

**An Overview of Operational Characteristics of
Selected Irrigation Districts in the Texas Lower Rio
Grande Valley: Harlingen Irrigation District
Cameron County No. 1**

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Preface

With the publicity and public recognition of water shortages that have existed across the Texas Lower Rio Grande Valley (Valley) in the 1990s and early 2000s, many questions have surfaced related to the characteristics, basic operations, and how irrigation districts allocate water among users. In response to questions about the history and legal framework related to water in the region, the report, “Evolution of Irrigation District and Operating Institutions: Texas, Lower Rio Grande Valley” (Stubbs et al. 2003), was developed to give insight on the overall evolution of agriculture and the establishment of institutions for irrigation operations.

A series of reports are being developed that address specific characteristics of selected irrigation districts. Through case-study reviews of individual irrigation districts, they can be compared and contrasted as to methods of operation and water allocation procedures. An irrigation district that provides water to both urban communities and agriculture (which includes most of the irrigation districts in the Lower Rio Grande Valley) brings forth more questions related to how each of these systems operates. Individuals or groupings of irrigation districts’ methods of operation remain unknown to many and, to a large extent, may impact the image of all irrigation districts – particularly with regards to basic efficiency and capability to react to alternative conditions. The clientele base, infrastructure, adoptive rate of technology, etc. can vary significantly across irrigation districts. So, to understand and appreciate the collective Lower Rio Grande Valley irrigation district system, one must understand the idiosyncrasies that distinguish one from another. The first report in the series of individual irrigation districts (Stubbs et al. 2004) addressed the specific operational characteristics of the Brownsville Irrigation District. In that report, the format to be used in this and other such reports (e.g., Stubbs et al. 2005) was established.

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Abstract

Population expansion and water shortfalls have placed the Texas Lower Rio Grande Valley (Valley) center stage in water publicity. The unique characteristics and lack of public knowledge on how irrigation districts divert and convey water from the Rio Grande to municipal, industrial, and agricultural consumers have precipitated questions regarding the operations and makeup of these districts. Differences between and similarities across irrigation districts can be partially attributed to the topography, water-delivery infrastructure system, past financial decisions, and population demographics and clientele base of each irrigation district. Harlingen Irrigation District Cameron County No. 1 (HIDCC1) is one of the 29 irrigation districts in the Valley. This study presents an overview of HIDCC1 that includes a brief historical background, a description of the District, and discussion of the District's current operations. Specific information in the report details how the District diverts and delivers its allocated water from the Rio Grande, how it is used (i.e., municipal, industry, and agriculture), and mechanisms for allocation within and outside the District.

The uniqueness of the Lower Rio Grande Valley irrigation districts requires an understanding of their origins and operating mannerisms to explain their overall institutional effects. Through unlocking some of the conundrum associated with these individual irrigation districts, policymakers and other interested stakeholders will have a better perception of the culture and evolution that surround these unique districts, thereby facilitating improved policy-making decisions affecting the region's water supply and usage.

About the Authors

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- **Wayne Halbert.** General Manager of the Harlingen Irrigation District Cameron County No. 1, who provided information and support essential to this report and other projects associated with the Rio Grande Basin Initiative;
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Thanks to the individuals noted above. Nonetheless, we, the authors accept all responsibilities for any errors and/or other oversights that are present in the manuscript. In publishing this report, we are describing operations and practices of the irrigation district and, therefore, offer no opinions. Specific operations and practices are neither supported nor criticized by the authors or the Texas Cooperative Extension and Texas Agricultural Experiment Station.

CDW, MJS, MER, AWS, RDL, ELP, CSR

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Chapter 1

Introduction and Background

The Texas Lower Rio Grande Valley (Valley) irrigation districts that exist today were officially formed after the turn of the twentieth century. Article III, Section 52 of the Texas Constitution allowed for the public development of the State's surface water. Created in 1904, this article allowed farmers within the Lower Rio Grande Valley to organize and create districts that became legal entities of the State. Due to the financial failure of many land and irrigation development companies in the Valley, local farmers were able to purchase the water rights and infrastructure through the legal indebtedness that Article III, Section 52 allowed (Strambaugh and Strambaugh). The Great Depression of the 1930s caused most of the land and development companies to collapse, leaving the newly-created irrigation districts to maintain the lifeblood of the Valley: irrigated agriculture.

This chapter introduces historical and background information pertaining to the Harlingen Irrigation District Cameron County No. 1 (HIDCC1) and the entire Valley. The intent is to present an informed understanding of how the area operated in the past and to explain some of the current day practices. Also discussed are other relevant cooperating agencies, such as the Texas Commission on Environmental Quality (TCEQ) and the International Boundary and Water Commission (IBWC). Both the TCEQ Rio Grande Watermaster program and the U.S. Section of the IBWC significantly influence the daily operations of Valley irrigation districts.

Historical Overview

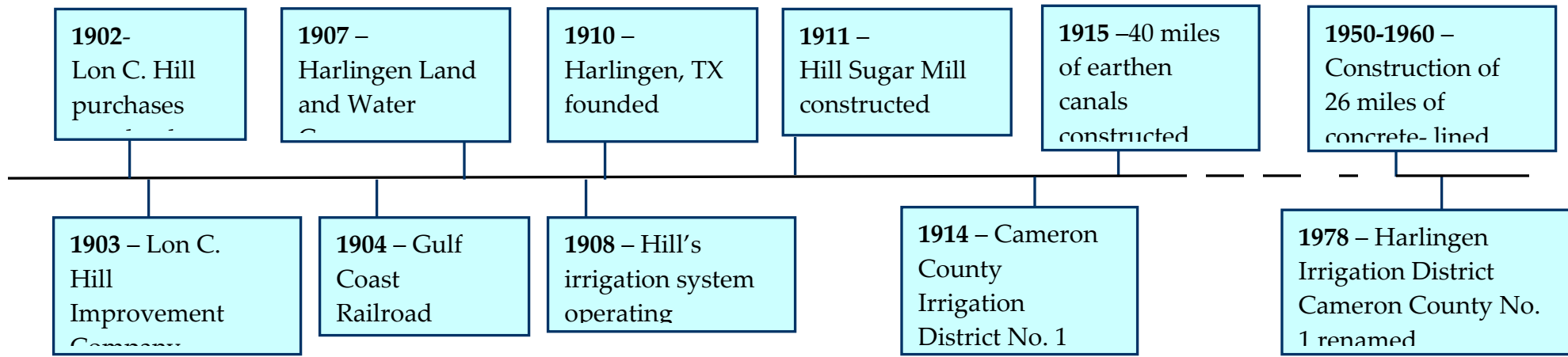
In the beginning of the twentieth century, land developers and businessmen alike stumbled upon a stretch of land for which irrigation opportunities and fortunes had previously been overlooked by others. Consequently, the Texas Lower Rio Grande Valley did not become heavily populated until the 1920–1930s (**Figure A1, and Tables B1 and B2**). Prior to that time, the population consisted mostly of Spanish descendants, Texas Rangers, and Border Patrolmen (McKenna).

It was not until the idea of expanding irrigation beyond the banks of the Rio Grande emerged that large masses of people from northern areas of the country began moving South to what was then called “The Magic Valley” (Strambaugh and Strambaugh). As irrigation and agriculture expanded, so did development across the Valley. This growth is evident by the fact that in 1920, the City of Harlingen had a population of only 1,784. After development of irrigation systems and establishment of railroad lines in the area, the population increased to 12,124 in 1930 (Harlingen Chamber of Commerce).

All indications are that the first irrigation canals were started by Lon C. Hill in 1905 (Halbert 2006). During this time of prosperity, the area that is now the HIDCC1 flourished. In 1907, Lon C. Hill developed the Harlingen Land and Water Company (HL&WC) with capitalization of \$300,000 in an attempt to expand irrigation beyond the Rio Grande. HL&WC was one of the first of many land and water companies established by developers throughout the Rio Grande Valley to promote development of the farming industry within the region. As early as 1908, large-scale irrigation attempts were made in the area by Hill on his recently-purchased 300,000 acres in Cameron and Hidalgo counties (McKenna).

The HL&WC was the predecessor to Cameron County Irrigation District No. 1. By 1910, most of the land and water companies in the area were in financial difficulty and many went bankrupt by 1920. New landowners to the region needed a way to provide for the diversion and delivery of water to farms recently put into cultivation (Harlingen Chamber of Commerce). With bankrupt water suppliers and a need for irrigation water, the 33rd Legislature of the State of Texas passed legislation for the creation of irrigation districts. It was during this time (August 10, 1914) that Cameron County Irrigation District No. 1 was established, with the purchase of the holdings of Lon C. Hill and the HL&WC, as a political subdivision of the State. Hill participated in passing the original State law governing irrigation districts. Major historical events are depicted in the timeline represented in **Exhibit 1**.

Few significant events took place in the District over the next four decades, until January 10, 1956, when the District voted to enter into an agreement with the United States Bureau of Reclamation (USBR) to borrow \$4.6 million to concrete line small canals and turn lateral canals into pipelines. With this funding, the District lined approximately 30 miles of canals with concrete and placed 130 miles of lateral canals into pipelines. This major project with USBR was completed in 1978 with the financial indebtedness of the District retired in 1988 (Halbert 2006).



1902 – Lon C. Hill purchased 11,007 acres of public land out of the original Spanish grants for \$13,837. By November of that year, he had acquired 300,000 acres of land in the Hidalgo-Cameron county areas.

1903 – Lon C. Hill Improvement Company was chartered. The following year, the company became the Lon C. Hill Town Improvement Company, with capitalization of \$200,000.

1904 – Gulf Coast Railroad lines reached the area which would become Harlingen in 1910.

1907 – Harlingen Land and Water Company, chartered by Hill, was capitalized for \$300,000.

1908 – Hill’s irrigation system operating; 26 miles of canals were in operation and approximately 75,000 acres of land were in irrigation or ready to be irrigated.

1910 – Harlingen, TX was founded on April 15, 1910. Harlingen had a population of 1,126 by 1911.

1911-Hill Sugar Mill was constructed. The mill was in operation until 1918 when it was burned down by bandits.

1914 – Cameron County Irrigation District No. 1 was founded on August 10. Hill participated in passing the original State law governing irrigation districts. This was the first irrigation district of its kind in the Rio Grande Valley of Texas.

1915 – 40 miles of earthen canals were constructed.

1950-1960 – Construction of 26 miles of concrete-lined canals.

1978 – Cameron County Irrigation District No. 1 is renamed Harlingen Irrigation District Cameron County No. 1.

Sources: McKenna and Harlingen Chamber of Commerce.

EXHIBIT 1. Key Historical Events Affecting the Organization and Development of the Harlingen Irrigation District Cameron County No. 1 (1902-1978).

The several name changes that occurred through the years were reflective of legislative changes in the laws that governed the districts. These laws refined the roles and responsibilities of Valley districts from general utility districts to irrigation districts. It was through this process that Cameron County Irrigation District No. 1 officially became the Harlingen Irrigation District Cameron County No. 1 in 1978 (Halbert 2006).

The Rio Grande Watermaster

The Watermaster acts as a policing force in controlling and enforcing water rights along the Rio Grande. Operating under Chapters 303-304 of the TCEQ regulations, the Watermaster is required to regulate, monitor, and record the flow levels, patterns, and rates of water being diverted and used within the Watermaster's program area (Texas Commission on Environmental Quality 2003). Diverters of the Rio Grande must notify the Watermaster's office prior to diverting and are subject to recorded measurements by the Watermaster to ensure that diverters are the true holders of the water rights and that they are diverting no more than their allotted amount (Texas Commission on Environmental Quality 2004).

The first Rio Grande Watermaster program began in the 1950s as a voluntary water administration commonly called the "Falcon Compact" (Jarvis). Under the Falcon Compact, water rights holders voluntarily employed a Watermaster and voluntarily divided more than 450,000 acre-feet of irrigation water equally (Jarvis). This program worked for only a few years. In 1956, Falcon Reservoir was drained below the desired minimum level due to the lack of enforcement powers by the Watermaster and excessive and illegal pumping that occurred along the Rio Grande. A landmark lawsuit, *State of Texas v. Hidalgo County Water Control and Improvement District No. 18* (1969), commonly called the "Valley Water Suit," ensued and took 13 years to resolve.

When the Valley Water Suit was filed on June 27, 1956, the District Court judge in Hidalgo County took possession of the U.S. share of the Rio Grande waters and appointed a Watermaster (Jarvis). During the Valley Water Suit, the court-appointed Watermaster controlled and enforced the allocations and regulations of the Rio Grande. In 1967, the State passed the *Water Rights Adjudication Act* that created a new administrative and judicial process for dealing with water rights. Upon completion of the Valley Water Suit in 1969, the Texas Water Commission (then known as the Texas Water Rights Commission) gained control over the Watermaster program from the courts under the provisions previously established in *Water Rights Adjudication Act* of 1967. The TCEQ is the State agency that manages the Watermaster Program. The executive director of TCEQ appoints one Watermaster per division. The State of Texas

has only two Watermaster division areas: the South Texas Watermaster and the Rio Grande Watermaster. The Rio Grande below Fort Quitman is managed by the Rio Grande Watermaster (**Figure 1**).

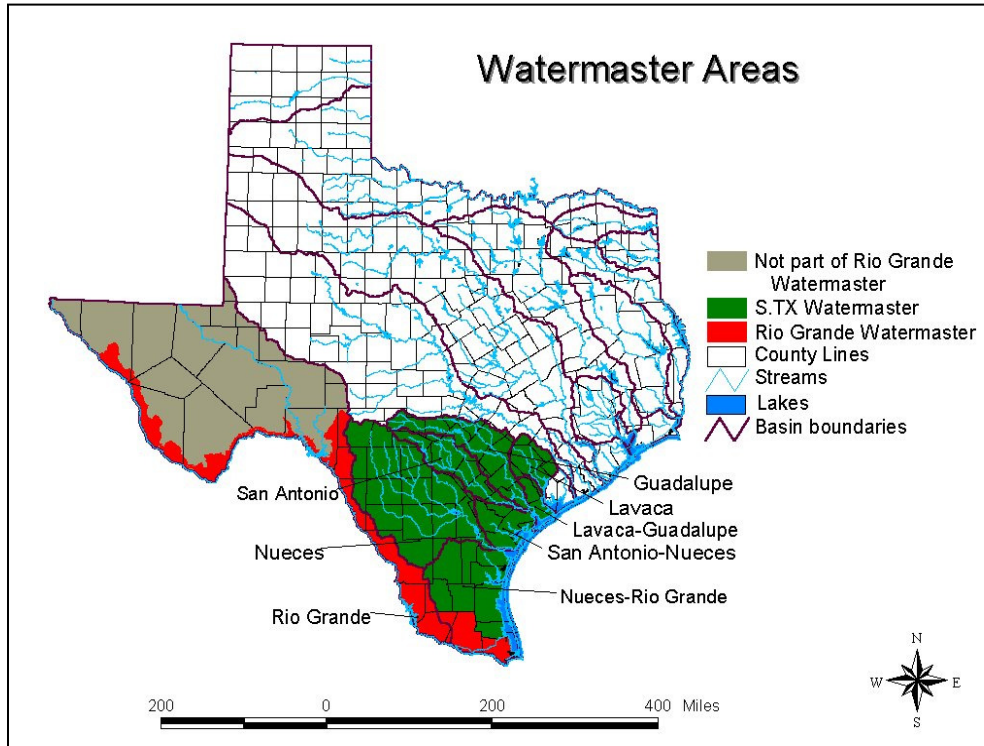


FIGURE 1. Geographical Location of the Watermaster Areas in Texas, 2004 (Texas Commission on Environmental Quality 2004).

The Watermaster program is funded through flat rate and variable fees charged to water right holders within the Watermaster’s program area. The current annual flat rate (i.e., base) fee is \$50.00 per water rights holder, plus an assessment fee that is based on the projected operating budget and the amount of water rights owned by the user (Texas Commission on Environmental Quality 2004). The 2003-2006 variable assessment fees are listed in **Table 1**. An exception to variable rate charges being assessed based upon the amount of water rights held is the instance of “no-charge”

water, which is based on the volume of water diverted.¹ No-charge water is priced to the districts based upon the type (i.e., water use) of water and the year diverted.

TABLE 1. Selected TCEQ Watermaster Variable Assessment Rates for Fiscal Years 2003-2006 (Hinojosa 2003, 2004; Vela).

Type of Water Use	Fiscal Year Assessment Rate (\$/ac-ft) ^a			
	2003	2004	2005	2006
Municipal	\$0.2721	\$0.2509	\$0.2171	\$0.2524
Industrial	\$0.2721	\$0.2509	\$0.2171	\$0.2524
Irrigation	\$0.2177	\$0.2007	\$0.1736	\$0.2019
Mining	\$0.2721	\$0.2509	\$0.2171	\$0.2524
Hydroelectric	\$0.0136	\$0.0125	\$0.0108	\$0.0126
Recreation	\$0.2721	\$0.2509	\$0.2171	\$0.2524
Recharge	\$0.1360	\$0.1254	\$0.1085	\$0.1262
Secondary	\$0.1360	\$0.1254	\$0.1085	\$0.1262
Salt Water	\$0.0272	\$0.0250	\$0.0217	\$0.0202
Spreader Dam	\$0.1088	\$0.1003	\$0.0868	\$0.1009
Domestic & Livestock	\$0.2721	\$0.2509	\$0.2171	\$0.2524
Storage	\$0.1088	\$0.1103	\$0.0868	\$0.1009
Stock Raising	NA ^b	\$0.2509	\$0.2171	\$0.2524
Game Preserves	NA ^b	\$0.2509	\$0.2171	\$0.2524
Reuse	NA ^b	\$0.1254	\$0.1085	\$0.1262
Public Parks	NA ^b	\$0.2007	\$0.1736	\$0.2019
Multi Use	NA ^b	\$0.2509	\$0.2171	\$0.2524

^a Assessments are charged (by the TCEQ) per acre-foot of water right.

^b New water-use category beginning in 2004.

The Rio Grande Watermaster Advisory Committee (RGWAC) provides oversight and administrative guidance to the Watermaster. Established in 1998, the RGWAC consists of 15 members and one alternate, who each serve a two-year term (**Figure A2**). Members serve voluntarily, hold water rights or represent those who hold water rights, and are chosen by the Executive Director of TCEQ based on the amount of water rights held, experience in water management, geographic location, and water-use type (i.e.,

¹ No-charge water refers to a temporary situation of excess water flow in the Rio Grande whereby the Watermaster allows the diversion of water at “no charge” to a district’s Watermaster-controlled allocation. That is, the district’s annual claim to Rio Grande flows is not reduced when it diverts under no-charge conditions. No-charge water is not “free” as the district does incur certain costs such as the variable rate assessed by the Watermaster and energy and other pumping costs required to divert the no-charge water from the Rio Grande. The variable rate assessment is effectively levied at year’s end on the actual amount of no-charge water diverted and the assessment rate (Hinojosa 2005).

irrigation user, municipal supplier, etc.) (Texas Commission on Environmental Quality 2004). The RGWACs responsibilities include: providing recommendations to the Rio Grande Watermaster and Executive Director, reviewing the annual budget of the Rio Grande Watermaster Program, and other duties as requested by the Executive Director (Texas Commission on Environmental Quality 2004).

International Boundary and Water Commission

The first International Boundary Commission (IBC) for the U.S.-Mexico border was created to survey the California-Baja California border in 1848. A second commission was created in 1853 to survey the New Mexico-Chihuahua border. The third temporary commission was established to conduct surveys and studies along the U.S.-Mexico border in 1882. In 1889, the Convention between the United States and Mexico permanently established the IBC for the purpose of carrying out the duties of the 1884 Convention. These duties included resolving boundary disputes, as well as water investigations for the Rio Grande and Colorado Rivers (U.S. General Accounting Office).

A 1944 Treaty changed the IBCs name to the International Boundary and Water Commission (IBWC) and created additional duties. The 1944 Water Treaty, "U.S.-Mexico Treaty for Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande,"² divided the international portions of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico. The Treaty also commissioned the IBWC to construct and maintain international dams for the purpose of flood control. In 1953 and 1969, construction was completed on the two international reservoirs, Falcon and Amistad, respectively (U.S. Section, International Boundary and Water Commission).

The IBWC plays a large role in the daily operations of the Valley irrigation districts. The rules set forth by the 1944 Water Treaty are still in practice today, and because the irrigation districts receive their water from an international river (i.e., the Rio Grande), they too must abide by these rules. When irrigation districts contact the TCEQ Watermaster's office requesting the diversion of water, it is the Watermaster that contacts the IBWC to release water from the reservoirs.

Articles 4 through 9 of the 1944 Water Treaty deal directly with the distribution of the Rio Grande waters.³ Article 4 defines specific allocation procedures from

² Commonly referred to as the 1944 Water Treaty.

³ Excerpts of 1944 Water Treaty that are cited in the text are included in **Appendix G**.

tributaries contributing to the Rio Grande (**Table 2**). The IBWC is responsible for recording and measuring the flows of contributing streams that are stated in the 1944 Water Treaty (U.S. Section, International Boundary and Water Commission). Each IBWC section (i.e., U.S. and Mexico) is responsible for maintaining and funding its country’s operations and equipment. Most cooperative project costs are shared proportional to the benefits received unless otherwise contractually stated (U.S. Section, International Boundary and Water Commission).

TABLE 2. U.S. and Mexico Allocations of the Rio Grande According to the 1944 Water Treaty (U.S.-Mexico Treaty for Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande).

Contributing Flows	To the United States	To Mexico
Rio San Juan	None	All Flows
Rio Alamo	None	All Flows
Pecos River	All Flows	None
Devils River	All Flows	None
Good-enough Springs	All Flows	None
Alamito Creek	All Flows	None
Terlingua Creek	All Flows	None
San Felipe Creek	All Flows	None
Pinto Creek	All Flows	None
Rio Conchos	1/3 of Flows	2/3 of Flows
Rio San Diego	1/3 of Flows ^a	2/3 of Flows
Rio San Rodrigo	1/3 of Flows ^a	2/3 of Flows
Rio Escondido	1/3 of Flows ^a	2/3 of Flows
Rio Salado	1/3 of Flows ^a	2/3 of Flows
Las Vacas Arroyo	1/3 of Flows ^a	2/3 of Flows
Main Flows of Rio Grande below Falcon	1/2 of Flows	1/2 of Flows
Non Measured Contributing Flows & not named in Treaty	1/2 of Flows	1/2 of Flows
Measured Contributing Flows & not named in Treaty	100% of Flows ^b	100% of Flows ^b

^a The average annual minimum delivery required of Mexico (over each five-year cycle) is 350,000 ac-ft. See Article 4, Section B, Subsection (c) in **Appendix G**.

^b 100% of contributing flows that are measured and not named in the 1944 Treaty belong to the country from which the flows originated.

It is the provisions of subparagraph (c) of Paragraph B in Article 4 that has created a recent controversy relating to Mexico’s delivery obligations to the U.S.⁴ Though the IBWC operates under broad treaties, specific agreements between the U.S.

⁴ For additional information regarding the 1944 Treaty non-compliance, refer to “Evolution of Irrigation Districts and Operating Institutions: Texas, Lower Rio Grande Valley” (Stubbs et al. 2003).

and Mexican governments come in the form of Minutes.⁵ Recent Minutes from the IBWC are evidence of attempts made to allow Mexico to repay its water debt associated with the 1992-1997 five year cycle and continuing into the 1997-2002 cycle to the U.S. in a timely fashion. The International Boundary and Water Commission announced on September 30, 2005 that “Mexico has fulfilled its commitment to eliminate its deficit in Rio Grande deliveries to the United States” (Spencer). These numbers account for all of the deliveries from Mexico to date and assume the minimum payments for the rest of the cycle.

Chapter Summary

This chapter discussed significant historical events that took place in HIDCC1. Beginning in 1902, the HIDCC1 area has played an intricate role in the Valley. Many of the past decisions and events presented in this chapter have formed both the current look of the District, as discussed in Chapter 2, and the current operating practices, as discussed in Chapter 3.

Also discussed were relevant state and international agencies, such as the TCEQ Watermaster program and the IBWC. The Watermaster program plays an important role in the daily operations of the Lower Rio Grande Valley irrigation districts. The organization of the Lower Rio Grande Watermaster program was the result of a failure of the irrigation districts to voluntarily control their own pumping along the Rio Grande in the 1950s. The program’s current enforcement and distributive powers, as well as the RGWAC, significantly impact irrigation districts’ operations. The IBWC also has an impact on the daily operations of irrigation districts. The requirements of the 1944 Water Treaty dictate the amount of the Rio Grande and its contributing flows that belong to Mexico and to the U.S. The amount of water that each irrigation district is allocated by the Watermaster’s office is dependent on these flows, making the IBWCs role increasingly important in times of drought and reduced water flow.

⁵ Minutes are documented decisions or recommendations between the U.S. and Mexico. Once each Minute is signed by the required Commissioner, Secretaries, and Governments, the Minute becomes a binding contract between the U.S. and Mexico (U.S. Section, International Boundary and Water Commission).

Chapter 2

District Description

The Harlingen Irrigation District Cameron County No.1 (HIDCC1) covers 56,114 acres within its 88-mile border. The District delivers water to approximately 38,025 acres of farmland each year and has an authorized water right for 39,574 acres (Halbert 1999a). The District is situated in such a way that its southernmost point touches the Rio Grande and then spans approximately 20 miles north (**Figure 2**). Though similar in nature and operating under the same State mandates, each of the 29 Rio Grande Valley Irrigation Districts are unique. Their distinctiveness is apparent in varying topography, physical location, cropping patterns and mixes, urbanization, as well as past and present decisions relating to financing and technological acceptance. HIDCC1 represents only one of the 29 different irrigation districts in the Valley.

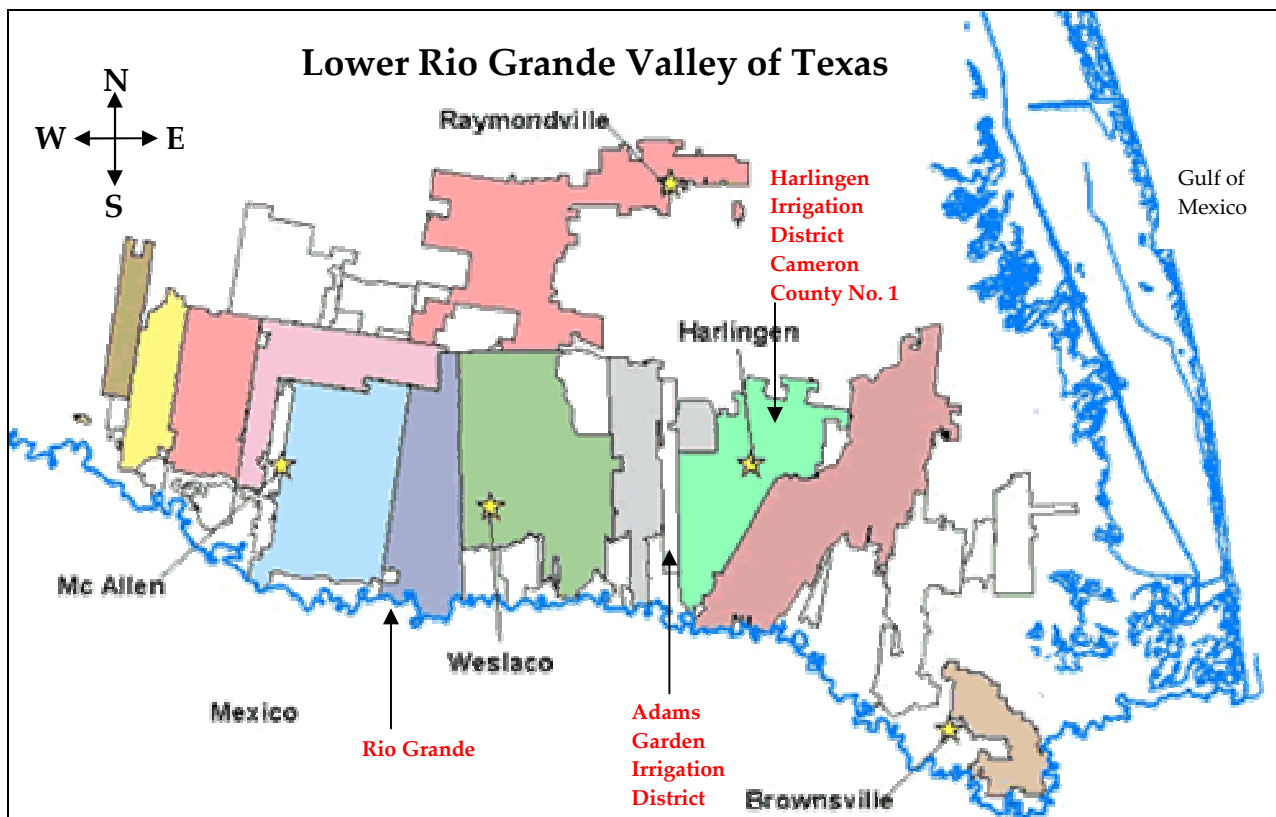


FIGURE 2. Irrigation Districts of the Lower Rio Grande Valley, 2002 (Fipps et al.).

First discussed in this chapter are the use and level of technology incorporated in HIDCC1s operations. Discussed next is the diversion of water from the Rio Grande into HIDCC1s water distribution system. Though all Valley irrigation districts adhere to the same rules and regulations, how and where a district diverts its water from the Rio Grande is exclusive to that individual district. As with all systems, there is a continuous need for maintenance and repair. Discussed in the third section of this chapter are the current improvements to the canal system and to the District as a whole. Infrastructure only describes one aspect of a district; cropping patterns, water use, water rights, and urban areas also all contribute to the operation of the District. These issues are discussed in the later sections of this chapter.

Technology

The HIDCC1 water-delivery system includes both aboveground canals and laterals, and underground pipelines. The District also utilizes advanced technologies, allowing for parts of the delivery system to be controlled from a remote location. The District is continually upgrading and advancing this technology in order to improve operational efficiency.

The District has a remote telemetry system in which flow-measurement devices are installed at 69 canal points within the water-delivery system. These permanent devices monitor deliveries of water into lateral canals and forward real-time information, by telemetry, to the District headquarters. Each system consists of: 1) a remote telemetry unit (RTU), 2) a radio and radio frequency (RF) modem, and 3) an alternating current/direct current (AC/DC) linear power supply. These units are mounted inside a steel enclosure with a radio antenna mounted on a 20-foot antenna mast for transmitting and receiving data to and from the base station. At pump house locations (diversion and relief), the telemetry unit is mounted inside the pump house facility and wired to the existing power source (Blair).

The telemetry system allows the District to periodically, and on demand, poll data from field devices (i.e., RTUs), process the data into a central database (i.e., base computer), send controls to field devices, and display the data in useful formats to district personnel. The base station is located at the District headquarters and consists of a computer, which holds the central database that stores and converts all of the data from the RTUs, and an antenna to receive data from and transmit data to the remote telemetry systems. The base station computer is equipped with software that displays current, most recent 24 hours, and monthly water and flow level data for any or all of

the RTUs. It also stores all engineering and conversion data necessary for converting flow measurements into volumetric units (Blair).

The District also utilizes a geographic information system (GIS) that ties the digital-mapping system to the water-use database. This integrated system allows the District to determine the fields where a water delivery has been ordered, for what type of crops the water will be used, and the various systems necessary to deliver that water.

A flow measurement system allows the District to determine what areas are being irrigated and how much water is being supplied. Spot-checking of flow rates by the District has revealed that as often as 40 percent of the time, more water is pumped than is required for irrigation (Blair). Most excess water is returned to the main canal. Portable measurement devices are used to determine individual operator usage, accuracy of the measurement, and for water-accounting purposes. Monitoring this information allows the District to reduce the amount of excess water passing through the system and to reduce pumping costs (Blair).

Diversion From the Rio Grande

HIDCC1 diverts 100 percent of its water deliveries from the Rio Grande. All of the water diverted by the District from the Rio Grande originates as surface water that is released by the International Boundary and Water Commission (IBWC) from Falcon Reservoir. The District averages annual deliveries of 52,000 acre feet (ac-ft) of water to agricultural accounts, 15,000 ac-ft to municipal accounts, and serves more than 1,600 water users (Halbert 2003).

The District is located approximately 105 miles southeast of Falcon Reservoir. To request water from Falcon Reservoir, the District manager must contact the Rio Grande Watermaster and request a diversion certificate. The TCEQ Rio Grande Watermaster reports a four-day travel time to deliver water from Falcon Reservoir to HIDCC1s point of diversion on the Rio Grande (Halbert 2003).

HIDCC1s main pumping plant diverts water from a man-made inlet near the city of Los Indios in Cameron County (**Exhibit C1**). The facility was built in the early 1920s and is in good working condition for its age and use (Halbert 2003). The pumping plant's current operating capacity is 470 cubic feet per second (cfs), with a typical peak-pumping rate of 410 cfs, and a usual pumping rate of 50 cfs (Halbert 2003).

The pumping station houses six electrical pumps (**Table 3 and Exhibit C2**), with the individual pumps operating between 50 and 125 cfs. The District only operates five pumps at any given time, as that level of pumping provides sufficient water to its customers. For most of the year, only one 50 cfs pump is used to supply water to Harlingen Water Works System (HWWS). The largest volume of water, 285 to 315 cfs, is pumped from the river during the months of May and June, which correlates with the growing season of the region’s major crops (i.e., grain sorghum, cotton, and sugar cane) and the low rainfall period for the area (Halbert 2003).

TABLE 3. Harlingen Irrigation District Cameron County No. 1’s Pump Details, 2003 (Harlingen Irrigation District Cameron County No. 1).

Pump No.	CFS	Pump Size	Horsepower	Meter Type
1	60	30"	300	Insertion Mag
2	75	36"	300	Insertion Mag
3	50	30"	300	Insertion Mag
4	50	30"	300	Insertion Mag
5	110	42"	500	Insertion Mag
6	<u>125</u>	54"	<u>500</u>	Insertion Mag
Total	470		2,200	

According to TCEQ rules, the Rio Grande Watermaster administers regulatory functions along the Rio Grande pertaining to diversions.⁶ The Watermaster records and certifies each diverter (i.e., irrigation district) along the Rio Grande based on §303.11 (Texas Commission on Environmental Quality 2003).⁷ Each diverter must first have an authorized diversion site (Texas Commission on Environmental Quality 2003; §303.11.a) recognized by the Watermaster. Then, for each diversion, the diverter must have written certification from the Watermaster in advance stating the intended amount of water to be diverted and the number of pumps that will be used in the diversion process (Texas Commission on Environmental Quality 2003; §303.11.b).

The diverter is also responsible for providing, maintaining, and operating meters that accurately measure the amount of water being diverted (Texas Commission on Environmental Quality 2003; §303.11.e). HIDCC1s Rio Grande diversion meters are located behind the pumping facility, approximately 200 yards from the river. As indicated in **Table 3**, an insertion mag meter is used with each pump. The District’s records for these meters and totalizer information are submitted to the Watermaster who periodically certifies that meters are reading within the tolerance and that the

⁶ The terms “diversions” and “pumping” are used interchangeably in this section.

⁷ Excerpts of TCEQ Rules and Regulations that are cited in the text are included in **Appendix F**.

District is not pumping without a certification permit from the Watermaster (Halbert 2006).

A district is charged for its diversions according to the policy schedule found in **Table 4**. Water diverted between 90 percent and 110 percent of the amount requested is charged to the district at the diverted amount (Texas Commission on Environmental Quality 2003; §303.12.e.1). If a district pumps less than 90 percent of what was requested from the Watermaster, it is still charged 90 percent of that request (Texas Commission on Environmental Quality 2003; §303.12.e.2). This rule is intended to discourage the wasting of water for those who would request too much water and not divert it. If a district pumps more than 110 percent of the requested amount, then the district is charged for the total amount of water that was pumped and could face penalties for this violation through the Watermaster (Texas Commission on Environmental Quality 2003; §303.12.e.3). This rule is intended to discourage over diverting by a district, which has the potential to impact other downstream users.

TABLE 4. Texas Commission on Environmental Quality Rio Grande Watermaster’s Diversion Policy (Texas Commission on Environmental Quality §303.12.e).

Amount Pumped as Percent of Request	Charge
< 90%	90% of Request
90%-110%	Actual Amount Diverted
> 110%	Actual Amount Diverted ^a

^a Also subject to possible penalties by the Watermaster for excessive pumping violation.

Water-Delivery Infrastructure System

Water is pumped from HIDCC1s pumping facility into the District’s distribution canal via 48-inch pipes (**Exhibit C3**). Key components of the distribution system include 40 miles of earthen canals, mainly constructed between 1905 and 1915 in clay soils. Canal dimensions range from 45-feet wide near the river to 20-feet wide at the extreme end points of the system. Under normal flow conditions, canals have an average depth of six to eight feet. The main canal system is operated with a series of locks (or check gates) which regulate the flow and elevation of water from 61 feet above sea level at the Rio Grande to 32 feet above sea level at the northernmost end of the system, thus making it possible for the system to rely primarily on gravity flow to transport water within the system (Halbert 1999b).

From its main earthen canal, water is diverted into smaller lateral canals for distribution during the irrigation season or to relift pumps which charge the pipelines that carry water from the main canals and reservoirs to individual farms and municipal delivery points (**Exhibit C4 and C5**). The smaller lateral system includes 20 miles of concrete-lined canals elevated above ground an average of six feet. The canals vary from 10-15 feet in width and four-six feet in depth. These canals were constructed in the 1950s and 1960s to serve as delivery laterals in areas considered to have higher-than-average seepage losses (Halbert 1999b).

The pipeline system consists of 155 miles of pipelines extending out from the main canal system and associated concrete-canal systems to provide outlets for every parcel in the District.⁸ These pipelines vary in size from 12-36 inches in diameter and are either concrete rubber gasket or Polyvinyl chloride (PVC) construction. Most of these pipelines are charged with relift pumps, either from the main canal or a concrete canal. This system delivers water to fields through 14-inch “alpha-type” valves with a head pressure of three-20 feet.⁹ Typically, these pipeline systems serve several hundred acres and are generally looped and connected to other systems to provide for a more efficient and reliable (i.e., backup) system. The pipeline systems are constructed with bypass facilities back to the source system for conservation purposes, as well as for maintaining constant head pressure (Halbert 1999b).

HIDCC1 maintains some 25 check gates to stabilize water levels in order to facilitate water delivery to fields behind the check. Located along the canal system are 44 pump sites that charge the water delivery pipelines. Each pump site has anywhere from one-three lift pumps, for a total of 55 pumps throughout the system. These relift pumps range in size from eight-30 inches and are powered by electric motors ranging from 7.5-75 horsepower. Each relift-pump station is designed with a bypass to maintain stable pressure on the pipeline and to allow overflow water to return to the main system. A bypass allows for gravity flow into pipelines when pumping is not necessary (Halbert 1999b). Gate systems exist at each of these relift pump sites, and at least one field gate (or turnout) can also be found at every field parcel (**Exhibit C6**). In some cases, there is more than one field gate or turnout per parcel, depending on the parcel’s overall size. HIDCC1 has 3,309 irrigation accounts to which it delivers water (Halbert 2003).

⁸ “Parcel” represents the area of land being irrigated. “Field” and “irrigated acreage” are interchangeably used in this section.

⁹ “Alpha-type” valves contain a valve-in-head rotor for precession application of water. They are most notably used on golf courses and turf.

District reservoir levels are critical to the District's operation. The District uses reservoirs as buffers against changes in producer use on a daily basis and as buffers against travel time (i.e., four days) between Falcon Reservoir and the District's diversion point at Los Indios. There are three storage reservoirs within the District, two in its northern part and one south of the Arroyo Colorado. Rangerville Reservoir, the main reservoir, is near the diversion point from the Rio Grande and allows the District to store approximately 500 ac-ft of water. The other two reservoirs are on the terminal end of the system and capture any surplus water from the District. The Boggus Reservoir has a capacity of 160 ac-ft and supplies water to 1,500 acres of land. The McLeod Reservoir has a capacity of 280 ac-ft and supplies water for 2,500 acres of land (**Figure 3**) (Halbert 1999b).

The District has approximately 40 miles of earthen canals and 20 miles of concrete canals. Total surface water area for these systems is approximately 477 acres. Net evaporation in the Rio Grande Valley is approximately five feet per year per surface acre, resulting in a net evaporation loss from these canals and reservoirs of approximately 2,385 ac-ft per year, assuming they are charged with water throughout the year. The District's water-delivery efficiency for water diverted for irrigation is approximately 75 percent to 80 percent. Seepage losses vary greatly by location within the District (Halbert 2003).

Improvements and Maintenance to the System¹⁰

Similar to many large-scale operations that rely heavily on infrastructure, repairs and maintenance are necessary for maintaining efficiency of HIDCC1s water-delivery system. In addition to daily maintenance, the water-transportation system is continually being updated with improvements that will streamline operations and consequently improve its water-delivery efficiency. Being required to provide water continuously throughout the year to farmers and municipalities alike makes it difficult for HIDCC1 to schedule an ideal time for maintenance and repairs.

Canal maintenance is a continuous issue for all irrigation districts. All HIDCC1 canals may be accessed by motor vehicle, allowing them to be easily checked for maintenance and needed repairs. Additionally, vegetation along canal borders is

¹⁰ For additional information regarding improvement and maintenance to HIDCC1s infrastructure and delivery system, refer to "Economic and Conservation Evaluation of Capital Renovation Projects: Harlingen Irrigation District Cameron County No. 1 – Canal Meters and Telemetry Equipment, Impervious-Lining of Delivery Canals, Pipelines Replacing Delivery Canals, and On-Farm Delivery-Site Meters" (Rister et al.).

typically well-kept as most borders are mowed on average six times per year and kept free from brush and trees that would consume measurable amounts of water (**Exhibit C5**). Little to no herbicide is used along canals due to concerns regarding water quality (Halbert 2003).

HIDCC1 has a program related to on-farm delivery systems which promotes producer cost-sharing. The District provides all of the labor for the improvement of delivery systems that will improve the efficiency of the network, as well as the efficiency of the producer, if the producer furnishes the materials. Material must meet the following specification: 80 psi PVC pipe up to 24 inches and concrete-reinforced pipe over 24 inches (Halbert 2003). The District takes ownership of these pipelines after installation and, by deed, possesses 20-foot block-line easements around each block of land. If new lines are installed outside the easement, additional easements must be granted to the District. HIDCC1 constantly works on project plans to enhance delivery systems and upgrade the ability of the system to perform with the overall goal of conserving water and promoting the efficient delivery and use of its allocated resources (Halbert 2003).

Inclusion of Land to the District¹¹

Land can be, and occasionally is, added and/or removed from a district. For land to be legally added to an existing irrigation district, the owner of the land must adhere to an application process and request that the Board of Directors adopt a resolution and record such approval within its meeting minutes (Texas Legislature Online; Texas Water Code §58.706).¹² The owner must assume all taxes levied on the land after the land is included into the district, as if it had been incorporated originally into the district (Texas Legislature Online; Texas Water Code §58.706). Also, the irrigation district has the same responsibility to serve and provide water to the new land as it does to land originally incorporated in the district (Texas Legislature Online; Texas Water Code §58.713).

The inclusion of land into an existing irrigation district is not a common occurrence in the Valley. Most existing irrigation districts are landlocked by municipalities and other irrigation districts and, therefore, do not have the option of including additional land into their district.

¹¹ "Inclusion" is a *voluntary* application process of being included into the District that is initiated by the landowner. The word "annexation" is not used in this section because it is an act usually initiated by a city or district, not the landowner.

¹² Excerpts of the Texas Water Code that are cited within the text are located in **Appendix E**.

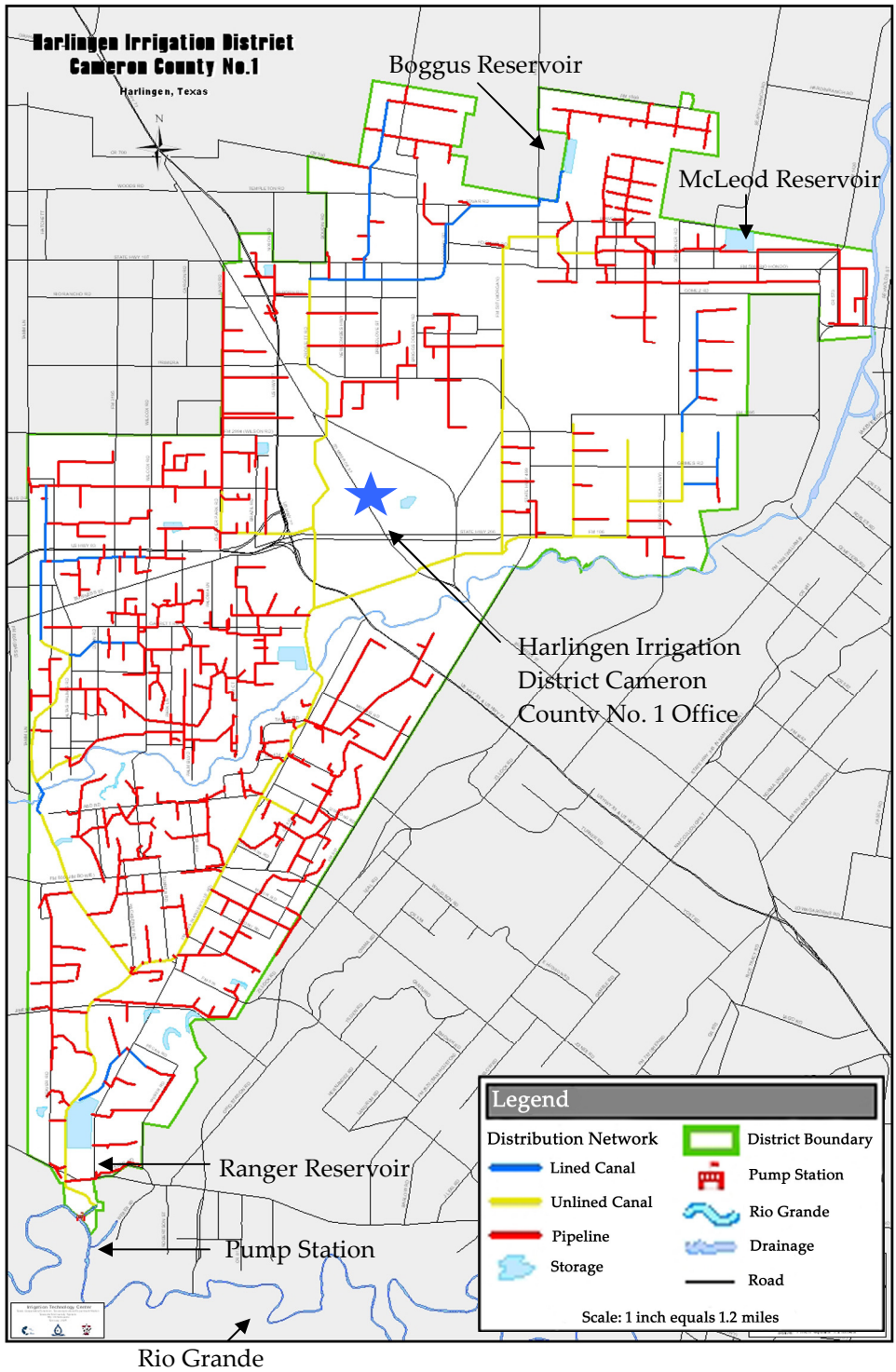


FIGURE 3. Illustrated Layout of Harlingen Irrigation District Cameron County No. 1 Highlighting the Type of Key Water-Delivery Infrastructure, 2002 (Fipps et al.).

Cropping Patterns and Water-Use Trends

The cropping patterns of HIDCC1 are continually changing due to population increases and urban sprawl in and around the District (Halbert 2003). Land converted to residential development decreases the total number of acres that can be cultivated. Not only does development take land out of production, it also removes an area of land (buffer strip) around the development site. On average, a 100-acre buffer strip is removed around a development due to farming practices currently in use (Halbert 2003). Farmers in HIDCC1 are no longer able to apply pesticides to crops or burn cane in such close proximity to residential developments. Urban development also causes a shift in the types of crops being grown within the District. This transition in Valley agriculture will intensify as urban growth and development continue in the region.

The region produces a wide variety of vegetables and citrus crops along with cotton, corn, milo, and sugar cane. **Table 5** depicts the District's typical irrigated acreage by crop and acres. Typical ranges in yields for the primary crops grown and irrigated in the District are shown in **Table 6**.

TABLE 5. Typical Irrigated Acreage: Harlingen Irrigation District Cameron County No. 1, 2002 (Halbert 2003).

Crop	Acres	Percent	Crop	Acres	Percent
Grain sorghum	10,850	31.22	Cabbage	400	1.15
Cotton	10,000	28.78	Nursery/trees/plants	400	1.15
Sugar cane	7,000	20.14	Other vegetables	300	0.86
Pasture	1,800	5.18	Aloe vera	200	0.58
Food corn	1,000	2.88	Cucumbers	125	0.36
Seed corn	750	2.06	Green onions	100	0.29
Citrus	600	1.73	Squash	75	0.22
Onions	600	1.73	Peppers	50	0.14
Feed corn	500	1.44			
			TOTAL	34,750	100

TABLE 6. Typical Irrigated Crop Yields: Harlingen Irrigation District Cameron County No. 1, 2002 (Halbert 2003).

Crop	Range in Crop Yield
Citrus	15 to 25 tons per acre
Corn	75 to 100 bushels per acre
Cotton	1.25 to 2.5 bales per acre
Grain Sorghum	4,000 to 4,500 lb per acre
Sugar cane	30 to 50 tons per acre

Farmers in the District are limited in the irrigation techniques they employ due to the distinct nature of the crops they grow. Furrow irrigation comprises 95 percent of irrigation deliveries to agricultural land, while flood irrigation is the general practice for orchards and pastures. Drip systems and micro-spray-emitter systems account for a very small percentage of overall irrigation practices. On average, laterals supplying drip and micro emitter systems must be continuously charged with water since a very small amount of water is applied frequently over several weeks (Halbert 2006).

Water Rights

There are two separate types of surface water accounts within Texas, one for the Lower and Middle Rio Grande below Amistad Dam and the other for the remainder of Texas. The area located below Falcon Dam operates under a water rights system that was established after the landmark Valley Water Suit (1969), as mentioned earlier. After that lawsuit, Domestic, Municipal, and Industrial (DMI) water rights were placed into a separate category from Irrigation water rights. Historical-cropped acreages were used to determine the amount of water rights that were allocated to each irrigation district or farmer. Within the irrigation water rights category, two separate categories of irrigation water rights were identified: Class A and Class B. Class A rights were given to those entities that could prove prior documented water rights (i.e., riparian,¹³

¹³ The riparian doctrine is based on English common law. Private water rights are tied to the ownership of land bordering a natural river or stream. Thus, water rights are controlled by land ownership. Riparian landowners have a right to use the water, provided that the use is reasonable in relation to the needs of all other riparian owners (Kaiser).

prior appropriation,¹⁴ or Spanish/Mexican land grant). Class B rights were awarded to those entities who could prove a history of diversion from the Rio Grande.

In 1967, the Texas Legislature merged the riparian-rights system into the prior-appropriation system with passage of the *Water Rights Adjudication Act*. The Act required any person claiming a riparian water right to file a claim for the right by 1969 with the Texas Water Commission. With passage of the 1967 Act, Texas consolidated the allocation of surface water into a unified water permit system. Anyone wishing to use surface water (exclusive of drainage water) must receive permission from the State in the form of a water right. Awarding permits for these water rights is a task of the Texas Commission on Environmental Quality (Kaiser).

Each account serviced by the HIDCC1 has a different certificate that is issued by the TCEQ and identified by a “cert” number. Under these certificates, the District is authorized to divert the amount of water allocated to them from the Rio Grande. HIDCC1s agricultural account, certificate 831-003, allows for the diversion of 98,233 ac-ft of water per year, if available. This amount is roughly seven percent of the total annual irrigation water in the Valley. In addition to this agricultural account, HIDCC1 has multiple municipal accounts that allow diversion for the total amount each year. Their largest municipal account, certificate 831-002, allows the District to deliver 17,070 ac-ft to the City of Harlingen per year. Although this account legally belongs to the District, it is assigned by the courts to the City of Harlingen each year, as the city only contracts for the delivery of this water and not the water itself. This is also true of the remaining municipal accounts (certificates 831-004, 831-005, 840-001, and 223-000), which are water the city (i.e., Harlingen) has purchased from others and owns outright. In total, up to 20,488 ac-ft of municipal water is contracted for delivery by the city of Harlingen. In the case when additional municipal water is needed, it is contracted from the District at a charge for both the water and delivery (Halbert 2006). Other municipal accounts totaling 2,053 ac-ft of water rights owned by other entities are held by and subject to being delivered by the District.

The sale of any water rights owned by the District must be approved by a vote of the District’s Board of Directors. The selling of water rights by an irrigation district is seldom done in the Valley. This is because annual water allocations are based on the

¹⁴ The prior appropriation doctrine is controlled by statute. Applied in the western states, prior appropriation is not related to land ownership; instead, water rights are acquired by compliance with statutory requirements. During their early development, western states failed to control rivers and streams, and water was treated as though it belonged to no one. In the absence of any rules, people simply took water from streams and used it; that is, they appropriated it. When this practice became legalized, it became known as the Doctrine of Prior Appropriation (Kaiser).

number of irrigation water rights owned by the district. Unlike municipal water rights that are given priority and are adjusted to the total amount of water rights owned at the beginning of every year, irrigation water account balances are carried forward from the previous year (Texas Commission on Environmental Quality 2004). Irrigation accounts are replenished only when the Watermaster has determined there to be excess water available within a given month. By selling water rights, a district decreases its base amount of water used in determining the Watermaster's monthly allocations for that district. This is particularly important in times of drought when water is allocated less frequently. Irrigation districts can convert their irrigation water rights to DMI water rights; however, there is a 2-to-1 conversion factor (i.e., two ac-ft of irrigation water rights are required to obtain one ac-ft of DMI water right).¹⁵

Urban Areas

The city of Harlingen, with a population of 57,564 (U.S. Census Bureau), lies within the heart of HIDCC1. Other cities within the District's boundaries include Palm Valley (1,298), Rangerville (203), part of Primera (2,728), Combes (2,553), and Los Indios (1,149).¹⁶

As urban development continues in the district, the amount of irrigatable land for production agriculture simultaneously declines. With this decline in production can come a decrease in the need for water for irrigation purposes. This urbanization has resulted in HIDCC1 reducing, or even curtailing, water-delivery services to small portions of its agricultural production acreage because of urban encroachment. According to Halbert (2003), the region's population continues to experience rapid expansion. If a subdivision is to be built inside of the current District boundaries, the development company is required to obtain approval from HIDCC1 prior to building. This approval is to ensure that development will not occur on any of the District's easements or right-of-ways. If the land were excluded, the water rights would not be transferred with the land and would subsequently remain with the irrigation district.

For a subdivision to be excluded from the district, it must petition the district for exclusion. Under §58.702-§58.713 of the Texas Water Code (Texas Legislature Online), any land that is no longer considered to be agricultural in nature, or able to be irrigated, can be excluded from the district. In order for an exclusion to take place, the landowner

¹⁵ For further information regarding DMI conversion, refer to Chapter 2, page 18, in "Evolution of Irrigation Districts and Operating Institutions: Texas, Lower Rio Grande Valley" (Stubbs et al. 2003).

¹⁶ Populations are represented in parentheses (U.S. Census Bureau).

must apply with the district and a hearing must take place. A notice must be published in a local newspaper 10-20 days prior to the hearing (Texas Legislature Online; Texas Water Code §58.708), and the Board of Directors must conduct an open hearing for all parties involved (Texas Legislature Online; Texas Water Code §58.709). If the Board of Directors approves the petition, it may be adopted into the minutes, thereby excluding the land from the District (Texas Legislature Online; Texas Water Code §58.710).

The new law (Texas Water Code §58.222) states that if the landowner owns less than one acre, they are automatically excluded from the district (Texas Legislature Online). Because most development areas are developed into less than one-acre lots, they are excluded automatically without anyone having to file an application with the district.

Chapter Summary

This chapter provided a descriptive overview of Harlingen Irrigation District Cameron County No. 1 (HIDCC1). Discussed first is the water's release from Falcon Reservoir to HIDCC1s diversion point and its diversions into the District's delivery system. HIDCC1 utilizes reservoirs to store and move water from one point to another throughout the District. In addition to the reservoirs, 155 miles of pipeline, 40 miles of earthen canals, and 20 miles of concrete canals require continuous maintenance and repair to function properly. Also discussed are cropping patterns, water use, water rights, and urban areas. All of these elements of the District are reviewed such that the reader is provided a "picture" of HIDCC1, thereby enabling an informative "look" into this District, as well as a basis to compare to other irrigation districts.

Chapter 3

District Operations

The operating practices of individual irrigation districts in the Valley are not well understood by the general public. It is evident that each irrigation district is made up of different components that attribute to its uniqueness, its operating principles, and complexity. Each district is subject to the same set of rules, but the actual mechanisms employed and implementation thereof employed vary significantly from district to district.

This chapter discusses the operating practices of the Harlingen Irrigation District Cameron County No. 1 (HIDCC1). First, identification of the organizational hierarchy and the Board of Directors of the District provides the foundation of District operations. Secondly, the water allocation procedures for both the District and all of the irrigation districts within the Valley are discussed. This includes two small sections on how “no-charge” water and the transferring of water inside and outside of the District are handled. How a district sells water is one of the most distinctive aspects of a district. Finally, other special water districts that operate near HIDCC1 and the water conservation efforts in which HIDCC1 participates are discussed.

Organizational Hierarchy

HIDCC1 currently employs a total of 52 individuals (**Exhibit 2**). In addition, five board members comprise the Board of Directors (**Figure A3**) and serve as elected officials that preside over the District. One General Manager, hired by the Board of Directors, oversees day-to-day operations and supervises the office and field staffs, District Engineer and project manager. The office staff consists of a Payroll Clerk, a Tax Collector and a Water Ticket Clerk. Finally, the field staff consists of a Field Supervisor, three canal riders, three pumping plant workers, and 35 subordinates charged with maintenance of the water-delivery system and pumping facility (Halbert 2006).

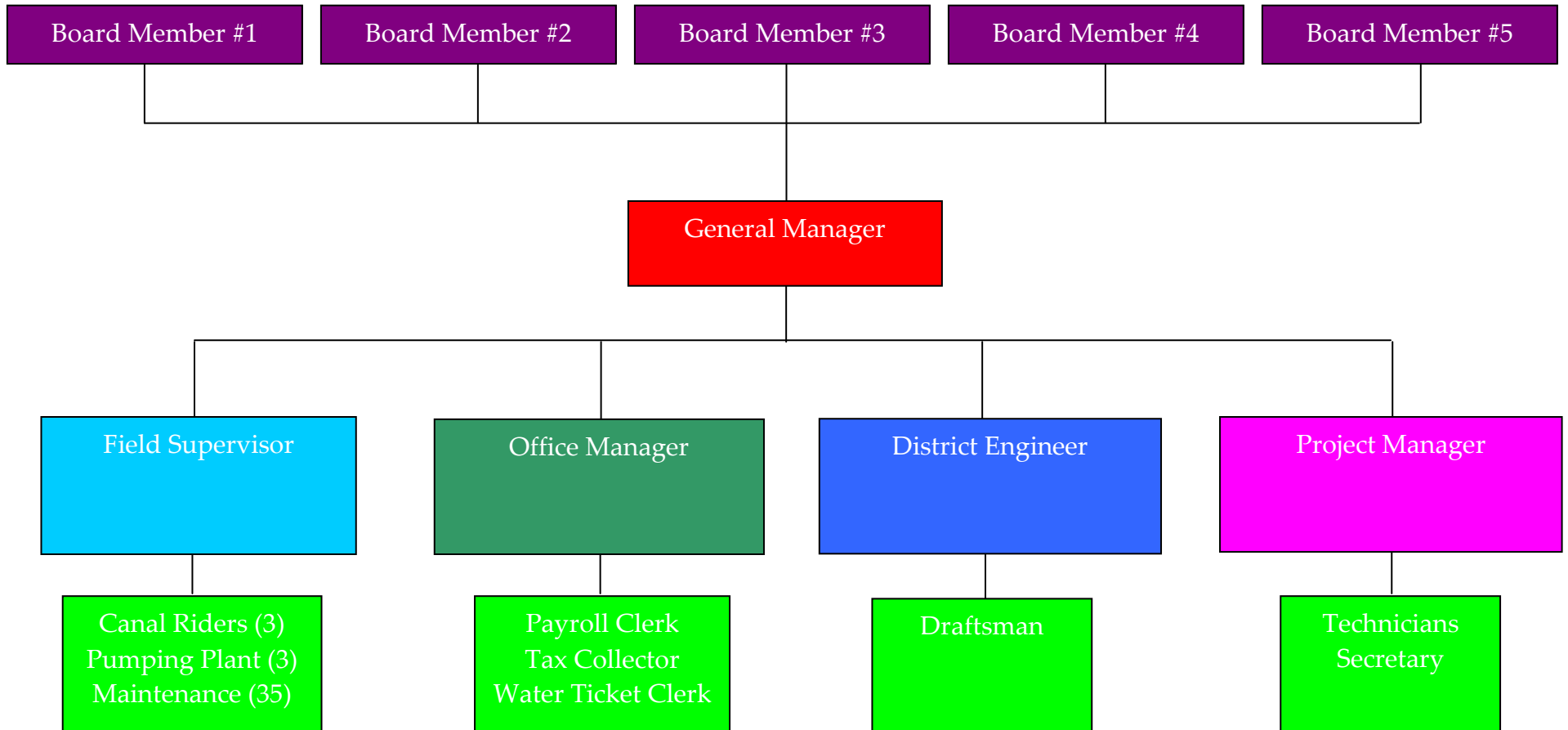


EXHIBIT 2. Harlingen Irrigation District Cameron County No. 1's Organizational Chart, 2006 (Halbert 2006).

Board of Directors

According to the Texas Water Code §58.071 (Texas Legislature Online), a district's Board of Directors (i.e., Board) is a governing body that must consist of five individuals. All directors are formally elected within a district and serve four-year, staggered terms. To be eligible to hold a director's position, a person must: be at least 18 years of age, have no prior payment obligations to the district, be a resident of the State of Texas, and "be the owner of record of fee simple title to land in the district" (Texas Legislature Online; Texas Water Code §58.072). Currently, five directors, all actively engaged in agricultural production, oversee the HIDCC1 (**Figure A3**).

An at-large board election is held every year ending with an odd number and on the first Saturday in May. In 2005, two board members were up for reelection; however, neither were contested. If no one contests a current director(s) up for election, they are elected without contest and serve another four-year term. HIDCC1 has not had a contested board election since 1991 (Halbert 2006).

The Board serves a critical role in that it makes decisions affecting the future of the District. The Board, with input and recommendations from the General Manager, votes on improvement projects within the District, with each project required to receive a majority of the votes before being implemented. Projects are presented for consideration to the Board where they are evaluated for profitability, benefit to the customers, and increased efficiency of the District and its operating systems (Halbert 2003). The Board is also charged with developing a budget for the organization, and evaluating and setting prices for services (Halbert 2003).

Allocation Procedures¹⁷

As mentioned in the previous chapter, every irrigation district in the Lower Rio Grande Valley owns a specific amount of water rights. The Watermaster's office is responsible for keeping track of the total amount of water in the Falcon and Amistad reservoirs and the amount that water-right holders are entitled to receive (while accounting for a 225,000 ac-ft reserve for DMI users, and an operating reserve of 75,000 ac-ft) (Texas Commission on Environmental Quality 2003; §303.21.b). The Watermaster allocates water using the following steps:

¹⁷ Additional information is available in **Appendix F**.

- 1) From the total usable storage of the Falcon and Amistad reservoirs, as reported by the IBWC, the dead storage is deducted;¹⁸
- 2) From the remaining amount, the 225,000 ac-ft of water that acts as the DMI reserve is deducted. This reserve is reestablished at the end of every month;
- 3) Next, the 75,000 ac-ft of operating reserve is deducted; and¹⁹
- 4) The remaining amount after deductions is allocated to Class A and Class B irrigation water rights holders. This allocation is in addition to the ending monthly balance for the irrigation account holders.

When the District needs water to be released from Falcon Reservoir, the District contacts the Watermaster's office and places a request for the desired amount. Depending on the travel time associated with the District's diversion point, the required advanced notice to the Watermaster's office varies. Because each water-right holder is limited to their annual authorization amount, the manager does not request a release amount in excess of what they can pick up at the river. If the amount of water requested from the Watermaster (by a district) is not diverted into the district's delivery system, then 90 percent of the loss is solely absorbed by the irrigation district. Balances in irrigation accounts with the Watermaster's office are rolled over from one year to the next (Stubbs et al. 2003). Water loss that occurs during travel from Falcon Reservoir to the diverter's diversion point (due to evaporation, invasive weeds, etc.) does not affect the amount of water the diverter is allowed to pump. The loss incurred during transportation is covered by the operating reserve mentioned above.

Each district handles individual allocation accounts within the district differently. Currently, HIDCC1 has 3,309 irrigation accounts (Halbert 2003). HIDCC1 goes under allocation when the water in their account reaches a level of only one irrigation per irrigated acre in the District (approximately 20,000 ac-ft). Allocations are based on the total number of irrigable acres that have been irrigated in the past 24 months. When the District is under allocation, no water is allocated to accounts that have been inactive for two years or accounts that are delinquent in paying their assessments. This follows the same rule that the Watermaster uses in his allocations. The District has only allocated once in its history and that was in 1998. At all other

¹⁸ Dead storage is the amount of water behind the dams that cannot be removed because of hydrologic restrictions (Texas Commission on Environmental Quality 2003; §303.22.a). Falcon Reservoir has a dead storage of approximately 54.3 ac-ft whereas Amistad's dead storage is 4,600 ac-ft (Rakestraw).

¹⁹ Operating reserve covers seepage, evaporation, conveyance losses, and emergency requirements (Texas Commission on Environmental Quality 2003; §303.21.c).

times, users have access to all the water necessary to individual account needs (Halbert 2006).

The District does not allow for the “stacking” of water accounts, i.e., farmers who do not use their water allocations during a given year forfeit them to other customers rather than “carry over” the unused allocation to the next year in their name. This is typically referred to as the “use it or lose it” water policy. This can provide for delivery of available water to other users that have a need. Unused allocated waters do not benefit the District as it does not receive revenue for the transportation/delivery of such water (Halbert 2003).

The following steps are required in order to obtain water:

1. Customers contact HIDCC1 and request a specified quantity of water;
2. The District determines if the customer is up to date on his/her per-acre flat-rate fees and that he/she has the requested water quantity remaining in his/her allocation account;
3. After that, the District contacts the Watermaster to release the requested amount of water;
4. Water is released from Falcon Reservoir for delivery to the District. Delivery to the District takes four days from the time it is released from the Reservoir (Halbert 2003);
5. Once the released water reaches the District’s pumping station, water is captured by its pumps and transported into the canal system for delivery to the customer; and
6. Water flows in the IDs water-delivery system to the customer’s delivery point where it is used for irrigating agricultural crops, or placed in municipal storage facilities.

The District requires a four-day advance notice for irrigators to request water due to travel time from Falcon Reservoir to the District’s distribution system. In most cases, however, the District can provide water to a user within 24 hours of the order due to reserve storage in its supply reservoirs. The four-day advance notice rule is maintained for instances when reservoir storage reserves are low. This keeps the

District from being delinquent in its water deliveries to customers who have made prior orders and/or obtained prior water-delivery commitments (Halbert 2003).

No-Charge Water

No-charge water is the excess flow of water in the Rio Grande that is determined by the Watermaster, usually due to rainfall, and is made available at what is termed no-charge pumping. No-charge pumping occurs when excess water can be pumped from the river at “no charge” to the district’s surface water account (Stubbs et al. 2003).

No-charge water is administered by the TCEQ Watermaster. When the Watermaster determines that there is potential no-charge water that can be made available to water right holders, the Watermaster sends out a notice to all holders and allocates the water based on a first-come, first-serve basis. For example, if it is determined that there is a minimum of 60 cfs of water to be released as no-charge, and HIDCC1 has the capacity within their system to store the water or provide it to a customer, the General Manager can respond to the notice and begin pumping when notified by the Watermaster.

Currently, HIDCC1 takes advantage of no-charge water availability to offset allocation balances (Halbert 2003). This additional water can be stored in the District’s reservoir storage system or provided to customers at the time of receipt to offset allocations.

Transfer Options

Under §303.51-§303.55 of the TCEQ Rules and Regulations, any owner of water rights may contractually sell all or part of their annual authorized water amount (Texas Commission on Environmental Quality 2003). This does not mean that they sell the actual water right, but rather the water attached to that right for the authorized year. The water owner is the District, not the members of the District. In order for a contractual sale, also known as a transfer, to take place, the seller must comply with the following rules:

1. The sale of the water must be for the same purpose of the original water right (e.g., an irrigation water right, if transferred, must be used for irrigation, but not municipal, domestic, or industrial). If the intended use differs from that of the original right, the seller must apply to amend the water right permanently to that of the intended use;
2. There is no change in the original water right of the seller or purchaser, even if the diversion point, diversion rate, or place of use is different;

3. The seller must actually own the water right or be a designated agent;
4. All of these requirements must be met before the transfer can be made;
5. No contract approval is necessary if the transfer occurs within the District, and the District's delivery system is used; and
6. The seller cannot sell more water than what he/she owns.

If all of the above requirements are met, and the Watermaster approves the application, the contracted amount is then transferred into the purchaser's account. Once the purchaser is in possession of the water (i.e., it is in their account), they are not allowed to resell that amount and must use the purchased amount first before any other water within their account (Texas Commission on Environmental Quality 2003; §303.51).

District Revenue and Sales

Irrigation districts have several means of generating revenue. They have the ability to tax land within the district, raise bonds,²⁰ and set variable charges for water, transportation fees, penalty fines, flat rate fees, etc. HIDCC1 operates on an annual budget of roughly \$2.5 million. There are four categories of major revenues for the District, including water delivery charges, assessments, maintenance and construction income, and other income. Each of these categories is discussed in the following section.

Water Delivery Charges

Water revenues to the District are dependent on crop mix and weather patterns (i.e., rainfall) of the region. HIDCC1 operates on a two-tier pricing system -- one for agricultural customers and the other for municipal users. The charge to municipalities is tied to the flat rate and irrigation fee structure charged to agricultural customers. Fees for agricultural and municipal use are established on a process based on (1) agricultural water, when converted to municipal use, is converted at two acre-ft to one, (2) an assessment fee levied on all water rights,²¹ and (3) municipal accounts are

²⁰ A referendum vote must be held to approve the issuance of bonds.

²¹ This assessment fee must be paid annually to remain current and eligible for purchasing irrigation water. In the event the fee is not paid for one or more years (and irrigation does not occur), subsequent intentions to irrigate will first require payment of all prior "past due" assessment fees.

demand accounts that are treated as priority over agricultural deliveries (Halbert 2003). HIDCC1s pricing structure is summarized in **Table 7**.

TABLE 7. Harlingen Irrigation District Cameron County No. 1’s Pricing Table, 2006
(Halbert 2006).

Item	In-District	Out-of-District
<i>Irrigation</i>		
<ul style="list-style-type: none"> Flat Rate Assessment 	\$24.00 for first acre + \$11.00 for subsequent acres	NA
<ul style="list-style-type: none"> Variable Rate 	\$7.00 per acre/per irrigation ^a	\$14.00 per acre/per irrigation
<i>Lawn-Watering</i>		
<ul style="list-style-type: none"> Flat Rate Assessment 	\$24.00 for first acre + \$11.00 for subsequent acres	NA
<ul style="list-style-type: none"> Up to one acre of land 	\$100.00 per year-\$24.00 flat rate = \$76.00 (unlimited irrigations)	\$100.00 per year (unlimited irrigations)
<ul style="list-style-type: none"> Per acre for > one acre of land 	\$100.00-\$11.00 flat rate = \$89.00	\$100.00
<ul style="list-style-type: none"> Golf Courses 	\$37.80 ac-ft	NA
<i>Municipal</i>		
<ul style="list-style-type: none"> Delivery charge 	\$0.145 per 1,000 gallons	\$0.145 per 1,000 gallons
<ul style="list-style-type: none"> Purchase of water above existing water rights and contracts^b 	\$0.116 per 1,000 gallons	\$0.116 per 1,000 gallons

^a Assumes six ac-in applied per acre.

^b Invoiced water amounts include accounting for 15 percent conveyance loss (Halbert 2006).

The District’s Board of Directors reviews the respective agricultural and municipal rate structures annually. Currently, the rate charged to deliver water to Harlingen Water Works Supply (HWWS), a municipal customer, is \$0.145 per 1,000 gallons. If the municipality purchases additional water beyond their water rights and any existing contracted amount, then they pay an additional charge of \$0.116 per 1,000 gallons. Water is metered at the delivery point and charged a seepage loss of 15 percent. The seepage loss is a factor because water is accounted for at the District’s diversion point on the Rio Grande. This loss value was derived by the District based on past experiences (Halbert 2006). If seepage losses are not figured against waters for

municipal use, then agricultural accounts would have to absorb these losses. HWWS is billed the first of every month, and the District receives payment within a week of billing.

The District charges an annual flat-rate assessment on every acre classified as irrigable, whether or not it is actually irrigated. The flat-rate assessment is used for maintenance and operation of the District. The flat-rate fee is currently set at \$24.00 for the first acre and \$11.00 for every subsequent acre in each parcel. The District charges agricultural customers a delivery fee of \$7.00 per acre/per irrigation for an estimated six inches of water (Halbert 2003). For example, if a farmer owned 20 acres and all 20 acres are irrigated, he would pay an annual, one-time “flat rate” assessment of \$233.00 and a \$140.00 delivery fee for each irrigation (i.e., six inches of water) (Halbert 2006).

Agricultural accounts are not billed, but rather payment is made when water is requested from the District, (i.e., advance payment must be made or no water is diverted/delivered). Water is not currently sold to farmers volumetrically. They purchase one irrigation and a canal rider applies what it takes to irrigate that acre. Funding from the North American Development Bank (NADB) will allow the District to invest in the metering equipment and technologies required to facilitate charging on a volumetric basis (Halbert 2003).

Golf Courses

HIDCC1 currently provides water for four golf courses within the District. Golf courses are charged either (1) on a delivery basis for those courses having allocations, or (2) \$37.80/ac-ft if they do not own the water right. The usage-based accounts are charged using an average water-use-per-acre system (Halbert 2006).

Lawn Watering

Separate from selling golf courses water, HIDCC1 has approximately 500 lawn-watering accounts (Halbert 2003). Lawn-watering accounts are established for residents that are both inside and outside of the District boundaries. Including the base assessment fees, the District charges residential customers \$100.00/year for up to one acre of land to supply water for the purpose of irrigating lawns and \$100.00/year for every acre or partial acre thereafter. Lawn-watering customers who are in-district get credit for the assessments (i.e., \$24.00 for the first acre and \$11.00 for each additional acre) that they pay on their property. Thus, in-district customers would pay \$76.00 for the first acre and \$89.00 for each additional acre. Lawn watering accounts located outside of the District are charged the full \$100.00/acre rate (Halbert 2006).

By State law, water is not delivered to users with delinquent assessment accounts. HIDCC1 collects more than 95 percent of its annual assessments by the time they are due. Within ten years of the original assessment date, the District has collected more than 99 percent of these assessments. All current delinquencies are on properties that no longer are irrigated (Halbert 2003).

Maintenance and Operation Contracts

Besides water sales to HWWS and other entities, HIDCC1 has several Maintenance and Operation (M&O) contracts with these entities. These contracts are based on hourly rates for equipment used. These rates are negotiated with the entities, but they are based on five-year depreciation schedules and total reimbursement of cost of operation of the equipment, operators, and administrative overhead. Fees are based on the M&O requirements in the District's budget.

According to the District, maintenance and construction income is associated with (1) City of Harlingen on drainage in the city, (2) maintenance work for Cameron County Drainage District No. 5 (CCDD5), (3) reimbursement for maintenance and operation of Adams Garden Irrigation District (AGID), and (4) construction repairs for farmers within the District for their on-farm facilities. HIDCC1 also provides maintenance work in the form of mowing and maintenance for HWWS, rural water systems, Valley International Airport, CCDD5, AGID, and others (Halbert 2003).

By providing service to other entities at a fee, HIDCC1 is able to capture some economies of size and provide M&O to its own internal customers at a lesser cost. This outsourcing of resources allows the District to maintain higher quality and quantity of equipment, as well as more well-trained M&O staff. These arrangements appear to allow for a very efficient use of resources as there is little or no down time for equipment or personnel (Halbert 2003). This allocation of resources in no way hinders the correction of problems that may arise due to failure of irrigation system infrastructure. If problems arise, the crew and equipment can be moved easily to rectify the problem. The District strives to address all maintenance issues within 24 hours of notification, with agricultural and municipal account delivery issues having priority over lawn-watering accounts (Halbert 2006).

Assessments

The Board sets budgetary estimates, rates, and changes to the District's fee structure. According to §58.304 of the Texas Water Code, it is the Board's responsibility to estimate the total operating and maintenance budget for the next 12 months (Texas Legislature Online). The major components of a district's budget are (1) operating and maintenance expenses, (2) capital debt services, and (3) building of capital-reserve funds. Further, the operating and maintenance expenses must not comprise less than one-third or more than two-third of the total annual assessments against all land in the district (Texas Legislature Online; Texas Water Code §58.305). The effect of the cited legislation is to prevent the District from accumulating excessive reserves and/or incurring excessive capital debt. The Board also has the right to change and set rates for water delivery to cities and towns as they see fit (Texas Legislature Online; Texas Water Code §58.319), as well as irrigation rates within the district. Proposed budgets and assessments are evaluated each September and adopted by the Board.

HIDCC1 has increased its annual budget (expenses and revenues) over the past nine years in order to provide services to its customers and to improve its water delivery infrastructure. While expenses overall have increased to keep up with inflation, revenue increases have primarily been from increased outside services. This helps to keep fees low for producers as commodity prices and drought conditions have been less than favorable to its primary customers, i.e., farmers (Halbert 1999a).

Irrigation district assessments are the highest single "tax" that landowners in the area have to pay (Halbert 2003). The typical local property tax rate of \$0.34 per \$100.00 of property value is allocated as 34 percent to school, 12 percent to the county, and 54 percent to the irrigation district. The District's current assessment is based on 34,636 acres which equates to \$354,611 per year (Halbert 2003).

Other Income – Rents, Leases, and Sales

Additionally, HIDCC1 obtains other revenue from the following, all of which do not directly relate to the transportation of water (Halbert 1999b).

- Farm Rent HIDCC1 leases parcels of farm land owned by the District.
- Advertising Leases HIDCC1 leases right-of-way advertising spots for billboards on District property.
- Office Space HIDCC1 leases office space to Cameron County Drainage District No. 5 (CCDD5).

- Sale of Assets HIDCC1 sells strips of property that are no longer needed.²²
- Administrative HIDCC1 receives administrative overhead income from AGID and CCDD5.
- Tax Certificates Tax information and other requests for certified information from HIDCC1.
- Miscellaneous Refunds for maps or other documents produced by HIDCC1.

Other Special Districts

In addition to managing its own district, HIDCC1 oversees and manages other districts. Included are another irrigation district, AGID, and a drainage district, CCDD5.

Adams Garden Irrigation District

The AGID (**Figure 4**) is geographically adjacent to HIDCC1, lying to the west, and is managed by HIDCC1 as it is too small to operate as an individual separate district (Halbert 2003). The District is operated by HIDCC1 personnel, but maintains its own Board of Directors. HIDCC1 operates AGID with HIDCC1 personnel, using the income it receives from AGID's irrigation water accounts as a source of operating funds. This income covers all M&O and administrative overhead cost and also allows for improvement work to be performed by HIDCC1 personnel. Improvement work within AGID is done as income from the small district allows. For economic and financial reasons, it is realistic to assume that, in the very near future, AGID will likely merge into the HIDCC1 system (Halbert 2003).

Cameron County Drainage District No. 5

HIDCC1 is responsible for agricultural-related drainage, including runoff from fields and pastures. The District maintains 140 miles of drainage ditches, which collect runoff water and discharges it into the Arroyo Colorado. The Arroyo, in turn, flows into the Laguna Madre (Halbert 2006).

In 1993, CCDD5 was established by HIDCC1 to manage drainage problems in the northern section of the District and the City of Harlingen. This drainage district captures storm-water runoff from the city. Fifty miles of this system is under the jurisdiction of CCDD5, but maintenance and operation are performed by HIDCC1

²² These properties are usually easements that are no longer needed, e.g., pipelines have been installed where canals were before.

(except for the small portion that lies within the boundaries of La Feria Irrigation District No. 3). HIDCC1 either owns the right of way or holds the easements for most of the ditches that CCDD5 maintains (Halbert 1999b).

Although both districts (i.e., HIDCC1 and CCDD5) share offices, CCDD5 is governed by an independent, elected, three-member Board of Directors, and has a separate manager and secretary. HIDCC1 does all the M&O for CCDD5, which is mutually beneficial for both entities (Halbert 2003).

Conservation Efforts

HIDCC1 has a goal to increase its overall water-delivery conveyance efficiency from the current estimated rate of 75-80 percent to 90 percent. The District hopes to accomplish this strategic goal using several tactical actions (Halbert 2003). Funding assistance provided by the United States Bureau of Reclamation (USBR), the NADB, and the Texas Water Development Board (TWDB) is facilitating several of the conservation efforts discussed below.

To further improve conveyance efficiency, the District plans to implement a meter-monitoring program that will allow the District to fine tune the accuracy of diversions from its diversion point in Los Indios and give management better tools in the ordering of water from the Rio Grande Watermaster. A metering system is being designed that will allow the HIDCC1 to determine areas of loss and inefficient uses of water. A drainage monitoring system is also being designed that will document water losses in the delivery system. This will provide the tools to determine utilization of current irrigation water under various conditions and for specific crops. The ultimate goal is to move to volumetric pricing for all customers in the future (Halbert 1999b).²³

Another conservation tool gaining momentum in the District is the adoption of drip and sprinkler systems by farmers. These are modern, advanced-technology field systems that are designed to be more water efficient. These systems are on-farm conservation techniques that must be privately adopted by individual farmers. HIDCC1 has designed outlet devices that encourage customers to use these technologies where applicable. The District supplies these outlets and installs them at no cost to the customer. In addition, HIDCC1 sponsors workshops and seminars to

²³ Farmers will be billed on actual volume of water used rather than an estimate. This will be a conservation-based measure with incentives for farmers to save. Currently, farmers have no incentive to save water (i.e., conserve) (Halbert 1999b).

expose agricultural users to the newest technologies and encourage their use (Halbert 1999b). The District's policy and operations are designed to encourage and facilitate its farmers using all feasible methods of water conservation (Halbert 2006).

HIDCC1s use of supply reservoirs helps solve the problem of push water²⁴ required to move the small amount of water needed by drip and sprinkler systems albeit on a more frequent basis. Therefore, farmers and growers that utilize additional conservation efforts on-farm within the District do not actually put a strain on the system. This is a contrast to the additional water loss often experienced in some other irrigation districts when such technologies are used.

The canal rehabilitation project, being undertaken with funding from USBR, NADB, and TWDB, includes the rehabilitation of approximately 8.5 miles of deteriorated concrete-lined canals. The damaged concrete allows water to seep from the canal into the adjacent fields and drainage ditches. One of two options for repair will be utilized, depending on the flow characteristics of the particular canal segment. In canal segments with a design flow rate greater than 60 cubic feet per second, existing concrete will be lined with an impervious liner. Segments with lower design flow rates will be replaced by pipeline. Each improvement will help eliminate seepage, thereby reducing pumping requirements and energy cost. Reducing seepage by lining and/or eliminating canals will allow more water to be available during times of shortage.

This rehabilitation project will increase the efficiency of both the District and growers by reducing the amount of water and energy used per acre irrigated. The District has installed innovative turnouts to encourage growers' use of polypipe for both annual and perennial crops. Metering and other technology-enhanced improvements are progressing, with the anticipation of minimizing inflationary effects on farmers and other District clientele.

²⁴ Push water is water that fills a District's delivery system and is used to propel (or transport) "other water" from the river-side diversion point to municipalities (Rister et al.).

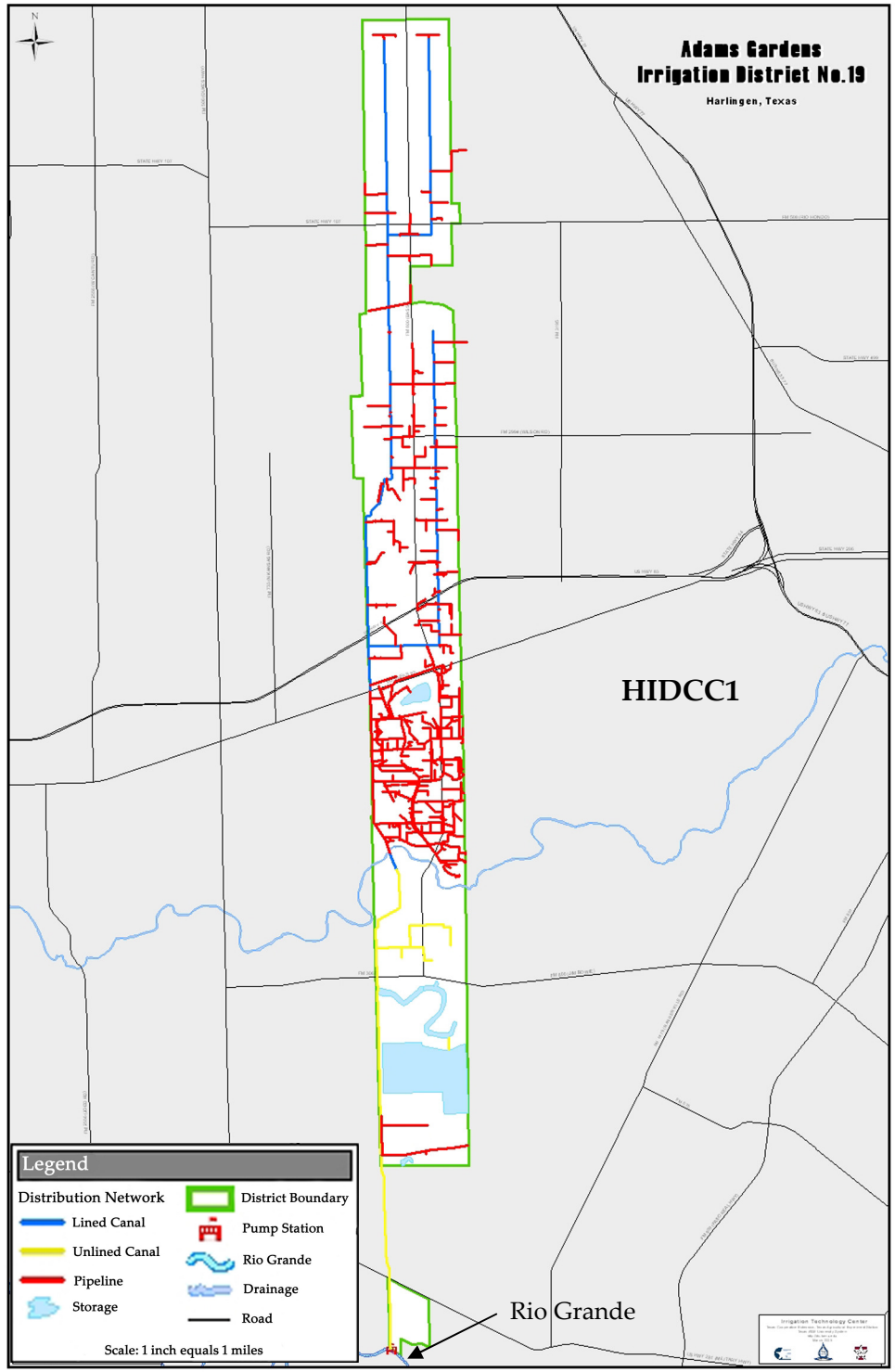


FIGURE 4. Illustrated Layout of Adams Garden Irrigation District, 2002 (Fipps et al.).

Chapter Summary

This chapter discussed the operating practices of HIDCC1. The foundation of the HIDCC1 operations is the Board of Directors and overall organizational hierarchy. Secondly, the allocation procedures (inside and outside) of the District indicate how the District handles its water once it is diverted from the Rio Grande. This also helps explain how no-charge water and water transfers are handled. In the case of HIDCC1, no-charge water is used to offset water allocations and for storage in its reservoirs. Exactly how the irrigation district sells and distributes its water, as well as other revenue-making activities, also are discussed. Adams Garden Irrigation District and Cameron County Drainage District No. 5 are special water districts that operate in close proximity to HIDCC1. These districts provide services that impact the operating procedures of HIDCC1. Finally, HIDCC1 encourages conservation activities within the District to help ensure that future water needs can be met.

Conclusions

The Harlingen Irrigation District Cameron County No. 1 (HIDCC1) represents only one of the 29 irrigation districts in the Texas Lower Rio Grande Valley. Though it follows the State and International guidelines, as do all Valley irrigation districts, it operates in a unique and discernable way that separates it from other Valley irrigation districts. HIDCC1 is not the only district to utilize storage reservoirs, an effective cost share agreement with agricultural providers, underground pipe, or other conservation tools; however, the combination and manner in which these tools are employed are what contribute to HIDCC1s distinctiveness. Also contributing to the distinctiveness of HIDCC1 is that it operates in an increasingly-urban area. These phenomena provide the District opportunities and challenges not necessarily present in other districts.

This report illustrated a brief history of HIDCC1 and how those activities played a key role in forming the makeup of the District, as well as how it operates today. The report was developed to be one part of a broader picture in helping to explain some of the differences in operating practices between irrigation districts in the Valley. The objective is to provide insight into separate irrigation districts in order to allow for future evaluation across multiple districts, gaining insight on implications of alternative conservation tools.

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Appendices

Appendix A: Additional Figures

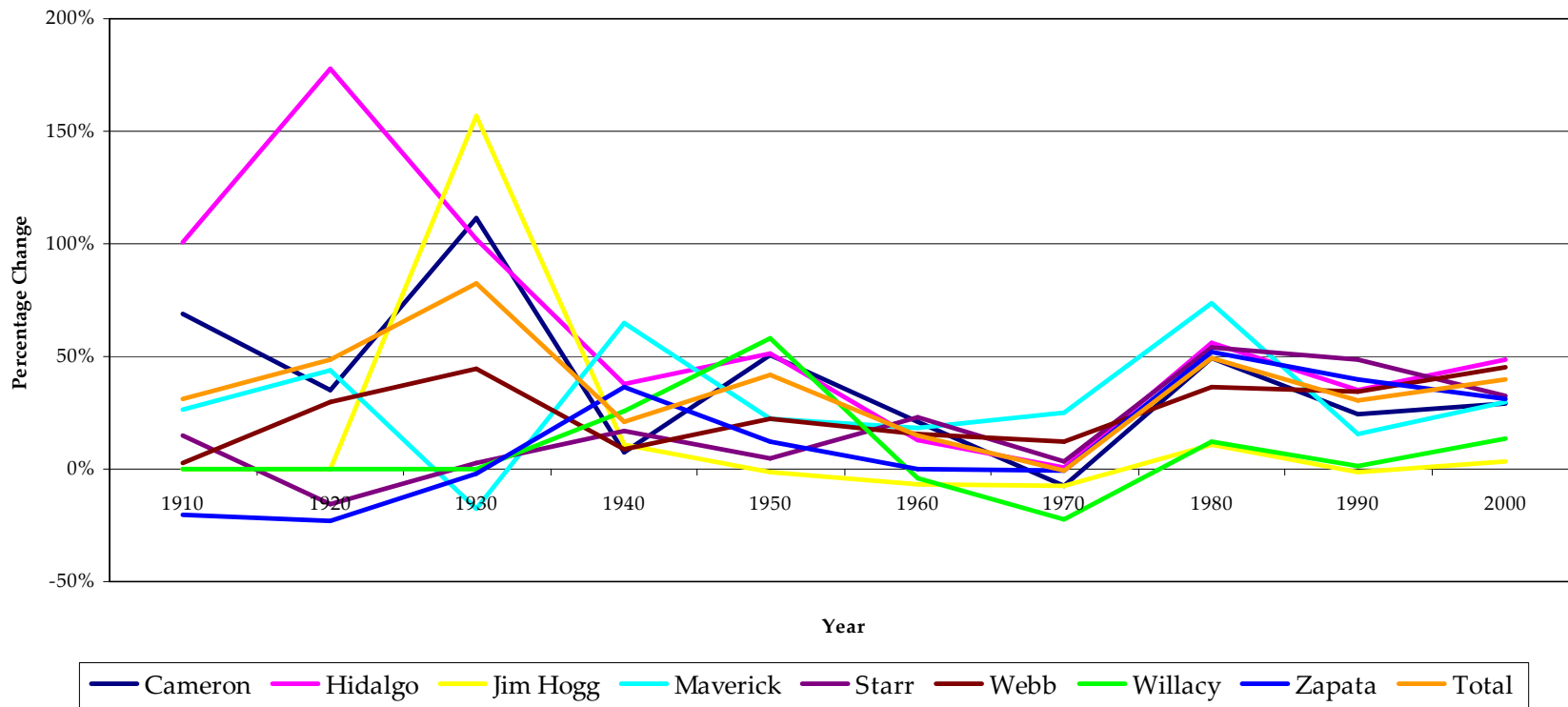


FIGURE A1. Graphical Representation of Lower Rio Grande Valley Counties' Populations as a Percentage Change of Growth per Decade, 1900-2000 (Forstall).

Name	Water Interests Represented	Association Represented
Terms Expiring August 31, 2004		
Charles Browning, Jr.	DMI	North Alamo WSC
Robert Burkhart	DMI	City of Harlingen
Rudy Atkinson	Industrial	AEP
Benton Beckwith	Irrigation	Beckwith Farms
Sonny Hinojosa (Secretary)	Irrigation	HCID2
Frank White	Irrigation	H&CCID9
Vidal Davila	Recreation	National Parks Service
Terms Expiring August 31, 2005		
Orville Ballard (Vice-Chair)	Recreation	Falcon
Wayne Halbert (Chair)	Irrigation	Harlingen ID
Sharon Williams	Nature	USFWS
James R. Elium	Municipal	Olmito Water Supply
Jed A. Brown	Irrigation/Industrial	Killam Corp., Laredo
Brenda Paez	Mining	Alice Southern Equipment
Jimmy Paz	Nature	National Audubon Society
Alternate		
Bruce Hardwicke		
Ex-Officio		
Carlos Rubinstein, Rio Grande Watermaster		

FIGURE A2. Rio Grande Watermaster Advisory Committee Appointments, 2004 and 2005 (Hinojosa 2005).

Position	Individual
President	H.J. Garrett
Vice-President	Harvey Adams
Second Vice-President	Edward Bauer
Secretary	Rick Guerrero
Member	Leonard Simmons

FIGURE A3. Harlingen Irrigation District Cameron County No. 1's Board of Directors, 2005 (Harlingen Irrigation District Cameron County No. 1.

Appendix B: Additional Tables

TABLE B1. Lower Rio Grande Valley Counties' Populations, 1900-2000 (Forstall).

Rio Grande Counties	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Cameron	16,095	27,158	36,662	77,540	83,202	125,170	151,098	140,368	209,727	260,120	335,227
Hidalgo	6,837	13,728	38,110	77,004	106,059	160,446	180,904	181,535	283,229	383,545	569,463
Jim Hogg	NA ^a	NA ^a	1,914	4,919	5,449	5,389	5,022	4,654	5,168	5,109	5,281
Maverick	4,066	5,151	7,418	6,120	10,071	12,292	14,508	18,093	31,398	36,378	47,297
Starr	11,469	13,151	11,089	11,409	13,312	13,948	17,137	17,707	27,266	40,518	53,597
Webb	21,851	22,503	29,152	42,128	45,916	56,141	64,791	72,859	99,258	133,239	193,117
Willacy	NA ^b	NA ^b	NA ^b	10,499	13,230	20,920	20,084	15,570	17,495	17,705	20,082
Zapata	4,760	3,809	2,929	2,867	3,916	4,405	4,393	4,352	6,628	9,279	12,182
Total	65,078	85,500	127,274	232,486	281,155	398,711	457,937	455,138	680,169	885,893	1,236,246

^a Jim Hogg County was organized in 1913, out of parts of Duval and Brooks Counties. The census population information was not available for Jim Hogg County until 1920.

^b Willacy County was organized in 1921, out of parts of Kennedy, Hidalgo, and Cameron Counties. The census population information was not available for Willacy County until 1930.

TABLE B2. Lower Rio Grande Valley Counties' Populations as a Percentage Change of Growth per Decade, 1900-2000 (Forstall).

Rio Grande Counties	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Cameron	NA	68.7%	35.0%	111.5%	7.3%	50.4%	20.7%	-7.1%	49.4%	24.0%	28.9%
Hidalgo	NA	100.8%	177.6%	102.1%	37.7%	51.3%	12.8%	0.4%	56.0%	35.4%	48.5%
Jim Hogg	NA	NA ^a	NA ^a	157.0%	10.8%	-1.1%	-6.8%	-7.3%	11.0%	-1.1%	3.4%
Maverick	NA	26.7%	44.0%	-17.5%	64.6%	22.1%	18.0%	24.7%	73.5%	15.9%	30.0%
Starr	NA	14.7%	-15.7%	2.9%	16.7%	4.8%	22.9%	3.3%	54.0%	48.6%	32.3%
Webb	NA	3.0%	29.6%	44.5%	9.0%	22.3%	15.4%	12.5%	36.2%	34.2%	44.9%
Willacy	NA	NA ^b	NA ^b	NA	26.0%	58.1%	-4.0%	-22.5%	12.4%	1.2%	13.4%
Zapata	NA	-20.0%	-23.1%	-2.1%	36.6%	12.5%	-0.3%	-0.9%	52.3%	40.0%	31.3%
Total % Change From Previous Decade	NA	31.4%	48.9%	82.7%	20.9%	41.8%	14.9%	-0.6%	49.4%	30.2%	39.5%

^a Jim Hogg County was organized in 1913, out of parts of Duval and Brooks Counties. The census population information was not available for Jim Hogg County until 1920.

^b Willacy County was organized in 1921, out of parts of Kennedy, Hidalgo, and Cameron Counties. The census population information was not available for Willacy County until 1930.

Appendix C: Additional Exhibits



EXHIBIT C1. Constructed Inlet Canal System off the Rio Grande Leading to Harlingen Irrigation District Cameron County No. 1's Pumping Plant, 2003 (Wolfe).



**EXHIBIT C2. Harlingen Irrigation District Cameron County
No. 1's Pumping Station and Pumps, 2003 (Wolfe).**



EXHIBIT C3. Rio Grande View of Harlingen Irrigation District Cameron County No. 1's Pumping Plant and 48-inch Inlet Pipes, 2003 (Wolfe).



EXHIBIT C4. Harlingen Irrigation District Cameron County No. 1's Main Canal, 2003 (Wolfe).



EXHIBIT C5. Harlingen Irrigation District Cameron County No. 1's Earthen Canal, 2003 (Wolfe).



**EXHIBIT C6. Harlingen Irrigation District Cameron County No. 1's
Concrete-Lined Canal With Gate, 2003 (Wolfe).**

Appendix D: Additional HIDCC1 Rules and Regulations

Rules and Regulations Governing Irrigation Water Service Harlingen Irrigation District Cameron County No. 1

In order to insure efficient and equitable water service to all persons served by the district: It is ordered by the Board of Directors of Harlingen Irrigation District Cameron County No. One that the following rules and regulations be and they are hereby adopted:

1. No water for irrigation purposes shall be delivered except to bonafide holders of water tickets issued at the District office authorizing the canal rider to deliver water.
2. (a) A person purchasing a water ticket should indicate on the ticket the date water is wanted. If such date does not conflict with previous applications, the canal rider will arrange to have water ready at the field gate on the date indicated. In cases when the date indicated on water ticket conflicts with previous applications, it will be the duty of the canal rider to contact the applicant and arrange a mutually satisfactory date.

(b) If the user making application for water does not know the exact date he will be ready to take water, the water ticket should be marked "Will Call," in which case it will be the duty of the ticket holder to contact his canal rider and arrange for a mutually satisfactory date for water delivery. It shall be the duty of clerks and of the applicants to see that the "Date-Wanted" is filled in on the ticket. The ticket should have the telephone number so that the canal rider may know where to contact the ticket holder should it be necessary.

(c) When any water user is not ready to take delivery on the date indicated on the water ticket, or agreed upon with the canal rider, he shall lose his priority and shall not be entitled to water delivery until deliveries are completed on other outstanding water tickets on the same canal or until otherwise arranged with the canal rider.

(d) When a water user does not take delivery of water authorized by the water ticket upon the second offer of delivery by the canal rider the water ticket will be marked

"CREDIT" by the canal rider, the water ticket will be considered canceled, and a water credit receipt will be issued by the canal rider. The water user may re-order water in like amount or request the purchase price of ticket be processed for a refund check.

(e) Any water ticket for which water has not been delivered may be refunded. It is the responsibility of the customer to acquire a credit receipt from the District office. This must be done within two weeks of the scheduled time of acceptance of delivery for which a part or all of the water ticket was not used. The District office will process a refund check upon request.

(f) A water ticket does not constitute a contract between the District and the water user. The water ticket does not guarantee water delivery in any particular time name. Water will be delivered as timely as possible within the capabilities of the District and the particular system.

3. Each canal rider is expressly authorized to allocate water to the users in the area holding water tickets, or to so rotate the delivery of taking of water, as to assure fair and equitable service among the users in points of time and amount; and his decisions shall constitute the condition and measure of the right of users to water. The canal rider, if and when he deems it necessary to meet the demands of water users in his area, may require night irrigation, and in any case in which the water user fails or refuses to comply with this requirement, communicated to him, he may be refused delivery of water until other ticket holders have completed their irrigation, or until the condition bringing about such requirement has been alleviated.
4. The only person authorized to open a head gate or check gate, or take or deliver water from a District canal or pipe-line is the canal rider in charge of water deliveries in the area. The Canal rider may delegate this authority to a bonafide holder of a water ticket as a matter of convenience to the ticket holder, in respect of water delivery authorized by a water ticket. If a ticket holder is asked by the canal rider to await his turn, he is not entitled to receive the water until given permission by the canal rider.

5. In order to conserve water, time and expense, all irrigation water users are urged to keep their field laterals free of weeds and grass or other impediments to the free flow of water and in condition for conveying water. In cases where field laterals are not reasonably free of weeds, grass or other impediments and not in good condition for delivering water without waste, it shall be the duty of the canal rider to call the attention of the user to such condition, and if it is not remedied, to withhold and refuse delivery of water until the condition is remedied.
6. Canal riders shall see that water is not held in canals higher than is reasonably safe to prevent breakage or overflow. If water at the appropriate height is not sufficient to water lands served by the canals it shall be the duty of the canal rider to request inspection thereof by the engineering department to determine whether a high land adjustment or other correction should be made in the canal operation.
7. No person shall open, close, change or interfere with, any head gate, check gate, or change the flow through pipeline delivery systems of the District, except a duly authorized canal rider. The opening and closing of field gates will be the responsibility of the customer but only as authorized as to time and amount by the canal rider. Scheduled closings of field gates must be coordinated with the canal rider. In specific instances the canal rider may authorize exceptions to the aforementioned rule for the convenience of the customer and the District. In addition the customers, as they open and close field gates, should attempt to utilize the bypass gates to keep head levels stable for the benefit of all users.
8. Strip watering is purchased for the entire field acreage. The canal rider will determine how many acres of any given field was actually irrigated and a credit will be issued for the unused part of the ticket acreage. This credit may be applied to the purchase of other water ticket or a request for a refund check can be made at the District office. No strip irrigation will be authorized for less than four (4) normal width rows (approximately 13 feet). Wet ground in un-watered strips will be considered irrigated.
9. Any water user will be expected to be fully prepared for carrying out prompt and continuous irrigation in a workmanlike manner by having field ditches clean and in good repair and by having sufficient laborers to make good use of water.
 - (a) Any water user wasting water on roads, low lands or on land previously irrigated, through carelessness or on account of defective ditches or borders, or land not properly prepared for irrigation or by failure to provide adequate labor, will be refused water service until conditions causing wasted water are remedied.

(b) A water user deliberately permitting water to flow into road, low land, land not covered by water ticket or on a part of land previously irrigated will be required to pay for such water in an amount determined by the canal rider.

(c) No water will be sold to a person who has not paid for excess water charged to him as set above.

(d) In the event of a "consistent waster" the District may require water to be metered through a meter furnished by the District at a rental cost to the customer. Such water will be priced at the regular price of water for the considered water duty of the District at the time, with a sur charge for additional water used. Current information on these charges will be available at the District office.

10. No water may be pumped by individuals from wells, reservoirs; resacas, drainage ditches or any other source into the District's distribution system except upon specific authorizations.

(a) No water may be pumped into the District distribution system-or transmitted through the system, if the District has water for delivery.

(b) In the event individuals wish to use District facilities for transporting water and are authorized to do so, such individuals shall agree to repair any damage they may cause to the system and leave the part of the system so used in good condition.

11. Only the following persons shall be entitled to receive water from canals, pipelines or other works of the District for any purpose:

(a) Any person who has paid the District for water and all due assessments or charges pertinent to the account, and holds a water ticket of the District authorizing water to be delivered for irrigating the land on which it is to be used; and has been authorized by the District's canal rider having charge of water deliveries on the canal or pipe line serving this land, to take water therefrom, within the amount and time and by the means authorized by the canal rider;

(b) Any person who holds an annual permit for water to be used through a drip or low volume water system, currently paid up to date including all due assessments or charges pertinent to the account, and has been authorized by the District's canal rider having charge of water deliveries on the canal or pipe line serving this land, to take water therefrom, within the amount and time and by the means authorized by the canal rider;

(c) Any person who holds a current temporary permit for water to be used for construction projects or similar temporary projects and has been authorized by the District's canal rider having charge of water deliveries on the canal or pipe line serving this facility, to take water therefrom, within the amount and time and by the means authorized by the canal rider;

(d) Any person who holds an annual permit for water to be used on his property, for limited domestic purposes only, not for production of commercial crops. This permit includes a signed agreement to pay a yearly sum for the use of water and all district taxes and any assessments on property, as well as an acknowledgment that canal water is untreated and not potable and shall be available only when water is in the canal in the normal course of the conduct of the affairs of the District. The agreement also includes an affidavit by the subscriber that property where canal water is to be used has an alternate treated water supply or that there are no domestic facilities located at the diversion site and that canal water is not used for any prohibited purpose. Prohibited purposes for human consumption are as outlined by *Title 40 Code of Federal Regulations Part 141*. (Human consumption includes drinking, bathing, showering, cooking, dishwashing, and maintaining oral hygiene.)

12. Each canal rider is expressly authorized to have charge of all water deliveries and make sure all rules and regulations of the District are followed in use of any water from the District.

13. Attention of all persons concerned is called to Subchapter C, Section 11.081, 11.082 and 11.083 of the Texas Water Code.

ADDENDUM

SUBCHAPTER C. UNLAWFUL USE, DIVERSION, WASTE, ETC.

Sec. 11.081. Unlawful Use of State Water.

No person may willfully take, divert, or appropriate any state water for any purpose without first complying with all applicable requirements of this chapter.

Amended by Acts J977, 65th Leg., p. 2207, ck 870, Sec. J, eff. Sept. J, J977.

Amended by Acts J997, 75th Leg., ck J072, Sec. 3, eff. Sept. J, J997.

Sec. 11.082. Unlawful Use: Civil Penalty.

(a) A person who willfully takes, diverts, or appropriates state water without complying with the applicable requirements of this chapter is also liable to a civil penalty of not more than \$5,000 for each day he continues the taking, diversion, or appropriation.

(b) The state may recover the penalties prescribed in Subsection (a) of this section by suit brought for that purpose in a court of competent jurisdiction.

(c) An action to collect the penalty provided in this section must be brought within two years from the date of the alleged violation.

Amended by Acts J977, 65th Leg., p. 2207, ck 870, Sec. J, eff. Sept. J, J977; Acts J98J, 67th Leg., p. 3J50, ck 828, Sec. J, eff. June J7, J98J.

Amended by Acts J997, 75th Leg., ck JO10, Sec. 3.0J, eff. Sept. J, J997.

Sec. 11.083. Other Unlawful Taking.

(a) No person may willfully open, close, change, or interfere with any headgate or water box without lawful authority.

(b) No person may willfully use water or conduct water through his ditch or upon his land unless he is entitled to do so.

Amended by Acts J977, 65th Leg., p. 2207, ch. 870, Sec. J, eff. Sept. J, J977.

Amended by Acts J997, 75th Leg., ch. 1072, Sec. 4, eff. Sept. J, J997.

Appendix E: Excerpts of the Texas Water Code

The following is a verbatim reproduction of selected sections of the Texas Water Code (Texas Legislature Online). The sections represented here are those previously cited within the text.

SUBCHAPTER C. ADMINISTRATIVE PROVISIONS

§ 58.071. Board of Directors

*The governing body of a district is the board of directors, which shall consist of five directors.
Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.*

§ 58.072. Qualifications

*To be qualified for election as a director, a person must be a resident of the state, be the owner of record of fee simple title to land in the district, be at least 18 years of age, and owe no delinquent taxes or assessments to the district. Section 49.052 does not apply to a district governed by this chapter.
Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.
Amended by Acts 1995, 74th Leg., ch. 715, § 32, eff. Sept. 1, 1995.*

SUBCHAPTER E. ELECTION PROVISIONS

§ 58.222. Eligibility to Vote

Notwithstanding the Election Code and any other law, a landowner or the landowner's registered representative under this subchapter is entitled to one vote in an election conducted by a district only if the landowner:

- (1) owns at least one acre of irrigable land located within the district's boundaries that is subject to an assessment for maintenance and operating expenses under Sections 58.305(a) and (b);*
- (2) is entitled to receive and use irrigation water delivered by the district through the district's irrigation facilities; and*
- (3) satisfies all other requirements for voting prescribed by this subchapter.*

Added by Acts 2001, 77th Leg., ch. 107, § 1, eff. Sept. 1, 2001.

SUBCHAPTER G. WATER CHARGES AND ASSESSMENTS

§ 58.304. Board's Estimate of Maintenance and Operating Expenses

The board, on or as soon as practicable after a date fixed by standing order of the board, shall estimate the expenses of maintaining and operating the irrigation system for the next 12 months. The board may change the 12-month period for which it estimates the expenses of maintaining and operating the irrigation system by estimating such expenses

for a shorter period so as to adjust to a new fixed date and thereafter estimating the expenses for 12-month periods following the adjusted fixed date.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

Amended by Acts 1997, 75th Leg., ch. 789, § 3, eff. Sept. 1, 1997.

§ 58.305. Distribution of Assessment

(a) Not less than one-third nor more than two-thirds of the estimated maintenance and operating expenses shall be paid by assessment against all land in the district to which the district can furnish water through its irrigation system or through an extension of its irrigation system.

(b) The assessments shall be levied against all irrigable land in the district on a per acre basis, whether or not the land is actually irrigated. The board shall determine from year to year the proportionate amount of the expenses which will be borne by water users.

(c) The remainder of the estimated expenses shall be paid by assessments against persons in the district who use or who make application to use water. The board shall prorate the remainder as equitably as possible among the applicants for water and may consider the acreage each applicant will plant, the crop he will grow, and the amount of water per acre he will use.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

§ 58.319. Charge to Cities and Towns

If a district supplies untreated water, the charge for the use of the water and the time and manner of payment shall be determined by the board or fixed by the contract made with the board.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

SUBCHAPTER N. ADDING AND EXCLUDING TERRITORY AND CONSOLIDATING DISTRICTS

§ 58.708. Notice of Hearing on Applications

The board shall give notice of the hearing on the applications by publishing the time, place, and nature of the hearing one time in a newspaper published in a county in which all or part of the district is located. The newspaper must have been published regularly for more than 12 months preceding the date of the publication of the notice and must have circulation in the district. The notice shall be published not less than 10 days nor more than 20 days before the date of the hearing.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

§ 58.709. Hearing Procedure

The board shall hear all interested parties and all evidence in connection with the applications.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

§ 58.710. Board's Resolution to Substitute Land

If the board finds that all the conditions provided for the exclusion of land and inclusion of other land in the district exist, it may adopt and enter in its minutes a resolution to exclude land which is nonagricultural or nonirrigable in a practicable manner and include land which may be irrigated from the facilities of the district in a practicable manner.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

§ 58.713. Right to Serve New Land Included in District

The district has the same right to furnish water service to the included land that it previously had to furnish service to the excluded land. The mere inclusion of a larger total acreage than that excluded does not give the district the right to irrigate a larger total acreage or to appropriate a larger quantity or volume of public water for irrigation than the district would have had the right to irrigate or to appropriate before the exclusion and inclusion of the land.

Added by Acts 1977, 65th Leg., p. 1537, ch. 627, § 1, eff. Aug. 29, 1977.

Appendix F: Excerpts of Additional Texas Commission on Environmental Quality Rules

The following is a verbatim reproduction of selected sections of the Texas Commission on Environmental Quality Rules and Regulations (Texas Commission on Environmental Quality 2003). The sections represented here are those previously cited within the text.

SUBCHAPTER B : WATERMASTER-REGULATORY FUNCTIONS

§303.11. Records of Diversions--General.

(a) The watermaster shall locate, number by river mile or other method, and rate as to capacity all authorized diversion facilities on the Texas bank along the Rio Grande and tributaries, and the owner or operator thereof shall be advised in writing of these facts. When a permanent diversion facility is replaced at the same location or when any changes in rating are made, the diverter shall immediately inform the watermaster prior to diversion. Any change in the location of the diversion facilities and place of use on the Middle or Lower Rio Grande shall be made pursuant to §295.71 of this title (relating to Applications to Amend a Permit) and §295.158(c) of this title (relating to Notice of Amendments to Water Rights), not requiring mailed and published notice. Any change in the location of the diversion facilities and place of use on the Upper Rio Grande and tributaries to the Rio Grande shall be made pursuant to §295.71 of this title (relating to Applications to Amend a Permit) and §295.158(c) of this title (relating to Notice of Amendments to Water Rights), not requiring mailed and published notice; or §295.158(b) of this title (relating to Notice of Amendments to Water Rights), requiring mailed and published notice.

(b) Each diverter shall request written certification from the watermaster prior to diverting water by identifying the specific certificate of adjudication to be used and the pump number of the pump to be used. When a diverter orders water for a nondiverter, the diverter may request written certification under such diverter's certificate of adjudication or under the certificate of adjudication of the nondiverter to which the diverter is delivering water, but shall report the amount of water diverted for the nondiverter as provided in §303.12(d) of this title (relating to Mainstem Middle and Lower Rio Grande). Certifications will be granted only for diversion from authorized diversion points associated with that water right. Certifications for irrigation water rights will be granted only for delivery of water to the authorized tract(s) covered by the water right or approved contractual sale. Certifications are limited to a maximum diversion period of one calendar month on the mainstream of the Lower and Middle Rio Grande and to one year on the Upper Rio Grande and all tributaries of the Rio Grande.

(c) Each diverter shall install and maintain measuring devices at the authorized point of diversion which will provide for accurate measurement and accounting of the quantities of water diverted. The installation, maintenance, and operation of measuring devices by the diverter shall be subject to approval of the watermaster. The diverter must ensure the accessibility of the measuring device, so it can be conveniently and safely located and checked by the watermaster. The diverter shall be liable for all expenses incurred in the acquisition, installation, maintenance, and operation of measuring devices.

§303.12. Records - Mainstem Middle and Lower Rio Grande.

(e) Diversions shall be charged against the appropriate accounts as follows.

(1) A diverter shall be charged with the actual amount diverted, without being penalized, if the total diversion is within plus or minus 10% of the amount requested pursuant to certification.

(2) A diverter shall be charged with 90% of the certification amount if the total diversion is less than 90% of the amount requested pursuant to certification.

(3) If the quantity of water diverted is more than 110% of the amount requested pursuant to certification, then the diverter will be charged with the actual amount of water diverted and the provisions of §303.31 of this title (relating to General) will apply.

SUBCHAPTER C: ALLOCATION AND DISTRIBUTION OF WATERS

§§303.21 - 303.23

Effective April 26, 2001

§303.21. Accounts-Amistad/Falcon Reservoirs.

(b) When there is adequate water to do so, the watermaster shall maintain the following accounts:

(1) a reserve of 225,000 acre-feet of water for domestic, municipal, and industrial uses;

(2) an operating reserve of 75,000 acre feet; and

(3) the accounts for irrigation uses and all other uses.

(c) The operating reserve is necessary to cover losses of water charged to the United States. These losses are the result of seepage, evaporation, and conveyance; emergency requirements; and adjustments of amounts in storage as may be necessary by finalization of provisional computations by the International Boundary and Water Commission.

Adopted April 4, 2001 Effective April 26, 2001

§303.22. Allocations to Accounts.

(a) Allocations shall be based on water in the usable storage of Falcon and Amistad Reservoirs.

Such storage shall be computed as the total storage in Amistad and Falcon Reservoirs as reported by the International Boundary and Water Commission on the last Saturday of each month, less the amount of water in dead storage, which is water behind the dams that cannot be released due to hydrologic restrictions. To determine the amount of water to be allocated to the various accounts, computations shall be made in the following sequence:

(1) from the amount of water in usable storage, deduct 225,000 acre-feet to re-establish the reserve for municipal, domestic, and industrial uses;

(2) from the remaining storage, deduct the total end-of-month account balances for all Lower and Middle Rio Grande irrigation and mining allottees;

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(3) from the remaining storage, deduct 75,000 acre feet for the operating reserve;

(4) after the deduction of the operating reserve, the remaining water will be allocated to the Class A and Class B accounts.

SUBCHAPTER F : CONTRACTUAL SALES

§§303.51-303.55

§303.51. General Policy.

Verified owners of water rights in the Middle and Lower Rio Grande with the right to call on releases from the Amistad-Falcon system may contract for the sale of all or part of their annual authorized amount of use to other water rights holders or their agents in the Middle and Lower Rio Grande as long as all of the contractual sales rules are complied with. The resale of purchased water is prohibited. The use of contract sale water by buyer will not go to the perfection of seller's appropriative right. All existing contracts shall be filed with the executive director in accordance with this section.

§303.52. General Filing Requirements.

(a) If the sale of water is for a purpose of use other than that authorized in the seller's water right, then the supplier must file an application to amend that right and have the right amended before any sale may be approved.

(b) If the use of water under the contract involves a change in the place of use, diversion point or diversion rate, an amendment to sellers or buyers water right is not required. Seller or buyer shall file a copy of the executed contract with the executive director for approval. Water diverted pursuant to this section shall be diverted from a diversion point and used on a tract of land identified in commission records in accordance with §303.53(b) of this title (relating to Documents Needed to File).

(c) The seller must be a verified owner of a water right. If the commission does not have adequate ownership records of the seller, then no sale may be approved by the executive director.

(d) All contracts must be filed with and approved by the executive director as complying with all the sections relating to contractual sales. No deliveries of sold water will be made by the watermaster until all requirements are met.

(e) The executive director will file the original approved contracts in the seller's permanent water right record and will send a copy of approved contracts to the watermaster.

(f) No contract approval is required for sales of water by a district when the district's distribution facilities are used to deliver the water to the buyer for purposes authorized by the district's water right.

(g) Seller can not use and/or sell in excess of his water right's annual authorized amount of use in any calendar year.

§303.53. Documents Needed to File.

(a) A contract of sale of water to be filed with the executive director in accordance with §303.52(d) of this title (relating to General Filing Requirements) shall indicate all of the following:

(1) the specific certificate of adjudication or other water right under which the water is being sold;

(2) the specific certificate of adjudication or other water right under which the bought water is to be used;

(3) the name and address of the seller and buyer;

(4) the total quantity of water being purchased in acre-feet;

(5) the purpose of use for which the water is to be used;

(6) the cost of water to the buyer per acre-foot;

(7) the diversion point to which the buyer is requesting deliveries to be made;

(8) the effective date and termination date of the contract (contract period can not exceed one year) the acreage to be irrigated, if applicable; and

(9) the contract executed by all verified owners of the water right from which water is purchased.

(b) The contract will be accompanied by an aerial photograph or United States Geological Survey topographic map with the location of diversion points and areas to be irrigated described thereon.

(c) The executive director may require any additional information needed to approve the contract, including any agreements with diverters if the buyer is not pumping from his own diversion point and deeds of any tracts to be irrigated.

§303.54. Responsibilities of Buyer and Seller.

- (a) Both buyer and seller must comply with all Texas Water Commission rules and watermaster orders.*
- (b) The buyer must obtain a certification from the watermaster before pumping.*
- (c) The buyer and seller are solely responsible as to the resolution of conflict regarding the terms and conditions of a water contract sale.*
- (d) The seller is responsible for reporting all sales of water on the yearly surface water use reports. The buyer must also report his use of purchased water separately from his water right on his yearly surface water use report.*

§303.55. Accounting for Contract Sale Water.

- (a) The watermaster will transfer the full amount of water, or portion thereof, specified in an approved contract from the seller's to the buyer's account upon contract approval.*
- (b) Upon transfer of contract sale water to buyer's account, subsequent use of water by buyer will be deducted from the contract water balance until the contract water balance equals zero or until the contract expiration date.*
- (c) Any contract water balance remaining in buyer's account at the contract expiration date will be deducted from buyer's account and will be available for allocation to the system reserves and accounts according to §303.22 of this title (relating to Allocations to Accounts).*
- (d) Buyer may not sell any water via contract as long as his bought water balance is greater than zero.*
- (e) At no time will buyer's or seller's irrigation storage account exceed 1.41 times the water right holder's recognized amount in acre-feet.*

Appendix G: Excerpts of the 1944 Water Treaty

The following is a verbatim reproduction of selected sections of the 1944 Water Treaty (U.S.-Mexico Treaty for Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande). The sections represented here are those previously cited within the text.

II -Rio Grande (Rio Bravo)

Article 4

The waters of the Rio Grande (Rio Bravo) between Fort Quitman, Texas and the Gulf of Mexico are hereby allotted to the two countries in the following manner:

A. To Mexico: (a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the San Juan and Alamo Rivers, including the return flow from the lands irrigated from the latter two rivers. (b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under this Treaty to either of the two countries. (c) Two-thirds of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, subject to the provisions of subparagraph (c) of Paragraph B of this Article. (d) One-half of all other flows not otherwise allotted by this Article occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article, between Fort Quitman and the lowest major international storage dam.

B. To the United States: (a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the Pecos and Devils Rivers, Good-enough Spring, and Alamito, Terlingua, San Felipe and Pinto Creeks. (b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under this Treaty to either of the two countries. (c) One-third of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, provided that this third shall not be less, as an average amount in cycles of five consecutive years, than 350,000 acre-feet (431,721,000 cubic meters) annually.

The United States shall not acquire any right by the use of the waters of the tributaries named in this subparagraph, in excess of the said 350,000 acre-feet (431,721,000 cubic meters) annually, except the right to use one-third of the flow reaching the Rio Grande (Rio Bravo) from said tributaries, although such one-third may be in excess of that amount. (d) One-half of all other flows not otherwise allotted by this Article occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article, between Fort Quitman and the lowest major international storage dam.

In the event of extraordinary drought or serious accident to the hydraulic systems on the measured Mexican tributaries, making it difficult for Mexico to make available the run-off of 350,000 acre-feet (431,721,000 cubic

meters) annually, allotted in subparagraph (c) of paragraph B of this Article to the United States as the minimum contribution from the aforesaid Mexican tributaries, any deficiencies existing at the end of the aforesaid five-year cycle shall be made up in the following five-year cycle with water from the said measured tributaries. Whenever the conservation capacities assigned to the United States in at least two of the major international reservoirs, including the highest major reservoir, are filled with waters belonging to the United States, a cycle of five years shall be considered as terminated and all debits fully paid, where upon a new five-year cycle shall commence.

Article 5

The two Governments agree to Construct jointly, through their respective Sections of the Commission, the following works in the main channel of the Rio Grande (Rio Bravo): I. The dams required for the Conservation, storage and regulation of the greatest quantity of the annual flow of the river in a way to ensure the continuance of existing uses and the development of the greatest number of feasible projects, within the limits imposed by the water allotments specified. II. The dams and other joint works required for the diversion of the flow of the Rio Grande (Rio Bravo). One of the storage dams shall be constructed in the section between Santa Helena Canyon and the mouth of the Pecos River; one in the section between Eagle Pass and Laredo, Texas (Piedras Negras and Nuevo Laredo in Mexico); and a third in the section between Laredo and Roma, Texas (Nuevo Laredo and San Pedro de Roma in Mexico). One or more of the stipulated dams may be omitted, and others than those enumerated may be built, in either case as may be determined by the Commission, subject to the approval of the two Governments. In planning the construction of such dams the Commission shall determine: (a) The most feasible sites; (b) The maximum feasible reservoir capacity at each site; (c) The conservation capacity required by each country at each site, taking into consideration the amount and regimen of its allotment of water and its contemplated uses; (d) The capacity required for retention of silt; (e) The capacity required for flood control.

The conservation and silt capacities of each reservoir shall be assigned to each country in the same proportion as the capacities required by each country in such reservoir for conservation purposes. Each country shall have an undivided interest in the flood control capacity of each reservoir. The construction of the international storage dams shall start within two years following the approval of the respective place by the two Governments. The works shall begin with the construction of the lowest major international storage dam, but works in the upper reaches of the river may be constructed simultaneously. The lowest major international storage dam shall be completed within a period of eight years from the date of the entry into force of this Treaty. The construction of the dams and other joint works required for the diversion of the flows of the river shall be initiated on the dates recommended by the Commission and approved by the two Governments. The cost of construction, operation and maintenance of each of the international storage dams shall be prorated between the two Governments in proportion to the capacity allotted to each country for conservation purposes in the reservoir at such dam. The cost of construction, operation and maintenance of each of the dams and other joint works required for the diversion of the flows of the river shall be prorated between the two Governments in proportion to the benefits which the respective countries receive therefrom, as determined by the Commission and approved by the two Governments.

Article 6

The Commission shall study, investigate, and prepare plans for flood control works, where and when necessary, other than those referred to in Article 5 of this Treaty, on the Rio Grande (Rio Bravo) from Fort Quitman, Texas to the Gulf of Mexico. These works may include levees along the river, floodways and grade-control structures, and works for the canalization, rectification and artificial channeling of reaches of the river. The Commission shall report to the two Governments the works which should be built, the estimated cost thereof, the part of the works to be constructed by each Government, and the part of the works to be operated and maintained by each Section of the Commission. Each Government agrees to construct, through its Section of the Commission, such works as may be recommended by the Commission and approved by the two Governments. Each Government shall pay the costs of

the works constructed by it and the costs of operation and maintenance of the part of the works assigned to it for such purpose.

Article 7

The Commission shall study, investigate and prepare plans for plants for generating hydro-electric energy which it may be feasible to construct at the international storage dams on the Rio Grande (Rio Bravo). The Commission shall report to the two Governments in a Minute the works which should be built, the estimated cost thereof, and the part of the works to be constructed by each Government. Each Government agrees to construct, through its Section of the Commission, such works as may be recommended by the Commission and approved by the two Governments. Both Governments, through their respective Sections of the Commission, shall operate and maintain jointly such hydro-electric plants. Each government shall pay half the cost of the construction, operation and maintenance of such plants, and the energy generated shall be assigned to each country in like proportion.

Article 8

The two Governments recognize that both countries have a common interest in the conservation and storage of waters in the international reservoirs and in the maximum use of these structures for the purpose of obtaining the most beneficial, regular and constant use of the waters belonging to them. Accordingly, within the year following the placing in operation of the first of the major international storage dams which is constructed, the Commission shall submit to each Government for its approval, regulations for the storage, conveyance and delivery of the waters of the Rio Grande (Rio Bravo) from Fort Quitman, Texas to the Gulf of Mexico. Such regulations may be modified, amended or supplemented when necessary by the Commission, subject to the approval of the two Governments. The following general rules shall severally govern until modified or amended by agreement of the Commission, with the approval of the two Governments: (a) Storage in all major international reservoirs above the lowest shall be maintained at the maximum possible water level, consistent with flood control, irrigation use and power requirements. (b) Inflows to each reservoir shall be credited to each country in accordance with the ownership of such inflows. (c) In any reservoir the ownership of water belonging to the country whose conservation capacity therein is filled, and in excess of that needed to keep it filled, shall pass to the other country to the extent that such country may have unfilled conservation capacity, except that one country may at its option temporarily use the conservation capacity of the other country not currently being used in any of the upper reservoirs; provided that in the event of flood discharge or spill occurring while one country is using the conservation capacity of the other, all of such flood discharge or spill shall be charged to the country using the other's. capacity, and all inflow shall be credited to the other country until the flood discharge or spill ceases or until the capacity of the other country becomes filled with its own water. (d) Reservoir losses shall be charged in proportion to the ownership of water in storage. Releases from any reservoir shall be charged to the country requesting them, except that releases for the generation of electrical energy, or other common purpose, shall be charged in proportion to the ownership of water in storage. (e) Flood discharges and spills from the upper reservoirs shall be divided in the same proportion as the ownership of the inflows occurring at the time of such flood discharges and spills, except as provided in subparagraph (c) of this Article. Flood discharges and spills from the lowest reservoir shall be divided equally, except that one country, with the consent of the Commission, may use such part of the share of the other country as is not used by the latter country. (f) Either of the two countries may avail itself, whenever it so desires, of any water belonging to it and stored in the international reservoirs, provided that the water so taken is for direct beneficial use or for storage in other reservoirs. For this purpose the Commissioner of the respective country shall give appropriate notice to the Commission, which shall prescribe the proper measures for the opportune furnishing of the water.

Article 9

(a) The channel of the Rio Grande (Rio Bravo) may be used by either of the two countries to convey water belonging to it. (b) Either of the two countries may, at any point on the main channel of the river from Fort Quitman, Texas to the Gulf of Mexico, divert and use the water belonging to it and may for this purpose construct any necessary works. However, no such diversion or use, not existing on the date this Treaty enters into force, shall be permitted in either country, nor shall works be constructed for such purpose, until the Section of the Commission in whose country the diversion or use is proposed has made a finding that the water necessary for such diversion or use is available from the share of that country, unless the Commission has agreed to a greater diversion or use as provided by paragraph (d) of this Article. The proposed use and the plans for the diversion works to be constructed in connection therewith shall be previously made known to the Commission for its information. (c) Consumptive uses from the main stream and from the unmeasured tributaries below Fort Quitman shall be charged against the share of the country making them. (d) The Commission shall have the power to authorize either country to divert and use water not belonging entirely to such country, when the water belonging to the other country can be diverted and used without injury to the latter and can be replaced at some other point on the river. (e) The Commission shall have the power to authorize temporary diversion and use by one country of water belonging to the other, when the latter does not need it or is unable to use it, provided that such authorization or the use of such water shall not establish any right to continue to divert it. (f) In case of the occurrence of an extraordinary drought in one country with an abundant supply of water in the other country, water stored in the international storage reservoirs and belonging to the country enjoying such abundant water supply may be with-drawn, with the consent of the Commission, for the use of the country undergoing the drought. (g) Each country shall have the right to divert from the main channel of the river any amount of water, including the water belonging to the other country, for the purpose of generating hydroelectric power, provided that such diversion causes no injury to the other country and does not interfere with the international generation of power and that the quantities not returning directly to the river are charged against the share of the country making the diversion. The feasibility of such diversions not existing on the date this Treaty enters into force shall be determined by the Commission, which shall also determine the amount of water consumed, such water to be charged against the country making the diversion. (h) In case either of the two countries shall construct works for diverting into the main channel of the Rio Grande (Rio Bravo) or its tributaries waters that do not at the time this Treaty enters into force contribute to the flow of the Rio Grande (Rio Bravo) such water shall belong to the country making such diversion. (i) Main stream channel losses shall be charged in proportion to the ownership of water being conveyed in the channel at the times and places of the losses. (j) The Commission shall keep a record of the waters belonging to each country and of those that may be available at a given moment, taking into account the measurement of the allotments, the regulation of the waters in storage, the consumptive uses, the withdrawals, the diversions, and the losses. For this purpose the Commission shall construct, operate and maintain on the main channel of the Rio Grande (Rio Bravo), and each Section shall construct, operate and maintain on the measured tributaries in its own country, all the gaging stations and mechanical apparatus necessary for the purpose of making computations and of obtaining the necessary data for such record. The information with respect to the diversions and consumptive uses on the unmeasured tributaries shall be furnished to the Commission by the appropriate Section. The cost of construction of any new gaging stations located on the main channel of the Rio Grande (Rio Bravo) shall be borne equally by the two Governments. The operation and maintenance of all gaging stations or the cost of such operation and maintenance shall be apportioned between the two Sections in accordance with determinations to be made by the Commission.

Notes
