Border Environment Cooperation Commission
Delta Lake Irrigation District (Edcouch, Texas)
Water Conservation Improvement Project

General Criteria

1. Project Type

The proposed project fall under the Border Environment Cooperation Commission (BECC) priority area of water conservation. The proposed project consists of four priority water conservation project components that were selected from a list of 11 major and 37 minor needs of the Delta Lake Irrigation District (DLID) system. The four project components include 1) reservoir renovation, consisting of construction of a 17,000 linear foot bypass canal along the eastern edge of Delta Lake, 2) a 3-mile pilot seepage recovery system for the main canal, 3) installation of a flow measurement and telemetry system at 20 water diversion points to control and monitor deliveries, and 4) replacement of approximately 16.8 miles open channel laterals with pipes. Given that the Rio Grande is the District's only anticipated water source, and the District's goal is to maximize efficiency, the proposed activities will improve management and conservation of water, reduce evaporation, seepage losses and operation and maintenance costs, and will conserve energy.

2. Project Location

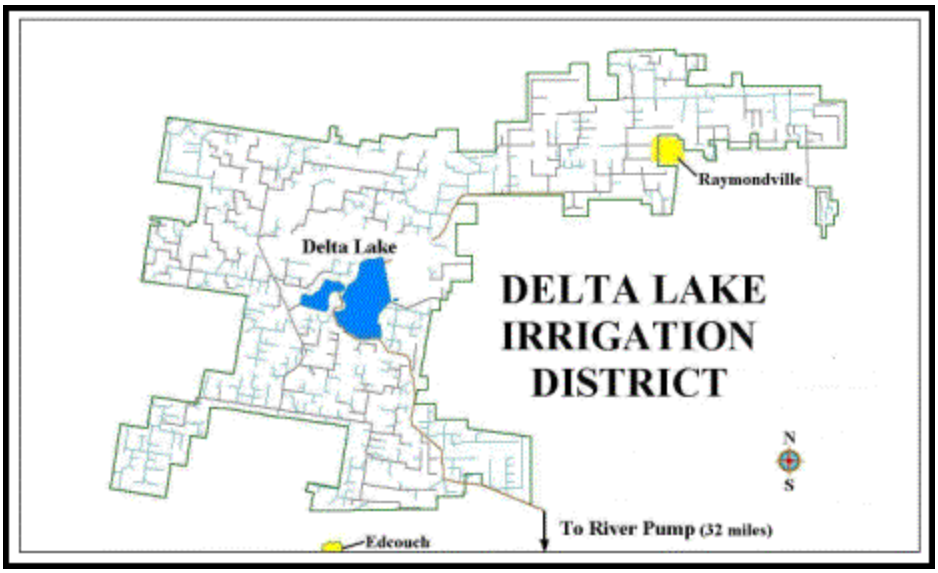
DLID was originally established in 1914. It is located in the Nueces-Rio Grande basin northeast of Edinburg, Texas, in Hidalgo and Willacy Counties. The District is within 62-miles from the Rio Grande River U.S.-Mexico border and the Rio Grande River is the only source of water for the district. The District has an irregular shape covering 148.95 square miles (95,328.8 acres), with it's southern boundary located about 1.5 miles north of Edcouch, Texas, and extending north and northeast including the cities of Hargill, La Sara, Monte Alto and part of the City of Raymondville.

The District's main landmark is Delta Lake, with a capacity of 25,000 acre-feet of water and a surface area of 2,371 acres. The lake was constructed in 1939 for District storage of water diverted from the Rio Grande River to regulate and assure adequacy of water for irrigation requirements. The lake assures a more

constant and reliable availability of water to meet District needs, considering the four-day travel time of water from Falcon Reservoir. The lake is separated by a roadway that divides it into a smaller West Reservoir and a larger East Reservoir. The two reservoirs are connected via a culvert running under the dividing roadway and can be isolated from one another using a valve.

Water is diverted from the Rio Grande River in Hidalgo County near the Hidalgo and Cameron County line at the Rio Grande River. Water is pumped into a main canal where it flows by gravity approximately 32 miles to the southeast corner of Delta Lake. Water is distributed to land from the canal during the irrigation season or to a pumping plant that lifts surplus water to Delta Lake for storage. When needed for irrigation, water is released from the lake and flows back to the main canal for distribution. The District water supply system consists of 250 miles of lined or partially lined canals, 42 miles of unlined canal and 122 miles of unlined laterals.

The District has the second largest area of the 28 Districts in the Rio Grande Valley, with authorized irrigation water rights of 174,776 acre-feet, 3,999 irrigation accounts and 70,000 acres in irrigation. In addition to irrigation water rights, the District also has annual municipal and industrial water rights of 9,520 acre-feet. The District system provides water to the cities of Raymondville, Hargill, La Sara, Monte Alto, and Lyford, including rural homeowners, as well as Santa Maria Irrigation District Cameron County No. 4, La Feria Irrigation District Cameron County No. 4, Valley Acres Water District, Hidalgo and Cameron Counties District No. 9 and Hidalgo County. The District's 5-year average annual water diversion was 80,944 acre-feet for 1998 to 2002. The District's 5-year average annual water diversion for irrigation is 75,704 acre-feet per year and 5,240 acre-feet per year for municipal and domestic water use. The District reports an estimated water delivery efficiency of approximately 63%. A location map of the District and layout drawing are shown below.



3. Project Description and Work Tasks

The project includes 4 priority components selected from a review of a list of 11 major and 37 minor projects identified throughout the District's water delivery system. The estimate of the quantity of water that will be saved from the four components combined is 13,808 acre-feet per year, and the annual energy savings is estimated at 741,614 KWH. The estimated completion time for the work is 28 months from approval of the project for funding. The following is a brief description of each of the four components of the project.

Reservoir Renovation

The reservoir renovation component of the project will consist of the construction of a 7,000-foot long by-pass canal beginning at the southeastern corner of the East Reservoir where the main canal supplies the lake, running along the east shoreline of the reservoir and terminating at a pump house along the reservoir's north-northeast edge. The purpose of the canal is to be able to by-pass the lake and be able to provide irrigation and domestic water to the northern and eastern portions of the District, including the cities of Raymondville and Lyford, without having to store that water in Delta Lake. Constructing the proposed bypass canal will reduce the seepage and evaporation losses associated with transporting water through the East Reservoir of Delta Lake. Under the current system, raw water is transported to these areas via the Delta Lake, and it has been estimated that in a dry summer month, over 1,700 acre-feet of water are needed to be placed in the East Reservoir to deliver about 400 acre-feet at the northeast corner. This is a loss rate of approximately 77 percent, mostly evaporation. The proposed by-pass can save a substantial amount of water, and if current drought conditions continue and expected future decreases in water supplies occur, the delivery of raw water through Delta Lake will not be possible. The projected annual savings of water for this component is 2,685 acre-feet, and the estimated cost of this component is $1,236,675.

Main Canal Seepage Recovery System

This component of the project includes construction of a pilot 3-mile surface and subsurface drain collection system and return pump to collect water that seeps from the main canal. The capital cost of such a recovery system is much more economically viable than concrete lining the main canal due to the length of the canal. In addition, the energy required to pump the recovered seepage back into the main canal will be approximately 25% of the energy required to pump water from the Rio Grande, or for every acre-foot of seepage water that is salvaged, the District will reduce energy cost per acre-foot by 75%.

A 5 cfs (cubic feet per second) seepage recovery system is proposed, consisting of a subsurface telescoping toe interceptor drain running adjacent and parallel to the banks of the main canal and a low head lift station to pump the water back into the canal. After construction, a monitoring system will be established to track the actual loss rate from the canal, the quality of the water recovered and the ability to collect and return the lost water back to the canal to plan future seepage collection activities. The projected annual savings of water for this component is 2,280 acre-feet, and the estimated cost for this component is $469,264.

This component, along with the rest of the 32-mile long main canal from the Rio Grande River (the Willacy Canal), is within the Otha Holland Wildlife Corridor. A Cooperative Management Agreement between the District and the U.S. Fish and Wildlife Service was signed on June 7, 1990 in order to eliminate illegal dumping and trespassing on the land, while preserving and protecting wildlife habitat along the length of the canal. During construction of the drain collection system, no land dedicated to public use (including wildlife management) is expected to be unreasonably impacted by the proposed construction, and in fact, the seepage recovery system will help preserve the habitat corridor compared to lining the canal.

Telemetry and Flow Measurement

This component consists of the installation of flow measurement devices at 20 diversion points within the District's water supply system. These devices will be permanently installed to monitor deliveries into particular laterals of the system and send this information, by telemetry, to the District headquarters. This information will allow the District to track and control water usage, identify where losses are occurring and allow the District to forecast and provide for future water uses. By having more real-time information, the District can operate the system more efficiently. The projected annual savings of water for this component is 2,650 acre-feet, and the estimated construction cost for this component is $510,180.

Canal Rehabilitation

The canal rehabilitation component includes replacement of approximately 16.8 miles of existing concrete lined canals with buried 12, 18, 24, 36, 42 and 48-inch pipelines. The 36, 42 and 48-inch will be reinforced concrete pipe (RCP), and the smaller diameters will be PVC (polyvinyl chloride) pipe. Most of the

pipelines to be installed will be 24-inch PVC. The first 3.4 miles of pipelines are fully designed based on a detailed hydraulic study using EPANET software. This information was used to prepare estimates of the balance of the canals identified for replacement with pipes, but which have yet to be fully designed.

This component will save water by reducing seepage and evaporation losses and their associated pumping requirements and costs. Also, the control of water and flow rates delivered to individuals will be improved and can allow for a greater number of fields to be simultaneously irrigated. The projected annual savings of water for this component is 6,193 acre-feet, and the estimated construction cost for this component is $3,605,355.

4. Conformance with International Treaties and Agreements

The International Boundary and Water Commission (IBWC) is an independent bi-nati2onal public organization that ensures implementation of the 1944 Water Treaty between the United States and Mexico related to water and boundary issues. The project does not violate the allocation of water rights. The District will continue to meet all state surface water diversions from the Rio Grande in accordance with the agreements in place and the restrictions of the Treaty.

The Texas Commission of Environmental Quality (TCEQ) and the International Boundary and Water Commission (IBWC) are the authorities for allocation of water to the District. The 1944 Water Treaty between the United States and Mexico applies. DLID diverts water from the Rio Grande River in accordance with a Permit issued by TCEQ, governed by Chapters 49 and 58 of the Texas Water Code and Article XVI, Section 59 of the Texas Constitution. TCEQ's Rio Grande Watermaster Office in Harlingen is responsible for allocating, monitoring, and controlling the use of surface water by the District in coordination with IBWC. The State Watermaster also cooperates with IBWC and its Mexican counterpart to monitor U.S. and Mexican compliance with the U.S.-Mexico Treaty of 1944. There is no reported non-compliance by the District under the TCEQ permit.

Human Health and Environmental

1. Human Health and Environmental Need

The proposed project activities address one of the most pressing problems facing the Lower Rio Grande Valley of Texas, i.e., water shortages due to drought over the last seven years and an increasing demand due to population growth. Water conservation reduces the impact of drought conditions and makes available additional water resources that would otherwise be lost to meet both domestic and agriculture demands. The future health, social and economic well being of the population in the Rio Grande Valley will be dependent on conservation and maximizing beneficial use of available water to meet domestic and agricultural needs. The project addresses the critical water shortages by reducing water losses and providing for more efficient delivery of water, thus enhancing availability of water both domestic and agriculture use.

2. Environmental Assessment

An Environmental Summary (ES) for the project was completed by Axiom-Blair Engineering. Preparation of ES utilized information for a wide variety of sources including the TCEQ, the U.S. Census Bureau, the U.S. Fish and Wildlife Service, the Texas Parks and Wildlife Department, the Texas Historical Commission, the National Weather Service, the U.S. Soil Conservation Service, the Texas Department of Transportation and on-site field reconnaissance.

The ES resulted in the following conclusions:

- *The need for the project is real and immediate. No reasonable alternatives exist to the recommended alternatives.*
- *No short or long term detrimental socioeconomic effects are expected as a result of the project. Socioeconomic impacts are expected to be wholly positive.*
- *Short-term wildlife habitat disturbance associated with the project will be moderate; however, long-term disturbance is expected to be minimal to none.*
- *No significant, long-term air, water or vegetative impacts are anticipated.*
- *No cultural resources will be impacted as a result of the proposed project.*
- *From a regional perspective, this Water Conservation Improvement Project is expected to have a positive impact from environmental and socio-economic perspectives, and no impact on cultural-historical resources.*

The ES was submitted to the Texas Parks and Wildlife Department, Texas Historical Commission, U.S. Army Corps of Engineers and the United States Fish and Wildlife Service for review. The U.S. Army Corps of Engineers has determined that since the project sites do not contain any areas subject to Section 10 of the Rivers and Harbors Act or Section 404 of the Clean Water Act, a Department of the Army permit is not required. The Texas Historical Commission reviewed the project under Section 106 of the National Historic Preservation Act of 1966 and the Antiquities Code of Texas and determined that "*the project should have no effect on historic properties*". *No further review is necessary from the Texas Historical Commission. Additional comments received from the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department have been addressed through correspondence and additional specifications were added to the construction drawings.*

Regardless of these jurisdictional determinations, it is the District's goal to protect the environment and its inhabitants. The construction drawings include specifications requiring the contractor to protect existing waterways, vegetation and wildlife from unnecessary disruptions during construction. In addition, the District will file the required Notice of Intent with the Texas Commission on Environmental Quality (TCEQ) and prepare a Storm Water Pollution Prevention Plan prior to construction.

The construction of the proposed water conservation measures will have an overall sustained positive environmental impact, enhancing the prospects for continued economic growth of the region, as well as the improved health and social well being of the region's growing population.

3. Compliance with Environmental and Cultural Resource Laws and Regulations

The environmental review of the project and the proposed mitigation measures comply with all environmental and cultural resource laws and regulations. All required permit conditions necessary for the construction or operation of the proposed project will be acquired and complied with. The District has the required water rights and is fully compliant with the terms of its water use permit.

Technical Feasibility

1. Appropriate Technology

The Project Plan for the project was completed by Axiom-Blair Engineering in accordance with USBOR guidelines, funded by the Texas Water Development Board (TWDB) State Energy Conservation Office (SECO) funds. The Project Report, also being funded by SECO funds, is being finalized for TWDB approval. As stated earlier, the four project components were selected from a review of a list of 11 major and 37 minor projects identified throughout the District's water delivery system. Each of the four project components was analyzed with consideration of most appropriate technical and least-cost alternative, as described below.

Reservoir Renovation

Four potential project alternatives were identified and analyzed; 1) construction of a new canal and associated improvements, 2) construction of a 24-inch transmission main, 3) construction of a 36-inch transmission main, and 4) the no-build alternative. Preliminary cost estimates for the 24 and 36-inch transmission mains were estimated to be from 2.2 to 4.6 times the estimated cost of the new canal. Both pipeline alternatives would require significant clearing along the same general alignment proposed for the canal. Although these widths are roughly half of that required for channel construction, a clear-cut swath would still be required through the project alignment. Additionally, the transmission capacity of the pipelines is extremely limited (12 to 27 percent) relative to the canal alternative. No overwhelming benefits were identified that justified the additional cost and limited capacity of the transmission main alternatives. Construction of either transmission main was therefore eliminated as a viable alternative.

Numerous potential negative impacts are associated with the "no-build" alternative. Severe curtailment of water use would be required resulting in damage to small-scale agriculture, lawns, trees, landscaping, etc. The Development of emergency interim water supplies would be necessary resulting in increased cost, fuel usage, air pollution and traffic. There would also be a higher potential for public health and safety problems typically associated with inadequate water supplies including loss of system pressure, system

contamination, longer distribution system residence times, etc. As a result of the significant potential negative impacts, the "no-build" alternative was eliminated from consideration. Construction of a bypass canal and associated improvements was therefore selected as the recommended alternative.

The proposed bypass canal will be constructed along the inner edge of the eastern embankment, utilizing the existing berm. The western embankment will be constructed from material dredged from the bottom of the reservoir. The trapezoidal cross section has a five-foot bottom width, 2:1 side slopes and has been designed to carry a minimum flow of 66 cfs (cubic feet per second). The bypass canal will not be lined in conjunction with this project. Control structures have been designed to accommodate the six existing diversion points along the eastern edge of the reservoir. Radial gates will be installed at the Main and "J" Canals to provide better flow control. The radial gates at the Main Canal will allow the East Reservoir of Delta Lake to continue to be utilized as a reservoir for the District, but in an "off-line" instead of "in-line" capacity. The proposed control structures will allow the steady flow of water to the bypass canal and excess water will be diverted into the East Reservoir. In times of extreme water shortages, this system will allow the District to still provide domestic water when lake levels are low. Appropriate control gates, weirs and concrete wells will allow the flows to be measured and controlled, and concrete flumes will be constructed along the bypass canal upstream of each of the control structures and flow measurement devices will be installed at each of the diversion points. These flow measurement devices will be connected to the proposed telemetry system.

Seepage Recovery System

The main canal (the Willacy Canal and the Otha Holland Wildlife Corridor) is 32 miles long with a typical trapezoidal cross-section consisting of top surface of about 80 feet wide, a base of 40 feet wide and a 1:1.5 side-slope ratio. Because of the size of the canal, concrete or urethane lining is prohibitively costly, and would directly impact the wildlife habitat. The proposed seepage recovery system is considered the best alternative to lining.

A feasibility study was performed to determine the most economical region of the project study area to recover seepage water. The project study area was defined as the entire length of the Willacy Canal from the Rio Grande to Delta Lake. The Soil Survey of Hidalgo County, Texas, the Soil Survey of Willacy County, Texas and the Soil Survey of Cameron County, Texas, published by the United States Department of Agriculture, Soil Conservation Service in cooperation with the Texas Agricultural Experiment Station, were consulted to determine the general soil characteristics of the study area. According to the Surveys, soils along the Willacy Canal range from clay, with a low permeability rate of less than 0.06 in/hr, to fine sandy loam, with a permeability rate between 0.6 to 6.0 in/hr. A three-mile length of canal was selected for the feasibility study area, due to its soil characteristics and its identification by District personnel as a high seepage area.

Once the feasibility study area was identified, a geotechnical engineering firm was hired to perform borings at regular intervals along the embankment and adjacent roadway to determine the actual permeability rate, the depth of the water table and the quality of the water in the canal and the borrow ditch. This information was utilized to design the subsurface telescoping toe drain system and a 5 cfs pump station to pump the recovered water back into the Willacy Canal. The location of the site is near the southeast corner of the District. The capital cost of such a recovery system is estimated to be 5 to 10 times more economically viable than concrete lining the main canal.

The activity will include the establishment of a monitoring system to accurately measure results for the possibility of future work to expand collection of water that seeps from the main canal and pumping it back into the system.

Telemetry and Flow Measurement

The 20 diversion structures for the installation of the measurement devices were designed with one or multiple measurement devices depending on the structures located on the site. Each of the measurement devices on the individual sites will be connected to a single telemetry system. The diversion structures can be broken into two categories, pump houses (closed conduit flow) and check structures (open channel flow). At all of the pump house sites, water is drawn from the supply canal with single or multiple pumps and discharged to a pump well. Once the water enters the pump well it is distributed to single or multiple distribution lines for delivery to the customer(s). Each pump well is constructed with a wall that acts an overflow weir. If the pump produces more water than the customer uses, the water fills up the well, eventually spills over the weir and flows through a recycle line that returns excess water back into the supply canal. When small flows are required, a valve at the bottom of the weir wall can be opened to allow water to flow directly from the supply canal to the distribution line without the use of the pump. With the present system, the District has no mechanism to routinely quantify the amount of water a pump house is producing in relation to the amount
actually delivered to the customer.

The District wanted a mechanism for determining how much water each of the pump houses were producing so they could compare this to the amount of water needed. In addition, they wanted to be able to reduce the amount of water being recycled without constant visual monitoring. It was decided that the flow from each pump would be metered with either a run-time meter or a pipeline meter depending on the pump house characteristics. Each of the pump well weir walls would be equipped with a submersible pressure transmitter to monitor the level of the water in the well. When the water level exceeds the height of the weir for a specified period, the pump would shut off. Once the water level drops below the crest of the weir, and the resting period has passed, the pump would again run.

Due to their reliability, accuracy and suitability for the sites, saddle mount propeller meters were chosen to meter the flow in the pump discharge line. Each meter will be protected from vandalism and theft by either a lockable concrete or

welded expanded metal enclosure. Concrete enclosures will be constructed at sites where the discharge pipe(s) are located below grade and welded expanded metal enclosures will be constructed at sites where the discharge pipe(s) are located above grade. Sites equipped with a propeller meter will also be equipped with a calibration port, located upstream of the meter, to calibrate the meter with a portable flow measurement device. At sites without sufficient pipe length to install a propeller meter, a run-time meter will be installed on the pump to measure the amount of time the pump is running. The pump characteristics will be utilized to prepare a rating curve for converting the measured time to flow.

At each of the check structures, the flow will be measured downstream from the check structure using a flow measurement structure or device. The canals containing the check structures could be divided into two categories; large (top width in excess of 20-feet), earthen canals and small, concrete-lined canals. Based on their ability to be computer calibrated using as-built dimensions, long-throated flumes were selected for flow measurement of the small, concrete-lined canals. A cross-section from the existing canal was utilized to design a flume for each of the sites using the WinFlume software. Rating tables were prepared for each of the flumes based on the proposed design. Once the flumes have been constructed, as-built dimensions will be tables for use in determining flows at different elevations. Each flume will be equipped with a submersible pressure transmitter, housed in a stilling well, for determining the water level in the approach section of the flume and a staff gage for visual verification. It was decided that a velocity flow meter would be the most cost effective and accurate metering device for the large earthen canals. A Doppler meter, which measures velocity in the channel, will be installed at each of these sites. The meter will be installed in a concrete slab constructed along one bank of the channel. The slab will be located sufficiently downstream from the check structure to minimize unsteady flow. The meter will measure the velocity of the water and will be equipped with an integrated pressure sensor for water surface level measurement. A rating curve will be developed for each of the canal Doppler meter sites to determine the flow. The meters will be calibrated using a portable metering device.

Three diversion points included in the project did not fall into any of the above categories. The No.1, No. 2 and No. 3 Canals currently receive water from the East Reservoir of Delta Lake via a pipeline through the existing embankment. Each of the existing diversion structures will be removed and replaced with a concrete vault equipped with a rectangular sharp-crested weir. A rating curve has been developed for each weir and will be utilized, along with the water level, to provide the District with flow data. This information will allow the District to control and measure the flow into each of the laterals.

A telemetry system will be installed at each of the 20 diversion points for the District to periodically, and on demand, poll for data from the field devices (remote telemetry unit (RTU)), process the data into a central data base (base computer), send controls to field devices and display the data in useful formats to water operation personnel. A Base System will be located at the District

Headquarters and will consist of a base computer, which will hold the central database to store and convert all of the data from the RTUs, and an antenna to receive from and transmit data to the remote telemetry systems. The base computer will be equipped with software that will display current, last 24 hours and monthly water and flow level data of any or all of the RTUs. It will also store all engineering and conversion data necessary for converting flow. A remote telemetry system will be installed at each of the flow measurement sites. Each system will consist of the following:

Remote Telemetry Unit (RTU)
Radio and RF Modem
AC/DC Linear Power Supply

These items will be mounted inside a steel enclosure on a panel with room for a storage battery to be placed on the bottom of the enclosure. A radio antenna will be mounted on a 20-foot antenna mast for transmitting and receiving data from the base system. At sites equipped with a pump house, the telemetry system enclosure will be mounted inside, on the specified wall, and wired to the existing power source. At sites without a pump house, but where electricity is available, the telemetry system enclosure will be installed in a steel vandal box and wired to the existing power source. When electricity is not available, the telemetry system enclosure will be installed in a steel vandal box and a solar panel will be added to the antenna mast to provide power. Once the telemetry system enclosures are mounted, the RTU will be wired to the metering device(s), the pressure transmitter, the existing pump panel(s), solar panel and antenna, as specified in the construction drawings. The system will then be programmed with the calibration coefficients for each site and DLID personnel will be trained in the operation and calibration procedures for the telemetry system.

<u>Canal Rehabilitation</u>
Four rehabilitation options were considered for the damaged canal segments; relining with concrete, line with an impervious liner, replace the canal with a pipeline or do nothing. Preliminary cost estimates were prepared and revealed that replacing existing concrete lining of the canals was 100 to 200 percent more expensive than lining the canal with an impervious liner or replacing the canal with a pipeline. Additionally, the soils in the area shrink and swell extensively in response to moisture changes. No benefits were found to justify the additional cost and future problems of installing new concrete lining. Replacing the existing canals with concrete was therefore eliminated as a viable alternative. According to an on-going study by Texas A&M University, concrete lined canals similar in size and soil type can lose from 220 to 375 acre-feet/mile per year of water due to seepage. An additional loss of 2.2 acre-feet/mile per year on the open canals is also estimated due to evaporation.

With the ongoing drought and the District's commitment to water and energy savings, the no-build alternative was eliminated from consideration. Both lining the canal with a polyurethane liner and replacing the canal with a pipeline had the positive benefit of eliminating

seepage and low maintenance costs, but each had its limits on cost-effectiveness. It was found that at higher flow rates, it was more cost effective to line the canal with a polyurethane liner. At low flow rates, replacing the canal with a pipeline was more cost-effective. Since both the liner and the pipeline would be installed along the existing canal alignment, the environmental impacts of the projects would be very similar. However, the segments selected for replacement are small laterals with low flow rates and based on the above observations, replacing the canals with pipes were determined the most cost-effective alternative.

A detailed hydraulic study for 3.4 miles of canals proposed to be replaced with pipes was performed using EPANET software to determine the flow requirements. Once the flow requirements were determined, the study was utilized to determine the size for each pipe segment, design and costs for this 3.4 miles. This information was also used to prepare preliminary sizes and costs for the rest of the 13.4 miles of proposed pipelines, including distribution pipelines, turnout pipelines and associated concrete structures. The proposed project costs include final design and preliminary estimated construction costs for the 13.4 miles of canal replacement with pipes.

All proposed pipelines larger than 24-inches will be installed as reinforced concrete pipe (RCP) and those equal to or smaller than 24-inches will be installed as polyvinyl chloride (PVC) pipe. The pipeline will be installed in one of the embankments of the existing canal, with its alignment parallel to the edge of the existing canal. A concrete inlet structure will be constructed at the intersection of the proposed pipeline and the supply canal. This structure will be located to ensure the inlet of the pipeline will remain submerged and thus, ensuring the pipeline will remain pressurized. A turnout connection box will be constructed at each point of delivery along the alignments. These boxes will provide access points for debris removal by District personnel. The line gates at each turnout can be locked in place for the duration of the delivery once the flows have been adjusted by District staff. This method allows for the use of portable flow meters rather than having a flow meter at each point of delivery. A drain pipeline will be provided at the end of each pipeline. Once the pipelines are in place, the existing canal will be backfilled with material from each of the embankments to provide a uniform slope across the District right-of-way.

2. Operation and Maintenance Plan

The operation and maintenance requirements for the improvements to the facilities are basically the same as already performed on the existing pipelines and canals of the system. The existing staff are considered sufficiently capable and experienced to undertake required maintenance of the new pipeline and canal. Equipment suppliers will be required to provide training on the operation and maintenance of equipment, including provision of O&M manuals.

3. Compliance with Applicable Design Standards and Regulations

The design and construction requirements will adhere to USBOR requirements under the "Guidelines for Preparing and Reviewing Proposals for Water Conservation and

Improvement Projects under Public Law 106-576." *USBOR design standards and criteria were applied and USBOR quality control procedures will be applied during construction.*

Financial Feasibility and Project Management

1. Financial Feasibility

Axiom-Blair Engineering prepared an analysis of project and the District's financial condition to provide matching funds for proposed funding structure of the project and the operation and maintenance of the system. The estimated project costs based on the design information are as follows:

PROJECT COSTS

ITEM	FUNDING SOURCE	TOTAL
Planning	*DLID & SECO*	*$134,632*
Design/Construction Contracting	*DLID & SECO*	*$527,789*
Construction Administration	*DLID*	*$636,105*
Construction Cost	*DLID, NADB & TWDB*	*$5,821,474*
TOTALS		**$7,120,000**

Cost in U.S. Dollars. August 2003

The funding sources for the project are summarized in the table below. Based on the WCIF Guidelines, the WCIF grant may support 50% of the project costs up to or a maximum of $4,000,000. The District is currently negotiating a cost sharing agreement with North Alamo Water Supply Corporation (North Alamo WSC) under the auspices of the Texas Water Development Board's Disaster Contingency Fund program. North Alamo WSC has been awarded $347,017 toward the excavation of the Delta Lake bypass canal proposed in the District's Water Conservation Project. Approximately $325,000 of the $347,017 is anticipated to be available to the District to provide for a portion of the excavation cost of the bypass canal. The funding sources for the projects are as follows:

FINANCIAL STRUCTURE FOR THE PROJECT

Source	Type	Amount USD	% Project Cost
NADB	*WCIF-Grant*	*$3,560,000*	*50%*
State of Texas	*SECO Grant*	*$253,020*	*3.5%*

TWDB Disaster Contingency Fund – North Alamo Water Supply Corp.	*Grant*	*$325,000*	*4.6%*
DLID	*Cash & In-Kind*	*$2,981,980*	*41.9%*
TOTAL		**$7,120,000**	**100%**

2. Rate Model

The table below summarizes the existing structure.

Existing Assessment Fee Structure

Fees	Per Acre
Annual Flat Rate (per irrigable acre)	*$10.00*
Ad Valorem Tax	*$0.54 per $100 valuation*
Water Assessment (per acre irrigated)	*$20.00*

The proposed projects and funding source structures do not require an adjustment to the current Fee and Assessment Structure implemented by the District.

3. Project Management

The project will be managed and implemented by DLID with engineer construction administration support. The telemetry system and the seepage control component are expected to be contracted, and the rest of the work is expected to be undertaken via force-account. The District has managed construction activities of similar magnitude. The District can operate in a self-sufficient manner, supporting itself through user fees, but is expected to apply for future potential USBOR grant resources for the project. The existing organizational structure which has been provided is considered sufficient and the project will not require additional District staffing, except for additional labor only for the proposed force-account construction. The District's engineer, Axiom-Blair Engineering, will provide the necessary technical and management support for project administration.

Community Participation

1. Comprehensive Public Participation Plan

The Public Participation Plan submitted by the DLID and the Project Steering Committee was approved on April 30, 2003.

2. Steering Committee

The Steering Committee was composed of Neal Galloway, President, DLID Board of Directors; Eleazar Garcia, City Manager, City of Raymondville; Chuck Browning, North Alamo Water Supply; and Max Phillips, Manager, DLIC. As a result of the effectiveness of this steering committee, public water users in the District understood and in the end supported the benefits of the proposed project.

3. Local Organizations

Steering Committee members contacted local organizations to solicit their support. Chuck Browning made a presentation for North Alamo Water Supply, Max Phillips made presentations for the City of Edcouch and the City of Monte Alto and Max Phillips and Eleazar Garcia made a presentation for City of Raymondville. DLID Board President Neal Galloway made presentations for Rio Farms, Wetegrove Brothers, Inc., Charles Wetegrove Company, Inc., CRB Farms, Encino Farms, Hargill Growers Gin and Hester Farms. Letters of support for the project were received from Rio Farms, Wetegrove Brothers, Inc., Charles Wetegrove Company, Inc., CRB Farms, Encino Farms, Hargill Growers Gin and Hester Farms.

4. Public Information

Project information such as the Project Proposal, Project Plan, Step I Application and draft Project Strategic Plan were available for review at the DLID offices. A fact sheet was developed and distributed to District water users and was made available at public meetings. Fact sheets were also available for walk-in customers at the DLID office and were posted in local businesses. Notices of public meetings were published in the McAllen Monitor.

5. Public Meetings

Three public meetings were held in 2003. The first meeting took place on June 2, the second meeting took place on June 3 and the third meeting took place on August 20, 2003. Surveys collected at these meetings indicated that the information received regarding the project was understood and documented no opposition to the project.

Sustainable Development

1. Definition and Principles

Sustainable Development Criteria is defined as conservation oriented social and economic protection and sustainable use of resources, while addressing both current and future needs, and present and future impacts of human actions. This definition is based on the Rio de Janeiro Declaration on Environment and Development, which states that development should meet the needs of the present without compromising the ability of future generations to meet their own needs.

All of the proposed project components will comply with the definitions and principals of

Sustainable Development in that they positively impact the area and sustainable life of the area's residents through the conservation of water. Water conservation is critical to quality and life and economic growth in the Rio Grande Valley. The Reservoir Renovation, Canal Seepage Recovery, Telemetry and Flow Measurements Sites, and Canal Rehabilitation projects will help eliminate the seepage of valuable water. In addition to water savings, local residents will experience energy savings through a more efficient delivery system.

2. Institutional and Human Capacity Building

The Rio Grande Regional Water Plan, in support for the implementation of agricultural water conservation strategies, includes the following actions for reduction of irrigation shortages:

- *Expanded technical assistance should be available from local, state and federal sources to assist irrigation districts with more detailed systematic evaluations of district facilities and management policies to identify cost effective water efficiency improvements.*

- *The State of Texas and the federal government should assist with the financing of irrigation water improvements through the provision of low interest loans and grants*

Accordingly, due to the limited financial capacity if irrigation districts, the State of Texas through the State Energy Conservation Office (SECO) and the Texas Water Development Board (TWDB) provided financial assistance to the District for the preparation of the project plan and the necessary documentation required to meet the federally appropriated funds.

The project plans for the proposed projects were completed under the Lower Rio Grande Valley Water Resources Conservation and Improvement Act of 2000 (Act), Public Law 106-576. The Act also provides limited funding availability for engineering work, infrastructure construction and improvements. An amendment to the Act (H.R. 2990/S.1577) authorized funds provided by the for conservation projects, including the Reservoir Renovation, Canal Seepage Recovery, Telemetry and Flow Measurements Sites, and Canal Rehabilitation projects.

The project plans for the four projects were prepared in accordance with the Guidelines for Preparing and Reviewing Proposals for Water Conservation and Improvement Projects, associated with the Act. Public Law 106-576. The project plan was prepared to partially fulfill the requirements of Contract Number G18900 between the TWDB and the DLID

The District entered into a contract with the TWDB, whereby the TWDB will reimburse the District, with grant funds, for the cost of preparing the project plan, project report, plans and specifications and monitoring reports for the proposed project.

The North American Development Bank (NADB) Water Conservation Infrastructure Fund (WCIF) will complement, with grant funds, the capital investments required by the District for construction of these projects. The use of WCIF grant funds allows the District to fully finance its infrastructure in order to reduce water conveyance losses.

The projects will be managed by the District and will be constructed and operated in conformance with Federal, State and NADB requirements. The process for the development of the projects has followed a planning and public participation process that developed alternatives and associated costs, solicited public input, established priorities based on the input of the stakeholders and proceeded according to the priorities established in the planning process.

The DLID has an annual operating budget of approximately $3.0 million. The District has funds and staff capable of meeting the obligations of the District for the proposed projects.

Contractors will be selected by competitive bidding pursuant to the requirements of Texas water Code Section 49.273.

The District has implemented metering of all irrigation deliveries and has invested approximately $400,000 per year replacing small open laterals with buried pipelines. Last year the District installed 4,800 linear feet of 36" RCP and 10,000 linear feet of 18" PVC pipe.

A monitoring program will be established for a two-year period to evaluate and quantify the actual water and energy savings following construction of the projects. This program will serve as a step-by-step outline for documenting the successes of the project. The program will include, at a minimum, sufficient information to allow for completion of the following tasks:

- *Designation of a construction inspector not affiliated with the primary construction contractor to inspect and administer construction quality control documentation for the proposed projects.*

- *Hydrostatic seepage tests of the installed canal liners by the District or Texas A&M. Hydrostatic leakage tests of all structures.*

- *Inspection of the lined canal reaches one and two years after the initial installation. Inspection should check structural integrity, cracking and leakage. Photographs should be taken of the inspected portions and a letter from the project engineer should be prepared summarizing the condition of the liner and if any repairs are warranted by the contractor pursuant to the construction contract documents.*

- *Preparation of an annual report containing the monthly reports and any other data collected.*

- *The electrical use per acre-foot of water pumped will be determined on a monthly basis and submitted annually. The annual report will include the historic electrical costs per acre-foot for comparison.*

- *The amount of water pumped will be measured and compared with the water delivered on a monthly basis and submitted annually. The annual report will include historic water pumped and water delivered volumes for comparison.*

3. Conformance with Applicable Local and Regional Conservation and Development Plans

The proposed projects comply with all local and regional conservation and development plans. In particular, the project complies with the "Rio Grande Regional Water Plan", which recommends agricultural water conservation and on-farm water use efficiency in order to reduce irrigation shortages.

The project Report has been prepared in accordance with the "Guidelines for Preparing and Reviewing Proposals for Water Conservation and Improvement Projects Under Public Law 106-576" issued by the U.S. Department of Interior, Bureau of Reclamation, June 2001.

The projects are in conformance with local conservation efforts already developed by the
District and served communities. Conservation of water is stresses and penalties are assessed for overuse of water. The municipalities served by the District have their own water conservation plans. A water allocation plan (Drought Contingency Plan), goes into effect for irrigation when the irrigation water account storage balance amounts to a maximum of three irrigations per acre. This program remains in effect until the water is restored to the District's irrigation account.

4. Natural Resources Conservation

The proposed project was developed with the intent of conserving water. The Districts authorized irrigation water rights are 174,776 acre-feet per year. However, these water rights are on an "as available" basis and the actual water available to the District may vary from year-to-year.

In addition to the irrigation water rights, the District holds authorized domestic, water rights in the amount of 9,520 acre-feet per year. The District contracts to deliver raw water to the City of Lyford, the City of Raymondville and North Alamo Water Supply Corp. for the City of Monte Alto. The District holds municipal water rights for the following entities:

- *City of Lyford 610 acre-feet per year*
- *City of Raymondville 5,670 acre-feet per year*
- *North Alamo Water Supply 600 acre-feet per year*

The District also supplements the above entities with its domestic, municipal and industrial water rights. The District has 3,999 water accounts with approximately 70,000 acres of irrigable farmland.

According to the report of the "Canal Ponding Test Results Delta Lake Irrigation District Edcouch, Texas", developed by the Department of Agricultural of the Texas A& M University, and to an estimate of water and energy savings, based on the findings in the studies "Potential Water Savings in Irrigated Agriculture for the Rio Grande Planning Region (Region M) Final Report", and "Economic Methodology for South Texas Irrigation Projects", both developed by researchers from the Texas A& M University; implementation of the project will allow an estimated water savings of 13,808 acre-feet per year, and an energy savings of 741,614 KWH per year on an average annual basis, as shown in the following table.

Project Component	**Project Description**	**Annual Water Savings (Acre-feet)**	**Annual Energy Savings (KWH)**
Reservoir Renovation	*Design and construction of a by-pass canal for transport of municipal water*	*2,685*	*141,327*
Seepage Recovery Pilot Project	*Feasibility study into the possibility of collecting water that seeps from the Main Canal and pumping it back into the system*	*2,280*	*53,337*
Telemetry and Flow Measurement	*Installation of floe measurement devices at the 20 diversion points within the Districts water supply system*	*2,650*	*139,484*
Canal Rehabilitation	*Replace approximately 17,800 linear feet of existing concrete lined canal with buried pipeline*	*6,193*	*407,466*
	Total Annual Savings	*13,808*	*741,614*

Water conservation by the District has become increasingly important due to an enduring drought that has affected the lower Rio Grande Valley over the past several years. The drought and the projected decrease in irrigation water supply has required the District to place a greater emphasis on water conservation to ensure the delivery of water to the customers they serve. Historically, the District has aggressively sought to develop ways to deliver the maximum amount of water possible to each turnout.

The installation of meters in delivery points and the substitution of canals by pipes, has increased the efficiency of the District and the growers by reducing the energy

used per acre irrigated.

The proposed Water Conservation Project is proposed to continue the District's commitment to conserve water and energy. The components were selected as priorities from a list of 11 major and 37 minor projects identified throughout the District's water delivery system.

The construction of the proposed improvements will conserve sufficient water to allow continued development in the Cities of Lyford, Raymondville and the North Alamo Water Supply Corporation as well as other small rural communities, which depend on the
Rio Grande for their water supply. The Cities and the District will be able to manage sustainable growth within their available resources.

5. Community Development

The benefit obtained by modernization of the irrigation facilities may directly impact agricultural production and may result in increased income and an improved quality of life for end users. Making residents active participants in development of their community may also enhance economic activity. An improved quality of life for the residents may also have a favorable impact on the development of health and education in
the area.

Available Documents

- *Axiom-Blair Engineering,* "*Project Plan for the Delta Lake Irrigation District Water Conservation Project*" *June 2003.*
- *Axiom-Blair Engineering,* "*Draft Project Report for the Delta Lake Irrigation District Water Conservation Project*"*, August 2003.*
- *Axiom-Blair Engineering,* "*Draft Financial Feasibility Report, Delta Lake Irrigation District Water Conservation Project*" *August 2003.*
- *Axiom-Blair Engineering,* "*Environmental Summary for the Delta Lake Irrigation District Water Conservation Project*"*, June 2003.*
- *Axiom-Blair Engineering,* "*Draft Sustainable Development Report for the Delta Lake Irrigation District Water Conservation Project*"*, August 2003.*
- *Axiom-Blair Engineering,* "*Feasibility Study for the Delta Lake Irrigation District Seepage Recovery Pilot Project*"*, August 2003.*
- *Axiom-Blair Engineering,* "*Pipeline Hydraulic Study for the Delta Lake Irrigation District Canal Rehabilitation Project – Task A*"*, August 2003.*

- *Fipps, Guy and Eric Leigh,* "*Canal Ponding Test Results Delta Lake Irrigation District Edcouch, Texas*"*, Texas A&M University Department of Agricultural Engineering, July 2000.*

- *Fipps, Guy,* "*Potential Water Savings in Irrigated Agriculture for the Rio Grande Planning Region (Region M) Final Report*"*, Texas Agricultural Extension Service, Texas Agricultural Experiment Station and Texas A&M University, December 22, 2000.*
- *Texas Water Development Board,* "*2001 Adopted Rio Grande Regional Water Plan (Region M)*"*, January 2001.*