seepage and evaporation as a baseline, future water deliveries will be accurately measured to determine the quantifiable water savings from the pipeline conversion. Estimates of previous over-delivery will be used as a baseline to determine the savings from the flow measurement and control components of the project. The project will also consider previous catastrophic bank failures and breakages in calculating water savings. This enclosed, charged, on-demand system will provide an estimated 1,832.86 acre feet per year in quantifiable water savings.

Performance Measure 2 – Accurate, Reliable, Automated Flow Measurement and Control

The amount of water flowing in the A-20 system will be recorded, along with any automatic shutoffs or other emergency events that otherwise cost hundreds of acre feet of water.

Performance Measure 3 – Increase in eligible on-farm irrigation improvement applications for NRCS technical and financial assistance.

Working with TWRI and NRCS to promote these programs to local agricultural producers, our partners will keep records of the number of applications from the area and the number of projects receiving assistance.

Evaluation Criterion G – Nexus to Reclamation Project Activities

In 2012, the District received and successfully completed a WaterSMART grant (#R11AP60059) for the conversion of Canal A-9 from open channel to pipe. That project and the A-20 Canal Project are part of the District's larger commitment and efforts to irrigation and delivery improvements throughout the area.

The Bureau of Reclamation has participated in and funded numerous water and energy conservation projects across the Lower Rio Grande Valley of South Texas. District General Manager Troy Allen is a Board Member of the Rio Grande Regional Water Authority (RGRWA). The District participated in the RGRWA "Lower Rio Grande Basin Study" with a variety of state and Federal partners which was financed in 2011 by Bureau of Reclamation funds. In addition, other irrigation districts, municipalities, water providers, and others have successfully completed important projects with Reclamation assistance.

Evaluation Criterion H – Additional Non-Federal Funding

The District is proposing a project with a budget of $3,915,450.00. We are requesting Federal funds from the Bureau of Reclamation WaterSMART Program of $1,000,000.00. The remainder, $2,915,450.00 along with any overruns, will be provided by the Delta Lake Irrigation District.

The total non-Federal funding will account for 74.5% of the project.

Project Budget

Funding Plan

The Delta Lake Irrigation District plans to fully fund the Non-Federal portion of the project, along with any cost overruns that may occur. The District budgets for such an expense and maintains the fiscal capacity to meet this requirement.

Table 1 - Summary of Non-Federal and Federal Funding Sources	
FUNDING SOURCES	**FUNDING SOURCES**
Non-Federal Entities	
Delta Lake Irrigation District	
Non-Federal Total	$ 2,915,450.00
Other Federal Entities	$ -
REQUESTED RECLAMATION FUNDING	$ 1,000,000.00

Budget Proposal

Table 2 - Budget Proposal				
BUDGET ITEM DESCRIPTION	**COMPUTATION**		**Quality**	**TOTAL**
	$/unit	**Quantity**	**Type**	**COST**
Salaries and Wages				
General Manager	$ 55.00	800	hours	$ 44,000.00
Field Staff Supervisor	$ 23.00	1600	hours	$ 36,800.00
Field Staff (4 employees)	$ 12.00	15200	hours	$ 182,400.00
Fringe Benefits				
Full-Time Employees	$ 52,640.00	1	20%	$ 52,640.00
Equipment				

Excavator	$ 63.03	3800	hours	$ 239,514.00
Loader	$ 49.18	2000	hours	$ 98,360.00
Dump Truck	$ 28.73	2000	hours	$ 57,460.00
Backhoe	$ 21.07	2000	hours	$ 42,140.00
Water Truck	$ 32.00	2000	hours	$ 64,000.00
Supplies and Materials				
30" A-2000 PVC Pipe	$ 45.00	17350	80 #	$ 780,750.00
24" A-2000 PVC Pipe	$ 27.00	6200	80 #	$ 167,400.00
SCADA, VFD Motors, Pumps, Meters	$ 565,000.00	1		$ 565,000.00
Gates, Fittings, Valves	$ 485,000.00	1		$ 485,000.00
Miscellaneous Supplies & Materials	$ 297,036.00	1		$ 297,036.00
Contractual/Construction				
Engineering and Surveying	$ 415,800.00	1		$ 415,800.00
Other				
Environmental & Regulatory Compliance	$ 2,500.00	1		$ 2,500.00
Inspection Fees	$ 34,650.00	1		$ 34,650.00
Contingency	$ 350,000.00	1		$ 350,000.00
Total Direct Costs				**$3,915,450.00**

Budget Narrative

Salaries and Wages

The program manager for the project is Delta Lake Irrigation District General Manager Troy Allen. Mr. Allen managed the A-9 canal pipeline conversion with a 2012 grant from the Bureau of Reclamation. Mr. Allen receives $55.00/hour and it is estimated that the two-year project will require 800 hours of his time for project management.

District field staff will perform all demolition and construction. A Field Supervisor and a crew of four employees accomplish the proposed project. The Field Supervisor receives $23.00/hour and it is estimated that the two-year project will require 1,600 hours of his time for demolition and construction. Field Staff are paid $12.00/ hour and it is estimated that the two-year project will require 3,800 hours of time from each employee, for a combined Field Staff time budget of 15,200 hours for demolition and construction.

Fringe Benefits
Fringe benefits are calculated at 20% of wages for full-time District employees.

Travel - NA

Equipment
The District will be utilizing its own equipment, including an excavator, a loader, a dump truck, a backhoe, and a water truck. All equipment will be used for demolition and construction for the project. The USACE usage rates were used from their Construction Equipment Ownership and Operating Expense Schedule. No exact matches were found, so rates for comparable units were used.

Daewoo 340 excavator, crawler mounted, 79,640 lbs., 317 HP, max. depth 22.7 ft., 1.25 cy bucket.
Comparable is Kobelco America SK350LC at $63.03/hour.

Daewoo mega 250 loader, wheel type, articulated, 152 HP, 3 cy bucket.
Comparable is Caterpillar 930K at $49.18/hour.

Freightliner FL112 dump truck, 13 cy bed
Comparable is no specific manufacturer 4x2 35KGVW at $28.73/hour.

John Deere 310SK backhoe, wheel type, 96.6 HP, 1.1 cy bucket.
Comparable is Caterpillar 416F at $21.07/hour.

Ford 750 water truck with 1000-gallon tank
Comparable is no specific manufacturer 4x2 20KGVW at $32.00/hour.
No comparable water tank is listed. $0/hour.

Materials and Supplies
All materials and supplies are for the construction of the project. Pricing is based on engineering estimates. These materials and supplies include pipe, SCADA system, VFD motors, pumps, flow meters, gates, fittings, valves, and miscellaneous other materials and supplies for construction.

Contractual
Contractual costs include the professional services of a qualified engineering firm to include surveying the project area, engineering services, construction plans and specifications, assistance with the procurement process to purchase supplies and materials, and support during construction. The costs for these professional services was determined approximately twelve percent of the estimated overall project budget.

Environmental and Regulatory Compliance Costs
The cost of environmental and regulatory compliance was estimated at $2,500.00

Other Costs

Inspection fees will be used for quality control as the project is constructed.

A contingency line of approximately nine percent of the project has been added in case of rising material prices or other unforeseen expense.

Indirect Costs - NA

Total Costs
The total estimated budget for the project is $3,915,450.00

Environmental and Cultural Resources Compliance

1. The proposed project will be built within the existing canal channel, which should minimize impacts on the surrounding environment. Construction may result in dust, which will be mitigated by watering. If additional control measures are needed, they will be implemented.
2. The Lower Rio Grande Valley of South Texas is one of the most biologically diverse regions of the United States. This diversity includes numerous threatened or endangered species including the ocelot and aplomado falcon, and plants such as star cactus, Walker's manioc, and Texas ayenia. The route of the A-20 Canal is heavily farmed and well-maintained. These species are not expected to be found within the area impacted by project activities.
3. There are no surface waters of the United States in the area. There are no wetlands with the exception of a small area at the edge of an agricultural field which saturates as a result of seepage from the A-20 Canal. There are no wetlands inside the project boundary that potentially fall under the CWA. The project will benefit natural wetlands and coastal natural resource areas through the water conservation and water quality protection it will achieve.
4. The District began building irrigation canals between 1910 and 1920. The A-20 Canal was built in the early 1940s.
5. The proposed project will not affect any features of an irrigation system.
6. There are no buildings, structures, or features within the irrigation district listed on the National Register of Historic Places. Several structures and features, including the District office and canals may be eligible for listing, but are not located within the project boundaries.
7. There are no known archeological sites in the proposed project area.
8. The proposed project is not expected to have any adverse effect on low income or minority populations. It will have a positive effect on water quantity and water quality for the 90% Hispanic population of the region and the 33% of the population living below Federal poverty level.
9. There are no Indian sacred sites or other tribal land in the area near the project.
10. The proposed project is not expected to contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in

the area. The proposed project may eradicate nutria from the project area by eliminating the open canal waters and bare, soil banks where canal linings have collapsed.

Required Permits or Approvals

If the NEPA review process finds that the project requires permits or approvals, those will be obtained. The District will also consult with the Texas Historical Commission for any requirements.

Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

Appendix A - Letters of Support

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

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

April 24, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

RE: Letter of Support for Delta Lake Irrigation District's Application to the Bureau of Reclamation WaterSmart and Energy Efficiency Grant Program

Dear Mr. Allen:

The North Alamo Water Supply Corporation is committed to safe, clean, dependable water for residents of northeast Hidalgo, Willacy, and northwest Cameron Counties. Our outreach efforts include the importance of conservation to ensure that future generations will have the water they need. This is particularly important considering the rapid growth of the region's population. Your project on the A-20 canal will facilitate our goals and enhance our management capabilities in the Delta Lake area and beyond.

A primary concern is the reliability of water delivery to our customers. Converting the A-20 canal to pipe will not only conserve water by reducing seepage and evaporation, it will reduce the potential for catastrophic failures that could result in a discontinuity in delivery. Conversion of pumps from diesel motors to more dependable and efficient electricity will improve that reliability. In your project, the SCADA system and variable frequency drive motors will enhance conservation and help to ensure delivery on an as-needed basis. The project will boost sustainability in water conservation and delivery, energy efficiency, and supply management.

We are excited about your water conservation project on the A-20 canal. The North Alamo Water Supply Corporation gladly supports the efforts of the Delta Lake Irrigation District and your application to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program.

Should you have any questions please do not hesitate to contact me at (956) 383-1618.

Sincerely,

Steven P. Sanchez
General Manager
North Alamo Water Supply Corporation

RGRWA
RIO GRANDE REGIONAL WATER AUTHORITY

April 24, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

The Rio Grande Regional Water Authority 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. Our mission is to enhance the capability of our primary water source – the Rio Grande – to serve our region well into the future.

The proposed project on the Delta Lake Irrigation District A-20 Canal is a prime example of the improvements we endorse. Converting irrigation canals to pipe, adding SCADA and water metering, and improving other infrastructure will result in reduced water loss to seepage and evaporation and more reliable water delivery. If every irrigation canal had these improvements, a water savings of up to forty percent could be realized. This project is the basis for long-term water management and protection.

We happily support the efforts of the Delta Lake Irrigation District and your application to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program. Please contact me if we can be of assistance.

Sincerely,

Jim Darling
President

Administrative Agent: Rio Grande Valley Partnership
P.O. Box 1499 • Weslaco, TX 78599
Telephone: (956) 968-3141 • Fax: (956) 968-0210

ARROYO COLORADO
Know it. Respect it. Enjoy it.
Conócelo. Respétalo. Disfrútalo.

The Arroyo Colorado Watershed Partnership

2401 E. Highway 83
Weslaco, Texas 78596

956/969-5607 Office 956/969-5639 Fax www.arroyocolorado.org

May 7, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

I am pleased to announce that the *Update to the Arroyo Colorado Watershed Protection Plan* has recently been accepted by the U.S. Environmental Protection Agency. The Plan was developed by the Texas Water Resources Institute, the Texas Commission on Environmental Quality, and with the dedication and input from hundreds of stakeholders in the Arroyo Colorado Watershed Partnership.

The Plan outlines many Implementation Measures aimed at developing and presenting irrigation management educational programs and promoting BMPs to conserve water and reduce agricultural runoff throughout the Lower Rio Grande Valley. Partners include the Texas State Soil and Water Conservation Board, the Texas Water Development Board, the Texas A&M AgriLife Extension Service, and our local agricultural community. Victor Gutierrez and I, along with the rest of our team, appreciate working with the Delta Lake Irrigation District to promote these programs.

The proposed project on your A-20 canal will accomplish many BMPs in the plan. Converting the channel to pipe will reduce leakage and evaporation to conserve water and reduce concentrations of pollutants and salinity. Metered flow, variable frequency drive pumps, and other infrastructure modernization will help to eliminate over-irrigation and limit runoff of fertilizers and pesticides into surface waters. The project will effectively manage water supplies, promote sustainability and water conservation, and give agricultural producers the reliability they need.

We are happy to support your efforts and your application to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program.

Sincerely,

Jaime Flores
for Arroyo Colorado Watershed Partnership

April 24, 2018

Chuck Wayne McDonald
25700 Mile 3 West
Monte Alto, Texas 78538

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

I am a farmer with agricultural land along the District's A-20 irrigation canal. Water is one of the most important resources in agricultural production. I fully support your planned project to convert the A-20 channel to pipe and add more reliable pumps and metering systems. I appreciate the efforts of the Delta Lake Irrigation District and am happy to support an application for funding to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program.

The project will facilitate better crop management. Piping will reduce leakage and evaporation to reduce the concentrations of pollutants and salinity that reach my fields. Better reliability in water pumping and delivery is critical to watering schedules and the economic viability of crops. Proper metering and automatic systems will ensure that my prescribed irrigation is followed, not too little water or too much that would cause expensive fertilizers or pesticides to run off. These systems will also protect the surrounding land from flooding that could occur with canal breaks. This project addresses several concerns that could devastate a crop.

Farming this land has been a part of my family for three generations. Concern for conservation and the environmental health of the land and water are a vital part of that tradition. This project will help ensure the future of agriculture and conservation in this fertile area.

Sincerely,

Chuck McDonald

Chuck McDonald Farms

April 24, 2018

Emma J. McDonald
6030 Mile 21 N.
Monte Alto, Texas 78538

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch,TX 78538

Dear Mr. Allen:

I am a farmer with agricultural land along the District's A-20 irrigation canal. Water is one of the most important resources in agricultural production. I fully support your planned project to convert the A-20 channel to pipe and add more reliable pumps and metering systems. I appreciate the efforts of the Delta Lake Irrigation District and am happy to support an application for funding to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program.

The project will facilitate better crop management. Piping will reduce leakage and evaporation to reduce the concentrations of pollutants and salinity that reach my fields. Better reliability in water pumping and delivery is critical to watering schedules and the economic viability of crops. Proper metering and automatic systems will ensure that my prescribed irrigation is followed, not too little water or too much that would cause expensive fertilizers or pesticides to run off. These systems will also protect the surrounding land from flooding that could occur with canal breaks. This project addresses several concerns that could devastate a crop.

Farming this land has been a part of my family for two generations. Concern for conservation and the environmental health of the land and water are a vital part of that tradition. This project will help ensure the future of agriculture and conservation in this fertile area.

Sincerely,

Emma McDonald

Emma McDonald

April 24, 2018

Craig W. McDonald
25660 Mile 3 West
Monte Alto, Texas 78538

Mr.Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

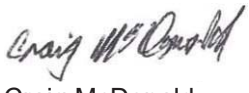
Dear Mr. Allen:

I am a farmer with agricultural land along the District's A-20 irrigation canal. Water is one of the most important resources in agricultural production. I fully support your planned project to convert the A-20 channel to pipe and add more reliable pumps and metering systems. I appreciate the efforts of the Delta Lake Irrigation District and am happy to support an application for funding to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program.

The project will facilitate better crop management. Piping will reduce leakage and evaporation to reduce the concentrations of pollutants and salinity that reach my fields. Better reliability in water pumping and delivery is critical to watering schedules and the economic viability of crops. Proper metering and automatic systems will ensure that my prescribed irrigation is followed, not too little water or too much that would cause expensive fertilizers or pesticides to run off. These systems will also protect the surrounding land from flooding that could occur with canal breaks. This project addresses several concerns that could devastate a crop.

Farming this land has been a part of my family for four generations. Concern for conservation and the environmental health of the land and water are a vital part of that tradition. This project will help ensure the future of agriculture and conservation in this fertile area.

Sincerely,



Craig McDonald

Texas House of Representatives

EDDIE LUCIO III
DISTRICT 38
CAMERON COUNTY

April 24, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

It is with great pleasure that I wholeheartedly endorse the Delta Lake Irrigation District in its application for funding to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program. As a member of the Texas House of Representatives, I serve on the Natural Resources Committee and the Advisory Committee for the State Water Implementation Fund for Texas. I understand and support the project and its numerous benefits in efficiency, conservation, and reliable water delivery.

Conservation is a shared responsibility. It is critical to work collaboratively for better management of natural and financial resources. Converting irrigation canals to pipe, adding SCADA and water metering, and improving other infrastructure are important elements in sustainability. This project will result in reduced water loss to seepage and evaporation, reduced water pollutant concentration, and more dependable water delivery. If every irrigation canal had these improvements, a water savings of up to forty percent could be realized. This project is the basis for long-term water management and protection and I applaud your efforts to leverage local funds to accomplish these goals.

Please contact me if I may be of further assistance.

Sincerely,

Eddie Lucio III

Eddie Lucio, III
State Representative

Committees: Rules and Resolutions, Chairman • Natural Resources • Government Transparency & Operation
Capitol: P.O. Box 2910 • Austin, Texas 78768-2910 • (512) 463-0606 •Fax (512) 463-0660
District: 1324 E. Madison St. • Brownsville, Texas 78520 • (956) 542-2800 • Fax (956) 542-2889

Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

Appendix B - Official Resolution

Resolution of the Board of Directors of Delta Lake Irrigation District

Bureau of Reclamation WaterSMART 2018 Water & Energy Efficiency Grant

WHEREAS, Delta Lake Irrigation District (the District) is an irrigation district organized under Chapter 59, Article 16 of the Texas Constitution and operates under Chapter 58 and Chapter 49, in part, of the Texas Water Code;

WHEREAS, the District is committed to water conservation, reliable and efficient water delivery, and energy efficiency, and;

WHEREAS, the District is seeking opportunities to implement projects that result in quantifiable water savings and water reliability benefits, and;

WHEREAS, the District has sufficient resources to match funds to complete such improvements, and;

WHEREAS, the District is seeking partnerships that will supplement and enhance the capacity of the District to accomplish water conservation projects;

NOW THEREFORE, BE IT RESOLVED that the Board of Directors of the Delta Lake Irrigation District agrees and authorizes that:

1. General Manager, Troy Allen, is authorized to act as the designated representative for the District and has the legal authority to enter into an agreement and to sign all necessary documents; and

2. The Board of Directors has reviewed this proposal and supports and authorizes the submittal of this application to the Bureau of Reclamation WaterSMART 2018 Water and Energy Efficiency Grant; and

3. The District is capable of providing the amount of funding and/or in-kind contributions, specified in the funding plan; and

4. If selected for funding, the District will work with Reclamation to meet established deadlines for entering into a grant or cooperative agreement.

Passed by an affirmative vote of the District Board of Directors on this 18th day of April, 2018.

Joe A. Pennington, President
Delta Lake Irrigation District

Richard Rupert, Secretary
Delta Lake Irrigation District

Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

Appendix C – Letters Regarding NRCS Technical or Financial Assistance

TEXAS A&M AGRILIFE
RESEARCH | EXTENSION

TEXAS A&M UNIVERSITY
AGRICULTURE & LIFE SCIENCES

TEXAS WATER RESOURCES INSTITUTE

May 7, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

We are pleased that the Delta Lake Irrigation District plans to apply to the Bureau of Reclamation for a WaterSMART grant. Your plans for water conservation and efficiency along the A-20 Canal will complement on-farm irrigation improvements that TWRI, AgriLife, and our partners are working toward. In 2012, TWRI received a $2,964,000, five-year Regional Conservation Partnership Program (RCPP) Grant from the NRCS to address both water quantity and water quality resource concerns in HUCs 12110208 and 13090002. The project improves the use of innovative irrigation techniques and technologies that decrease water use, improve productivity, and reduce irrigation return flows. With the NRCS and our other partners we evaluate and demonstrate automated irrigation systems, encourage adoption of innovative nutrient and irrigation management, provide technical and financial assistance to support eligible on-farm implementation, and support and collaborate with regional planning efforts. Priority conservation practices promoted in this program include those associated with irrigation water management, irrigation systems, land leveling, irrigation pipeline and other eligible on-farm irrigation improvements. Agricultural producers from the Delta Lake Irrigation District have participated in our NRCS-financed program and many have received financial and technical support from NRCS. The A-20 Canal Project will facilitate eligible on-farm improvements in the future, making them more feasible and effective. We expect the project to encourage additional landowners and agricultural producers to seek technical and financial assistance from the NRCS. These on-farm projects could conserve thousands of acre-feet of water annually in addition to the conservation achieved by the A-20 Canal Project. TWRI will target the Delta Lake Irrigation District area for future educational programs, technical support, and financial assistance.

Significant population growth has put greater pressure on the limited water supply. Water conservation must become a much larger factor in the future with agriculture shouldering the majority of the burden. I appreciate your support and promotion for our outreach and education efforts, and I am happy to work with you to achieve conservation goals.

Sincerely,

Lucas Gregory, PhD
Senior Research Scientist

578 John Kimbrough Blvd., First Floor
2260 TAMU
College Station, TX 77843-2260
Tel. (979) 845-1851 Fax. (979) 845-0662
twri@tamu.edu
http://twri.tamu.edu

MCDONALD FARMS

Chuck McDonald

25700 Mile 3 W.
Monte Alto, TX 78538
956-330-7158

May 4, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

We are pleased that the Delta Lake Irrigation District plans to apply to the Bureau of Reclamation for a WaterSMART grant. Your plans for water conservation and efficiency along the A-20 Canal will complement on-farm irrigation improvements and make them more feasible and effective. Conversion to pipe, improved pump efficiency, on-demand water supply, and improved metering will facilitate my on-farm improvements and efficiencies.

Due to the planned improvements of the A-20 Canal, I intend to apply to the NRCS for financial assistance for an on-farm irrigation improvement in order to have a more adequate supply of water. I will also be applying for EQUIP assistance to laser level the land in order to more efficiently utilize the water.

Irrigation district improvements in water delivery and reliability have been proven to enhance the effectiveness of on-farm irrigation improvements to save money and conserve water. I support your efforts and I plan to participate in additional conservation on my own land.

Sincerely,

Chuck McDonald

Chuck McDonald Farms

Emma McDonald
6030 Mile 21 North
Monte Alto, TX 78538

May 4, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

We are pleased that the Delta Lake Irrigation District plans to apply to the Bureau of Reclamation for a WaterSMART grant. Your plans for water conservation and efficiency along the A-20 Canal will complement on-farm irrigation improvements and make them more feasible and effective. Conversion to pipe, improved pump efficiency, on-demand water supply, and improved metering will facilitate my on-farm improvements and efficiencies.

Due to the planned improvements of the A-20 Canal, I intend to apply to the NRCS for financial assistance for an on-farm irrigation improvement in order to have a more adequate supply of water. I will also be applying for EQUIP assistance to laser level the land in order to more efficiently utilize the water.

Irrigation district improvements in water delivery and reliability have been proven to enhance the effectiveness of on-farm irrigation improvements to save money and conserve water. I support your efforts and I plan to participate in additional conservation on my own land.

Sincerely,

Emma McDonald

Emma McDonald

SUPERIOR FARMS
202 WINDSOR
EDINBURG, TEXAS 78539

May 7, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

We are pleased that the Delta Lake Irrigation District plans to apply to the Bureau of Reclamation for a WaterSMART grant. Your plans for water conservation and efficiency along the A-20 Canal will complement on-farm irrigation improvements and make them more feasible and effective. Conversion to pipe, improved pump efficiency, on-demand water supply, and improved metering will facilitate my on-farm improvements and efficiencies.

Due to the planned improvements of the A-20 Canal, I may apply to the NRCS for financial assistance for an on-farm irrigation improvement in which I can add valves, or level the land.

Irrigation district improvements in water delivery and reliability have been proven to enhance the effectiveness of on-farm irrigation improvements to save money and conserve water. I support your efforts and I plan to participate in additional conservation on my own land.

Sincerely,

Adrian Salinas

Rogelio Garza
25431 FM 1015
Monte Alto, TX 78538

April 24, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

I am a farmer with agricultural land along the District's A-20 irrigation canal. Water is one of the most important resources in agricultural production. I fully support your planned project to convert the A-20 channel to pipe and add more reliable pumps and metering systems. I appreciate the efforts of the Delta Lake Irrigation District and am happy to support an application for funding to the Bureau of Reclamation WaterSMART Water and Energy Efficiency Grant Program.

The project will facilitate better crop management. Piping will reduce leakage and evaporation to reduce the concentrations of pollutants and salinity that reach my fields. Better reliability in water pumping and delivery is critical to watering schedules and the economic viability of crops. Proper metering and automatic systems will ensure that my prescribed irrigation is followed, not too little water or too much that would cause expensive fertilizers or pesticides to run off. These systems will also protect the surrounding land from flooding that could occur with canal breaks. This project addresses several concerns that could devastate a crop.

Farming this land has been a part of my life for the past 18 years. This project will finally allow me to irrigate my land, which was extremely difficult in the past. Concern for conservation and the environmental health of the land and water are a vital part of that tradition. This project will help ensure the future of agriculture and conservation in this fertile area.

Sincerely,

Rogelio Garza

Rogelio Garza

Rogelio Garza
25431 FM 1015
Monte Alto, TX 78538

May 4, 2018

Mr. Troy Allen
General Manager
Delta Lake Irrigation District
10370 Charles Green Rd.
Edcouch, TX 78538

Dear Mr. Allen:

We are pleased that the Delta Lake Irrigation District plans to apply to the Bureau of Reclamation for a WaterSMART grant. Your plans for water conservation and efficiency along the A-20 Canal will complement on-farm irrigation improvements and make them more feasible and effective. Conversion to pipe, improved pump efficiency, on-demand water supply, and improved metering will facilitate my on-farm improvements and efficiencies.

Due to the planned improvements of the A-20 Canal, I'm considering apply to the NRCS for financial assistance for an on-farm irrigation improvement in which I would install a pond and sprinkler system.

Irrigation district improvements in water delivery and reliability have been proven to enhance the effectiveness of on-farm irrigation improvements to save money and conserve water. I support your efforts and I plan to participate in additional conservation on my own land.

Sincerely,

Rogelio Garza

Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

Appendix D – Maps and Photos

Delta Lake Irrigation District

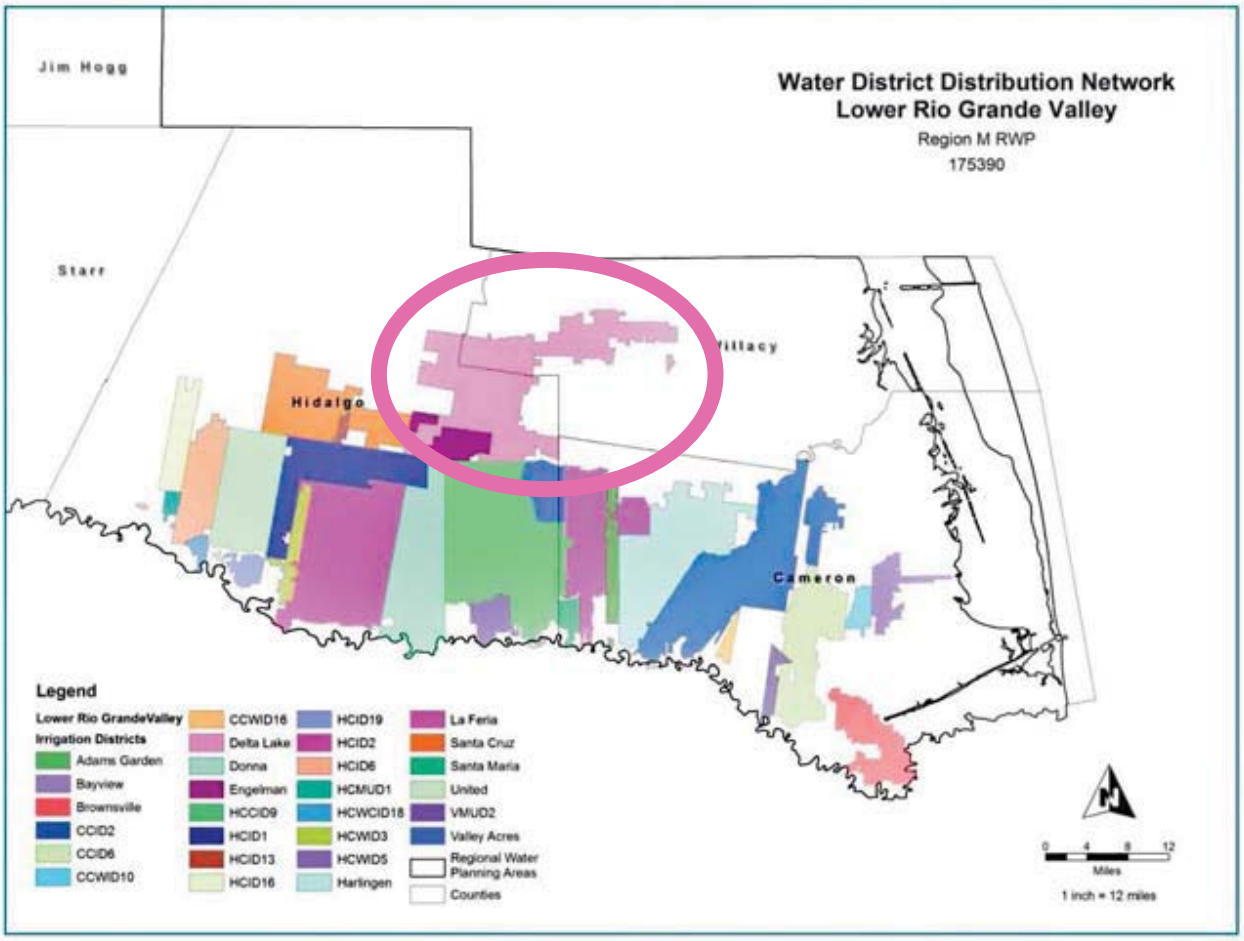
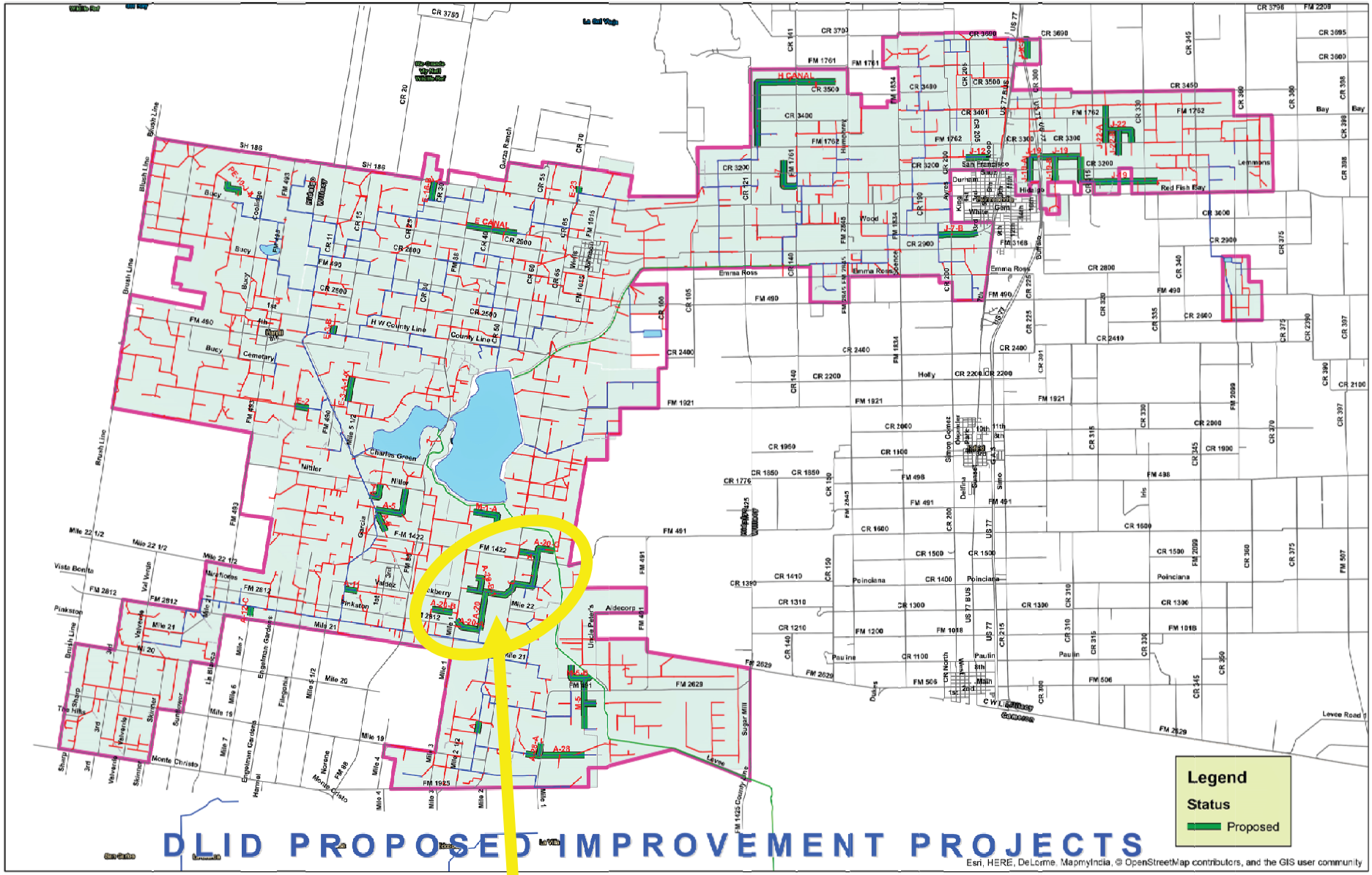


Figure 7 Water District Distribution Network, Lower Rio Grande Valley


DLID PROPOSED IMPROVEMENT PROJECTS
Legend
Status
Proposed
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
A-20 Canal

Delta Lake Irrigation District A-20 Canal

Delta Lake Irrigation District A-20 Canal

Some of the sites of damage and collapsed lining walls.

Delta Lake Irrigation District A-20 Canal

Seepage from the A-20 Canal.

Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

Appendix E – Delta Lake Irrigation District Conservation Policy and Drought Policy

DELTA LAKE IRRIGATION DISTRICT

WATER CONSERVATION POLICY

Section #1: Organization of the District

Delta Lake Irrigation District (The District) was established on June 22, 1928. The District is a political subdivision of the State of Texas, organized under and by virtue of Article XVI, Section 59 of the Constitution of the State of Texas. The District is operated under the statutes of chapter 58 and 49, in part, of the Texas Water Code.

Section #2: Structural Facilities

A: Service area.

The District provides irrigation, drainage, and raw water supply functions to 149 square miles of Hidalgo and Willacy Counties. The District delivers water to approximately 69,936 acre of irrigated land. The District also delivers raw water to the city of Monte Alto, La Sara, Hargill, Raymondville, Lyford, and North Alamo Water Supply Corp. The District owns 175,026.375 acre-feet of Class A Water Rights, 202.500 acre-feet of Class B Water Rights, and 1320 acre-feet of Domestic Water Rights.

B: Canal System:

The Districts canal system consist of 240 miles of lined or partially lined canals, and 42 miles of unlined canals. Lined canals range in width from 3’ to 25’. Unlined canals range in width from 40’ to 65’.

C: Pipeline System:

The Districts pipeline system, consist of 135 miles of concrete or pvc pipelines. Pipelines range in size from 10” to 72”.

D: Reservoir System:

The District operates four reservoirs. The two main reservoirs Delta Lake Reservoir Unit #1 and Unit #2 have an approximate storage capacity of 10,750 acre-feet. 1,350 acre-feet for Unit #1 and 9,400 acre-feet for Unit # 2, at a water surface elevation of 49 feet. Water is diverted from the river to either of the two main reservoirs. Water is then diverted from the reservoirs to the District and Municipalities. The District also has two other

reservoirs. The Hargill Reservoir with a full storage capacity of approximately 120 acre-feet, and the Nile Reservoir with a full storage capacity of approximately 40 acre-feet. The total storage capacity for the District is approximately 10,910 acre-feet storage.

E: Relift Pumps:

The District operates 53 relift pumps most of which are vertical lift pumps. Of these pumps nineteen are powered by Diesel Motors ranging from 40hp to 139hp, two are powered by Butane Motors 70hp each, and thirty two are powered by Electric Motors ranging from 20hp to 200hp. Sizes of the pumps range from 10" to 30".

F: Pumping Plants

The Districts main pumping plant is located on the Rio Grande. Water is diverted from the Rio Grande through the main canal system 32 miles to the Delta Lake Reservoirs Unit #1 and #2. The District also has a relift station (Relift #1) located on Delta Lake Reservoir Unit #1. There are four pumps at the river plant all being 450hp with 48" discharge capable of pumping 160 cfs each. Relift #1 on the reservoir has five pumps all being the same size with one pump being a variable speed magnetic pump. The sizes are 350hp with 42" discharge capable of pumping 120 cfs.

H: Metering Practices:

The District uses various different metering practices depending on the application. Field turnouts are measured with propellers, pipelines with Sea metrics and Siemens Sonoflow. Meters are read on a daily basis and reconciled at the end of the irrigation.

I: Field turnouts:

The Districts standard turnouts are alfalfa type valves ranging in size from 10" to 14". The District uses canal gates in most areas to control flow to the turnouts and to isolate parts of the system if repairs are needed.

J: Canal System Conditions:

The concrete canal system was originally constructed in the late 1930's through the late 1940's. The system overall is in fair to excellent condition. The District repairs structural damages as needed. The District started installing pipelines to replace parts of the antiquated system in the mid 1970's. In total to date the District has installed 97 plus miles of new concrete and PVC pipe. During the last 5 years the district replaced 10 miles of concrete lined canal with PVC pipe. We currently have three projects scheduled for 2014-2017 that will replace 6 plus miles of concrete lined canal with PVC pipe.

K: Relift Pumps and Pumping Plants Condition:

The original pumping system was constructed in the late 1930's through the late 1940's.

In 2008 the District started replacing the all-older diesel motors with new Deutz and John Deere diesel motors. The electric motors are repaired as needed. The District rebuilds the relift pumps as needed.

Section #3: Management Practices:

A: Water Deliveries:

The District total available water rights are 176,548.875 (Certificate of Adjudication No.is 23-811) with the maximum storage amount of 248,392.709. The District delivers water under contract to the cities of Lyford, Raymondville and North Alamo Water Supply Corp. The District also delivers water to the Valley Acres Irrigation District and Engelman Irrigation District. The Districts average annual water diversions in acre/feet for the last three years is 122,311 ac/ft. The Districts average annual water deliveries to customers for the last three years is 136,123 ac/ft.

Year	Annual Rainfall (in./yr.)	Total Annual Water Diverted (acre/feet)	Annual Irrigation Water Delivered (acre/feet)	Annual Municipal Water Delivered w 40%los (acre/feet)	Annual Other Water Delivered w 15% (acre/feet)	Toltal Annual Acres Irrigated
2011	9.8	189,430	162,875	4,522	16,512	199,647
2012	15.15	156,823	133,016	4,932	16,575	139,478
2013	25.33	93,961	71,043	4,330	10,024	69,244
Average	50.28	440,214	366,934	13,784	43,111	408,369

B: Practices used to account for water deliveries:

The District uses four different methods for water deliveries. 1) Flood Irrigation 2) Flood Metered 3) Drip Metered 4) Pond Metered. Water is metered to field turnouts through propeller type meters with the water being sold on a volumetric procedure. This method allows irrigators to monitor their usage rate helping conserve their water. Water deliveries to Municipalities are metered through Sea metrics meters.

C: Agriculture Water Deliveries Rate:

Water diverted to agriculture land is sold at a rate of $15.00 per acre flood, $6.00 per acre drip and sprinklers, and $30.00 per ac/ft for all other applications.

D: Municipal Water Delivery Rate:

Water diverted to municipal accounts is billed on the rate of $73.75 per acre-foot ($ .022633 per 1000 gallons)

Section #4: User Profile:

A: Total number of acres in service area: 69,936

B: Average number of acres irrigated annually: 136,123 (3yr avg.)

C: Projected number of acres to be irrigated in 10 years: 1,250,000

D: Number of active irrigation customers: 462

E: Total irrigation water delivered annually (ac/ft): 123,311 (3yr avg.)

F: Types of crops grown by customers: Cotton, Grain, Sugar Cane, Corn, Vegetables, Citrus, Soybeans, Sesame and Grass.

G: Types of Irrigation Systems:

1. Furrow flood irrigation accounts for approximately 75% of the irrigation deliveries. This type of irrigation is used for most of the pastures, sugar cane, cotton, and grain crops, plus about 25% of the orchard crops.

2. Drip systems or micro spray emitters systems account for approximately 24% of the irrigation deliveries. This type of irrigation is used for most of the vegetable crops.

3. Sprinkler systems account for about 1% of the irrigation deliveries in the district.

H: Types of Drainage Systems:

The district installs drop structures and discharge pipes from the fields to the drainage facilities.

I: Municipal Water Right Holders within the District.

1. North Alamo Water Supply: 3,966.916

2. City of Lyford: 610.00

3. City of Monte Alto: 600.000

4. City of Raymondville: 5,670.000

Section #5: Districts future plans for water conservation:

A: The District replaces 1-3 miles of concrete canal with PVC pipeline annually. The District also re-lines sections of the larger concrete canals with an EPDM liner on an as needed basis.

B: The District currently monitors all pipelines (when in use) daily with canal riders. Work orders are turned in on a daily basis for needed repairs on lines that can be isolated and shut off. Major leaks are radio into the maintenance Superintendent immediately for repairs.

C: The District encourages growers to convert to poly pipe if applicable. Drip irrigation is also encouraged in areas where the district can provide an adequate supply of water. In areas within the district where it is not feasible for the district to keep the system full for a drip system the district encourages the grower to install a holding pond to reserve water for the drip system.

D: The five-year target for savings is 1,000 – 2,000 ac/ft per year. The ten-year target is an additional 1,000 ac/ft per year.

Section #6: Effective Date of Policy:

The effective date of this Policy shall be April 16, 2014.

Delta Lake Irrigation District
Drought Contingency Policy / Water Allocation Policy

Section #1: Purpose and Intent

The Board of Directors of the **Delta Lake Irrigation District (District)** deems it to be in the best interest of the District to adopt Policy governing the equitable and efficient allocation of limited water supplies during times of shortage. This policy constitutes the drought contingency plan required under Section 11.1272, Texas Water Code, (Vernon's Texas Codes Annotated), and associated administrative rules of the Texas Natural Resource Conservation Commission (title 30, Texas Administrative Code, Chapter 288)

Section #2: User Involvement

The District is a political subdivision of the State of Texas, governed by a Board of Directors, under the direction of the provisions of Section 49 & 58 of the Texas Water Code, (Vernon's Texas Codes Annotated). The Board members must be landowners of the district and are elected by the Land Owners of the District. The Board will be open to comments on this policy by water users at the regular scheduled Board meetings during the public comment agenda item.

Section #3: User Education

The District will periodically provide the water users with information about the Plan, including information about the conditions under which water allocation is to be initiated or terminated and the District's policies and procedures for water allocation. This information will be provided by means of available copies of the plan at all times at the District office as well as posted on the public bulletin board at the District office. When the Board determines that drought conditions warrant the implementation of the drought contingency plan, notice will be posted on the public bulletin board at the District office or mailed to landowners and water users for which the District has a valid mailing address on file at the District office.

Section #4: Authorization

The general manager is hereby authorized and directed to implement the applicable provisions of this Plan upon determination by the Board that such implementation is necessary to ensure the equitable and efficient allocation of limited water supplies during times of shortage.

Section #5: Application

The provisions of this Plan shall apply to all persons utilizing water provided by the District. The term **"person"** as used in the Plan includes individuals, corporations, partnerships, associations, and all other legal entities.

Section #6: Initiation of Water Allocation

The general manager shall monitor water supply conditions on a daily basis and shall make recommendations to the Board regarding initiation of water allocation.
Upon approval of the Board, water allocation will become effective when:

A. The storage balance in the District's irrigation water rights account has decline to ***60,000*** ac/ft.

AND/OR

B. The Board determines that there is not sufficient water to complete the traditional crop year.

Section #7: Termination of Water Allocation

The District's water allocation policies will remain in effect until:

A. The storage balance in the District's irrigation water rights account exceeds ***75,000*** ac/ft.

AND/OR

B. The Board deems that the requirements to continue with the water allocation program no longer exist.

Section #8: Notice

Notice of the initiation or termination of water allocation will be given by notice posted on the District's public bulletin board or by mail to each landowner and water user who has a valid mailing address on file at the District office.

Section #9: Water Allocation

A. Water Allocation to irrigation accounts shall be the same parcels of land as identified by ownership for flat rate assessments purposes as shown in the records of the District. Upon institution of the Water Allocation Program, additional water allocated to the District will be distributed to the eligible District's users on a pro-rata flat rate acreage basis. Eligible District users are those irrigation users having an account balance of ***9"*** or less for each flat rate acre and having no outstanding balances due to the District.

B. Water allocated to an irrigation account shall be referred to as the District water user's Water Allocation. The amount of water that will be charged to water allotments

will be based on the meter readings turned in from the canal rider. The over use of the allotment shall be a violation of the District policy and subject to penalties.

Section #10: Transfers of Allotments

A. All or part of a water allotment may be transferred within the boundaries of the District from one landowners account to another. The transfer of all or a portion of a water allotment from landowner account to another account shall constitute irrigation use for purposes of use provided for in these Policies. Only the landowners or the landowner's agent may make the transfer of water allotments.

B. No water contained in a water allotment account may be transferred to land located outside the District boundaries except in special situations where traditionally these lands are irrigated as out of District lands and the water is diverted through the regular District diversion system.

C. Water from outside the District may be transferred into the District by a landowner for use within the District. The District will divert and deliver the water on the same basis as District water is delivered, except a 40% loss will be charged against the amount of water transferred for use in the District. The loss of 40% will be deducted at time of transfer. The District will allow the total amount of transferred water not to exceed 1 ac/ft per taxable acre of land. The transferred water will be stored in an account called *OUT OF DISTRICT WATER*. The District requires all transferred in water to be delivered first. The District will only be able to store the transferred water up to *12 MONTHS* or when the Districts storage balance with the Rio Grande Master reaches the maximum allowable balance.

Section # 11: Deliveries to Municipal Accounts

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

Section #12: Penalties

Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of Section 11.083, Texas Water Code, may be assessed an administrative penalty up to $5,000.00 a day under Section 11.0842 of the Texas Water Code. Additionally, if the violator is also taking, diverting, or appropriating state water, the violator may be assessed a civil penalty in court of up to $5,000.00 a day. These penalties are provided by the laws of the State and may be enforced by complaints filed in the appropriate court jurisdiction in Hidalgo or Willacy County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Policies.

Section #13: Sever-Ability

It is hereby declared to be the intention of the Board of Directors of the District that the sections, paragraphs, sentences, clauses, and phrases of the Plan are severable and, if any phrase, clause, sentence, paragraph, or section of this Plan shall be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, and sections of the Plan, since the same would not have been enacted by the Board without the incorporation into this Plan of any such unconstitutional phrase, clause, sentence, paragraph, or section.

Section #14: Authority

The foregoing policies are adopted pursuant to and in accordance with applicable sections of the Texas Water Code, Vernon's Texas Codes Annotated, which govern the actions of the District.

Section #15: Effective Date of Plan

The effective date of this Policy shall be February 20, 2013, and ignorance of the Policies of the District is not a defense for a prosecution for enforcement of the violation of these Policies.

Approved by Delta Lake Irrigation District Board of Directors on February 20, 2013
Revised and Approved by Delta Lake Irrigation District Board of Directors
April 16, 2014

Delta Lake Irrigation District A-20 Canal Conservation and Reliability Improvements

Appendix F – Canal Ponding Test Results, Delta Lake Irrigation District, Edcouch, TX; TAMU July 2000

Canal Ponding Test Results
Delta Lake Irrigation District
Edcouch, Texas

July 2000

Prepared by:

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Ponding Test Results Summary

Seepage loss tests preformed in the Rio Grande Valley were extremely high, ranging from 90 to 1220 ac-ft/mi./yr. Generally, the highest seepage losses occurred in the smaller lined canals. High concrete canal seepage losses indicate that improper construction methods and materials are being used in the region and/or canals may have inadequate maintenance programs.
The unlined canals have seepage loss rates similar to those reported in the scientific literature by soil type, and range from 54 to 1037 ac-ft/mi./yr. We found no clear relation between visual condition and seepage loss for the unlined canals. However, for the lined canals, there was a clear relation, particularly for canals rated 5 or less (on a scale of 10).

Table 1. Ponding Test Results for Delta Lake Irrigation District

Test	Segments	Canal Type	Soil Type	Canal[1] Rating	Top Width (ft)	Length (ft)	Seepage Rate (gal/ft²/day)	Total Loss in Canal (ac-ft/mile) per day	per year[2]
1	A & A-12	lined	fine sandy loam	6.1	18	11405	3.63	0.98	293.79
2	A-11	lined	fine sandy loam	4.9	6	2552	5.32	1.03	308.55

[1] on a scale of 10 to 1.
[2] based on 300 days of operation per year.

Ponding Test Procedures

1) We walked the canal test section to measure the length using a measurement wheel. We also completed the canal rating survey, took photos, and looked for leaks occurring from open valves and/or large cracks that were not representative of the canal lining. Those were then sealed.

2) Five to 6 staff-gages were placed at equal distances along the canal test section. One location was equipped with a pressure transducer, which served as staff gage.

3) The canal test section was filled to normal operating capacity and shut down for the 24-hour test.

4) Before the test began, time was allowed to inspect and seal the check structures to prohibit any further flows into the test section. Check structures used include dirt dams, wooden side gates, and steel-plated valves. As additional sealant, dirt was back-filled around the check structures.

5) Staff-gage readings were taken from 4 to 5 times over the period of the 24-hour ponding test.

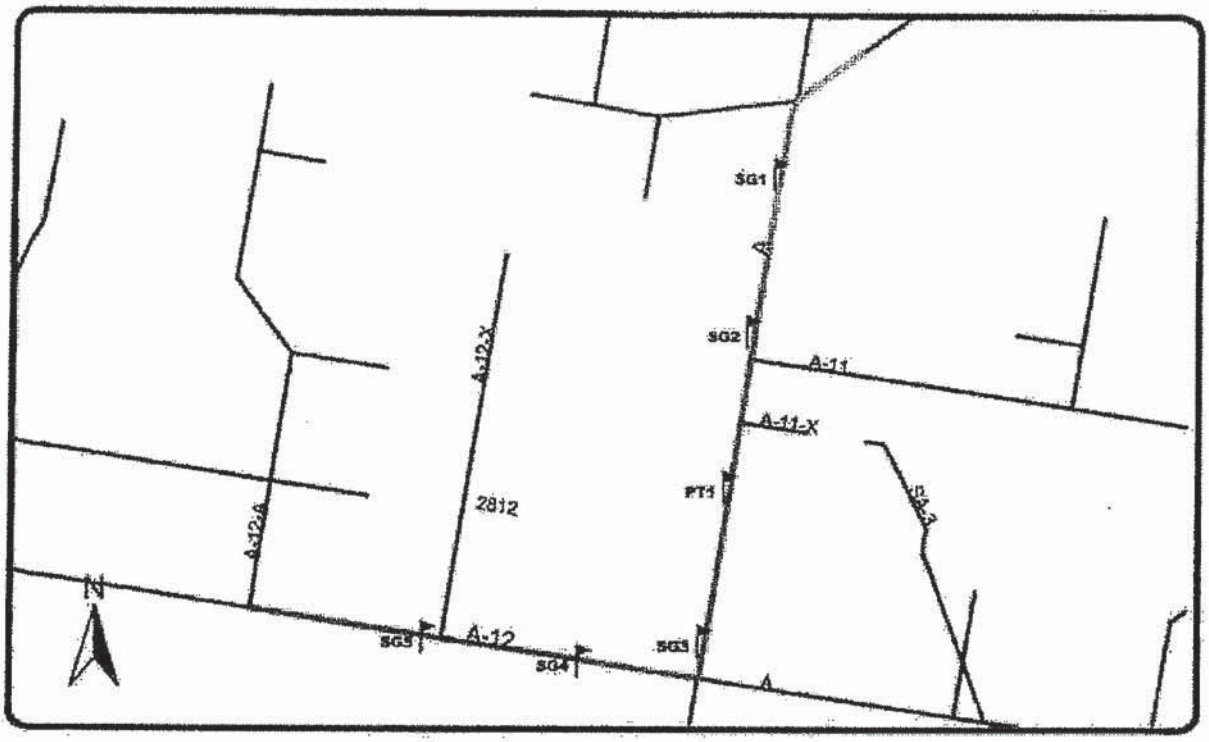
6) During the course of the test, canal dimensions were recorded including top width, bottom width, total depth, side slope angle, and cross-sectional shape. For earthen canals an average top width was calculated, and the bottom width estimated using the other canal dimensions.

Delta Lake Test 1

September 16 – 17, 1999

Delta Lake - Ponding Test 1

September 16-17, 1999



Staff Gage

Test Section

A

A-12

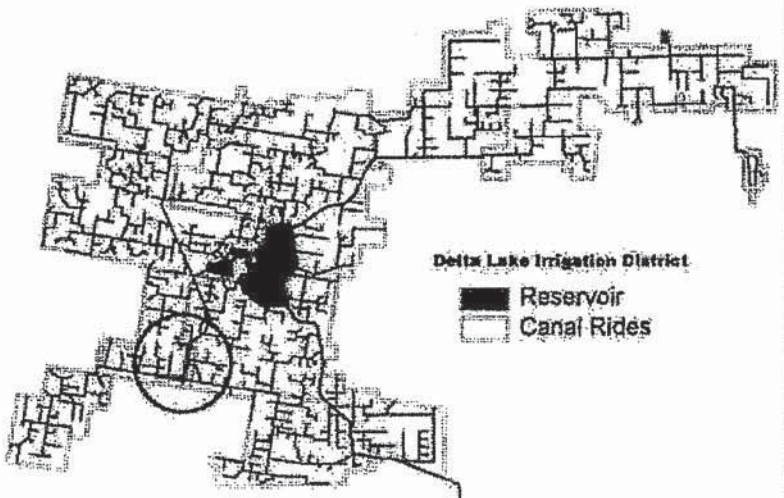
Conveyance System

canal

pipe

Roads

Projection: UTM, zone 14
Datum: NAD 83
Units: Meters



DMS Team, Agricultural Engineering
Texas A&M University
July 2000

0.6 0 0.6 1.2 Miles

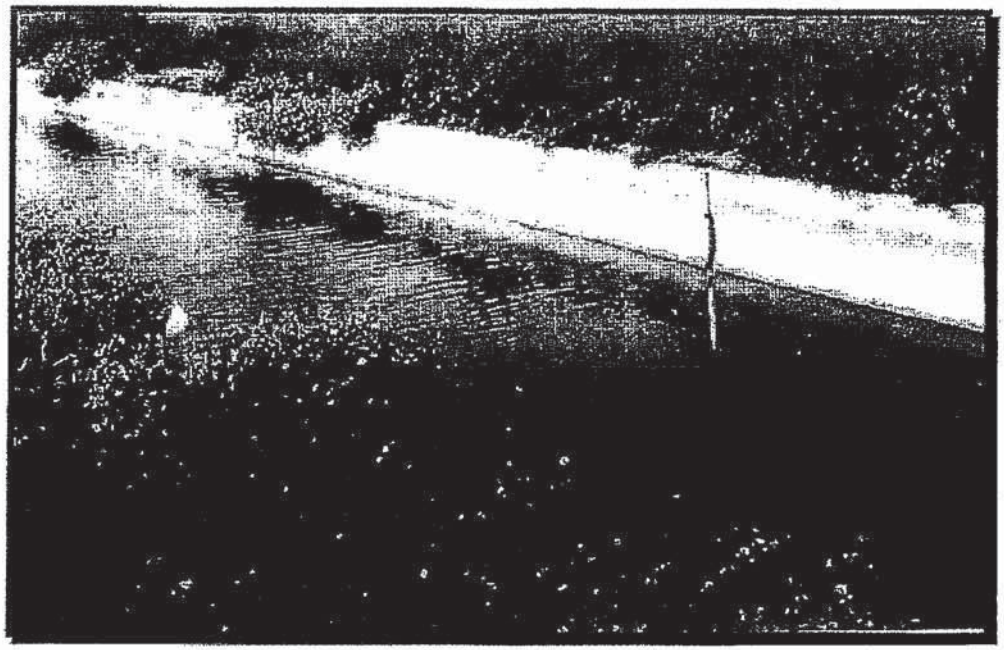


Table 2. Canal Rating[3]

Scale	lining condition	cracks/holes	frequency of cracks/holes	vegetation
1 to 5	3	4	1	3

Table 3. Rating Totals

Scale	Overall Rating
4 to 20	11
10 to 1	6.1

[3] See Canal Rating Chart in Appendix

Test 1. Information and Field Measurements

District: **Delta Lake Irrigation District**
Test ID: **Delta Lake 1**
Canal: **A & A-12** Lining Type: **Concrete**
Location: **Southwest of Monto Alto: RLP No.1**
Test Date: **September 16-17, 1999**
Start Time: **12:00pm** Finish Time: **12:30pm**

Canal Dimensions

Cross Section: **Trapezoidal**
Top Width(ft): **16.5 (A-12), 20 (A)**
Bottom Width(ft): **5.5 (A-12), 9 (A)**
Total Depth(ft): **6.0**
Side Slope: **1:1**
Segment Length(ft): **11405**
Soil Type: **fine sandy loam**
Overall Canal Rating: **6.1**

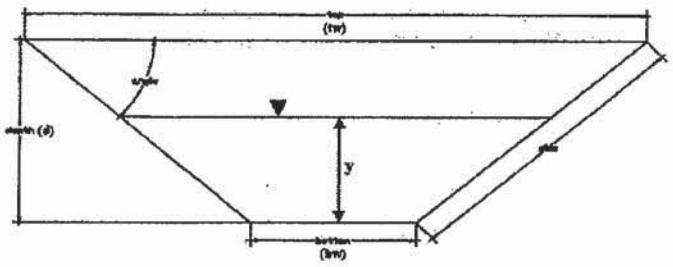


Table 4. Staff Gage Readings (feet above bottom)

Date	Time	SG1	SG2	PT1	SG3	SG4	SG5
16-Sept	12:00 PM	4.5417	4.75	4.9375	4.875	3.4375	3.625
	1:00 PM	4.5208	4.75	4.9375	4.875	3.4375	3.625
	4:00 PM	4.5208	4.75	4.9375	4.875	3.4167	3.625
17-Sept	11:30 AM	4.5	4.7292	4.9167	4.8541	3.3958	3.6041
	12:30 AM	4.5	4.7292	4.9167	4.8541	3.3958	3.6041
Segment Length (ft)		2400	1600	1600	1600	1600	2605

Table 5. Average Unit Area Loss Rate

$Ft^3/ft^2/hour$	Ft/day	In/day	$Gal/ft^2/day$	Acre-ft/mile/year[4]
0.0202	**0.4849**	**5.8188**	**3.627**	**293.79**

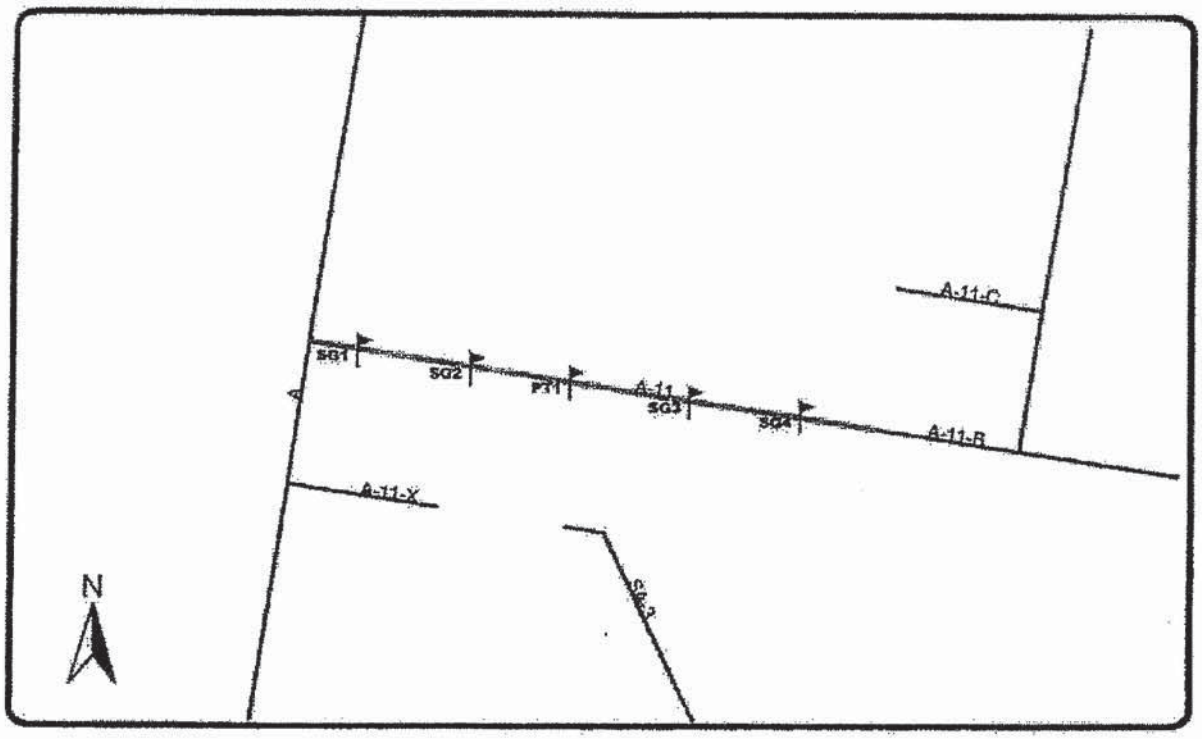
[4] Based on 300 days of operation per year.

Delta Lake Test 2

September 1999

Delta Lake - Ponding Test 2

September 22-23, 1999



Staff Gage

Test Section

A-11

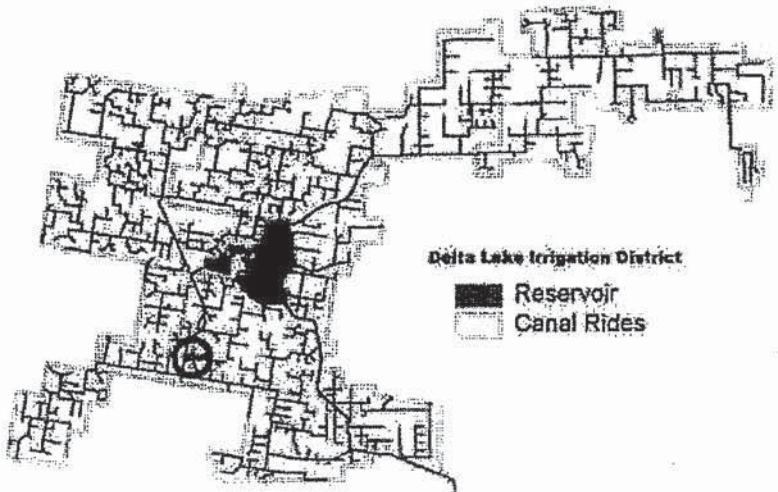
Conveyance System

canal

pipe

Roads

Projection: UTM, zone 14
Datum: NAD 83
Units: Meters



DMS Team, Agricultural Engineering
Texas A&M University
July 2000

0 0.2 0.4 0.6 0.8 Miles

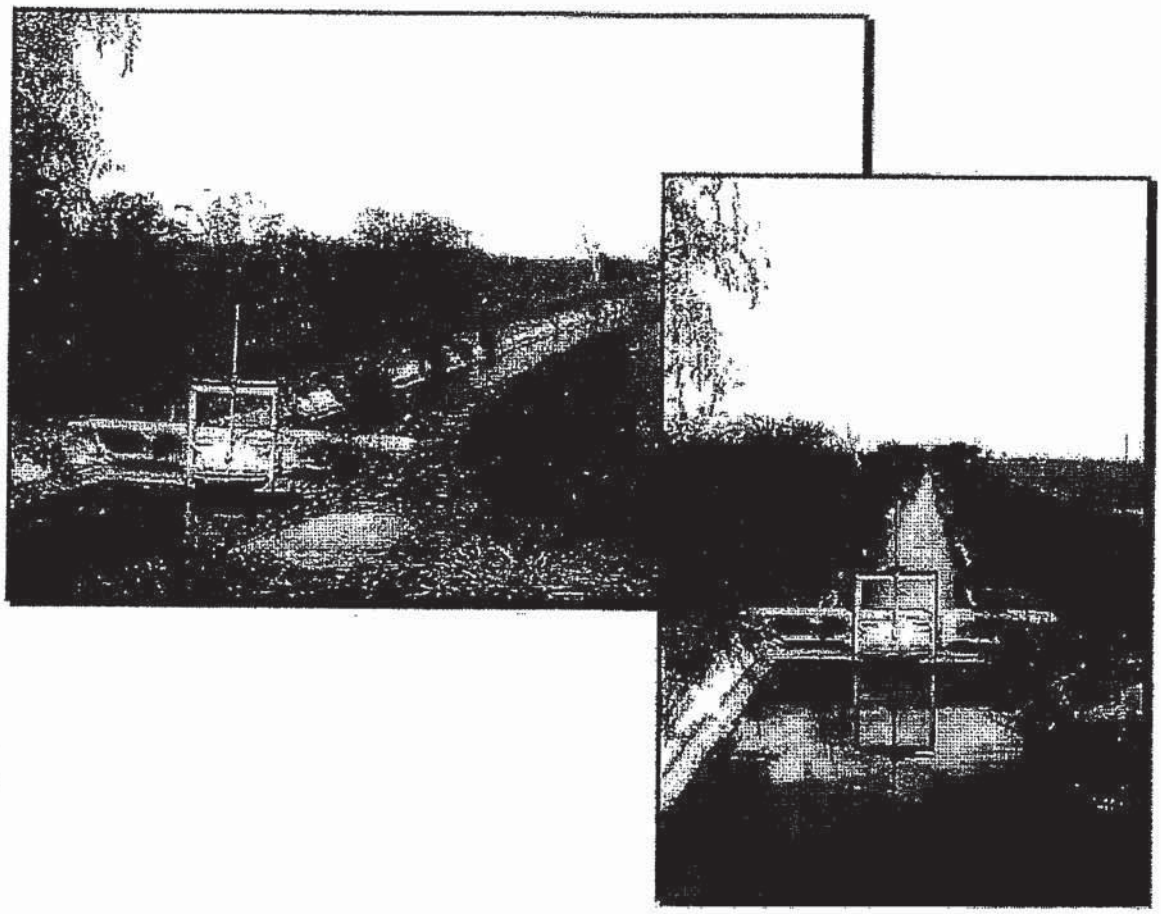


Table 6. Canal Rating[5]

Scale	lining condition	cracks/holes	frequency of cracks/holes	vegetation
1 to 5	3	3	3	3

Table 7. Rating Totals

Scale	Overall Rating
4 to 20	12
10 to 1	4.9

[5] See Canal Rating Chart in Appendix

Test 2. Information and Field Measurements

District: **Delta Lake Irrigation District**
Test ID: **Delta Lake 2**
Canal: **A-11** Lining Type: **Concrete**
Location: **Southwest of Monte Alto off of canal segment A**
Test Date: **September 22-23**
Start Time: **5:00pm** Finish Time: **5:00pm**

Canal Dimensions

Cross Section: **parabolic**
Top Width(ft): **6.25**
Total Depth(ft): **4.0**
Segment Length(ft): **2552**
Soil Type: **fine sandy loam**
Overall Canal Rating: **4.9**

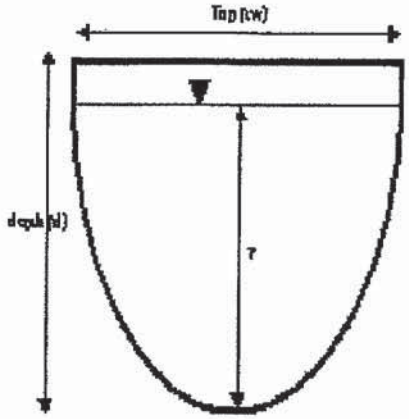


Table 8. Staff Gage Readings (feet above bottom)

Date	Time	SG1	SG2	PT1	SG3	SG4
22-Sept	5:00 PM	2.5417	2.5417	2.5417	2.5833	3.0833
23-Sept	9:30 AM	1.8125	1.7917	1.8333	1.875	2.3958
	12:00 PM	1.7917	1.7708	1.8125	1.8125	2.375
	4:30 PM	1.75	1.6667	1.75	1.7917	2.25
Segment Length (ft)		495	500	510	535	512

Table 9. Average Unit Area Loss Rate

$Ft^3/ft^2/hour$	Ft/day	In/day	$Gal/ft^2/day$	Acre-ft/mile/year[6]
0.0296	**0.7107**	**8.5284**	**5.316**	**308.55**

[6] Based on 300 days of operation per year.

Acknowledgements

DMS TEAM

Support provided by the DMS (District Management System) team of:

Stewart Beall, Research Agricultural Technician (former)
Kenneth Carpenter, Research Agricultural Technician (former)
Bryan Treese, Computer Programmer (former)
Raul Garcia, Student Technician (former)
Craig Pope, Extension Assistant

DELTA LAKE IRRIGATION DISTRICT

The district office personnel and canal riders provided helpful planning and assistance in canal ponding testing.