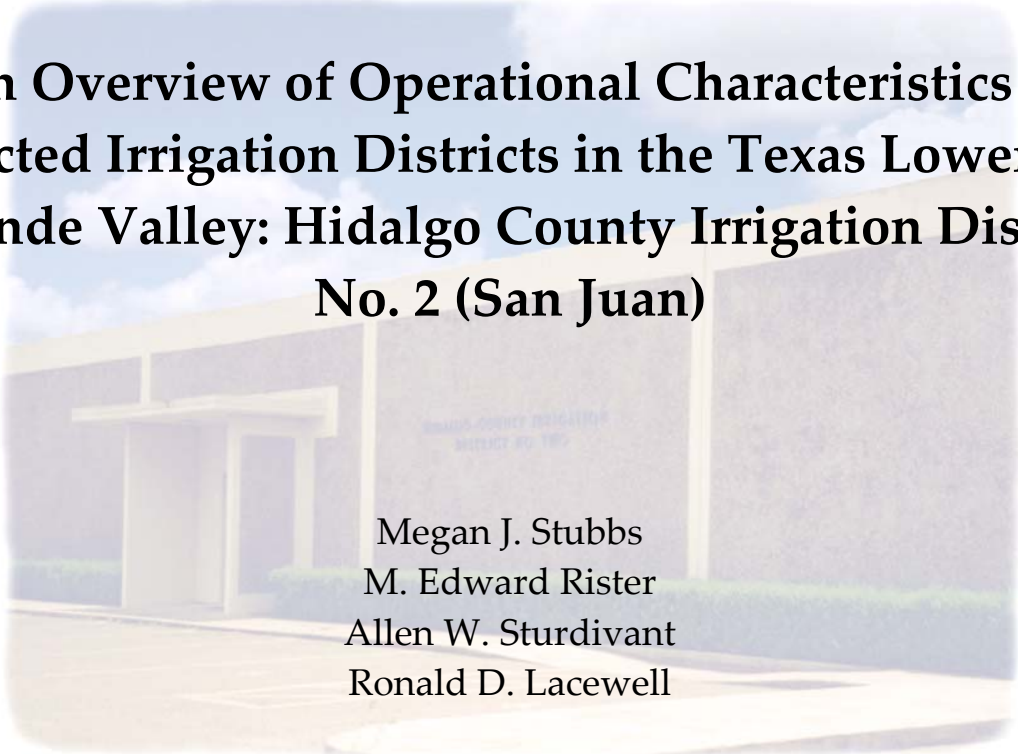


**An Overview of Operational Characteristics of
Selected Irrigation Districts in the Texas Lower Rio
Grande Valley: Hidalgo County Irrigation District
No. 2 (San Juan)**

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An Overview of the Operational Characteristics of Selected Irrigation Districts in the Texas Lower Rio Grande Valley: Hidalgo County Irrigation District No. 2 (San Juan)

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 Districts and Operating Institutions: Texas, Lower Rio Grande Valley” (Stubbs et al.) 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 districts. Through case-study evaluations of individual irrigation districts, the plan is to compare and contrast methods of operation and water allocation across irrigation districts. 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 operate. Individual 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 regard to basic efficiency and capability to react to alternative conditions. That is, the clientele base, infrastructure, adoptive rate of technology, etc. can vary significantly across irrigation districts. So, to completely understand and appreciate the collective Lower Rio Grande Valley irrigation district system, one must understand the idiosyncrasies that distinguish one from another. This second report¹ in the series addresses the specific operation characteristics of the Hidalgo County Irrigation District No. 2, headquartered in San Juan, Texas.

¹ The first report was on the Brownsville Irrigation District, “An Overview of Operational Characteristics of Selected Irrigation Districts in the Texas Lower Rio Grande Valley: Brownsville Irrigation District.”

An Overview of the Operational Characteristics of Selected Irrigation Districts in the Texas Lower Rio Grande Valley: Hidalgo County Irrigation District No. 2 (San Juan)

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 agriculture 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. The Hidalgo County Irrigation District No. 2 (HCID2), with its unusually high number of urban customers and extensive number of water rights owned, is one of the 29 distinct irrigation districts in the Valley. This study provides a historical background, a description of the District, and a discussion of the District's current operations. Specific information in the report details not only the use of technology within the District, but also 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.

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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.

MJS, MER, AWS, RDL

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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 Hidalgo County Irrigation District No. 2 (HCID2) 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, mostly descendents from the Spanish-Mexican settlements and former military men from Fort Brown lived in the area.

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). The St. Louis, Brownsville, and Mexico railroad fostered this migration from the north to the current Pharr, San Juan, and Alamo areas in 1911. In 1915, the area’s population was estimated at 600 (Garza and Long). Currently, the area has a population of almost 95,000 (U.S. Census Bureau).

One of the most significant pioneers during this time was John Closner, a farmer and law enforcement officer originally from Wisconsin. While serving as sheriff and tax collector in Hidalgo County, Closner purchased large amounts of cheap land in Hidalgo County and created the San Juan Plantation six miles northeast from the city of Hidalgo (Allhands). It was here that he began experimenting with large-scale irrigation. In 1895, he began building canals and laterals and ordered a twenty-five horsepower centrifugal pump and portable steam engine (Allhands). This pump could lift 4,800 gallons of water² 18 feet high to irrigate over 200 acres. One of Closner’s laterals has survived the test of time and is now referred to as lateral A, one of the most heavily used waterways in modern day HCID2 (National Register Nomination Form). Closner experimented with many crops, including sugarcane. In 1904, Closner’s sugarcane won the gold medal at the Louisiana Purchase Exposition in St. Louis (McKenna). This award brought national attention to the Valley as an untapped resource for developing agriculture. Currently, the City of San Juan is located in porciones³ 71 and 72 that were previously owned by John Closner (National Register Nomination Form).⁴ **Figure 1** provides a historical illustration of the porciones in Hidalgo County.

In 1907, John Kelley and C.E. Hammond purchased 20,000 acres for \$17.50 per acre (National Register Nomination Form). In 1909, Henry Pharr and his brothers, along with other sugar growers from Louisiana, purchased Hammond’s half (10,000 acres) of the Kelley- Hammond tract for \$35.00 per acre. In 1911, Kelley and Pharr dedicated a portion of their land (in porciones 69 and 70) and founded the City of Pharr, which is located at the heart of the tract (National Register Nomination Form).⁵

² Time factor is unknown (Allhands).

³ A porción is a Spanish term meaning “assigned lands.” Porciones were about 9/13th of a mile or one league of riverfront on the Rio Grande. The Spanish determined that the land would be useless without access to the Rio Grande, therefore they divided the land into long strips as illustrated in **Figure 1** (National Register Nomination Form).

⁴ These porciones are represented in red in **Figure 1**.

⁵ These porciones are represented in yellow in **Figure 1**.

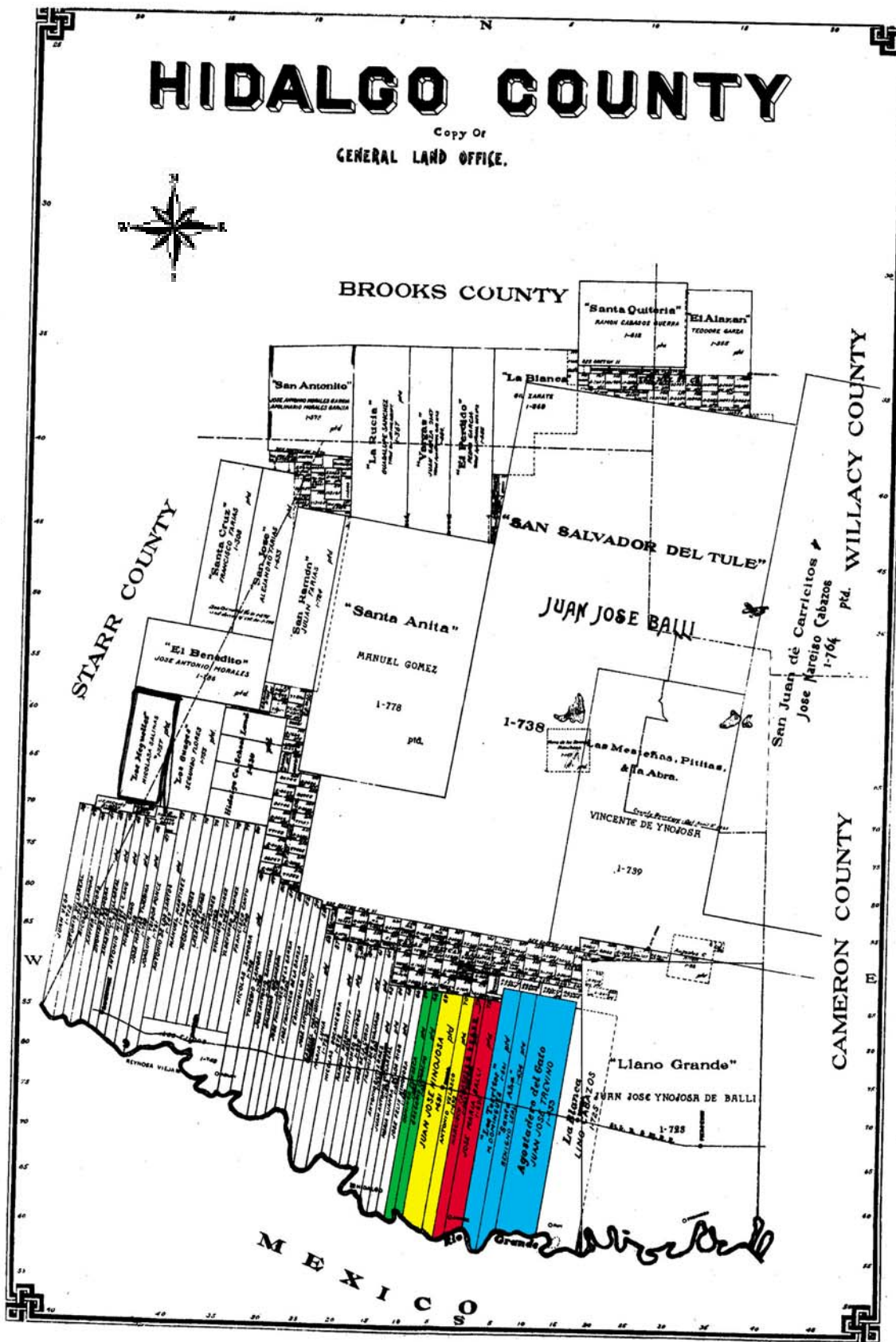


FIGURE 1. Historical Illustration of the Spanish Porciones Within Hidalgo County, Date Unknown (Garcia).

The Louisiana-Rio Grande Canal Company was incorporated in 1910 for the purpose of building an irrigation system, selling farm tracts and town sites, and promoting the growth of sugar cane (National Register Nomination Form). The Company originally included porciones 67, 68, 69, 70, 71, and 72, which totaled approximately 40,000 acres (National Register Nomination Form).⁶ Henry N. Pharr, John C. Kelley, A.W. Roth, and John C. Conway organized the Louisiana-Rio Grande Canal Company, which remained in existence until July 16, 1920, when local farmers purchased the company and formed the Hidalgo County Water Improvement District No.2 (HCWID2) (National Register Nomination Form). The HCWID2 remains in operation today as the Hidalgo County Irrigation District No. 2 (HCID2) after changing its name in 1978 (National Register Nomination Form).

The eastern portion of HCID2 is comprised of approximately 32,000 acres originally acquired by Peter Ebenezer Blalock and George T. Hawkins (Garza and Long). In 1909, the land was sold to the Alamo Land and Sugar Company, which was situated on the original Spanish land grants of *Santa Ana*, *Los Toros*, and portions of the *Agostodero del Gato* (National Register Nomination Form).⁷ The town of Alamo was laid out and established in 1919 after previously being called Ebenezer (National Register Nomination Form).⁸

The Rio Grande Watermaster

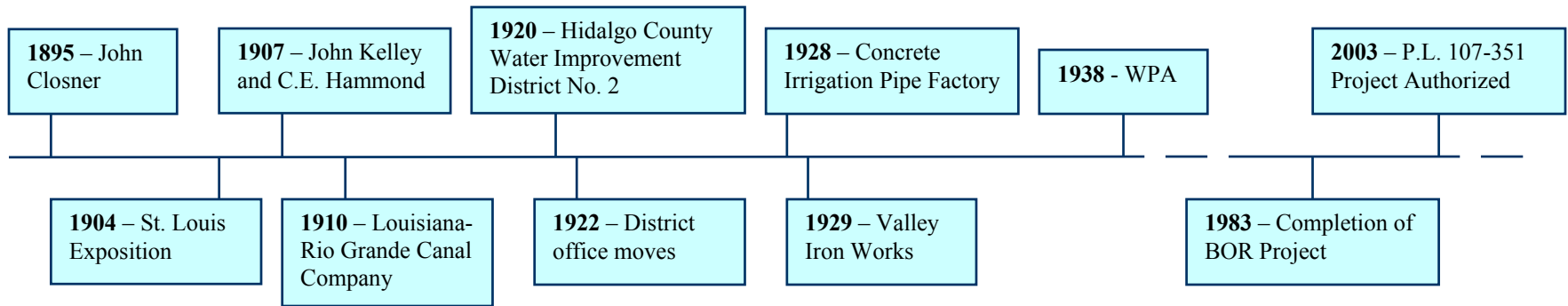
The Watermaster acts as a policing force in controlling and enforcing water rights along the Rio Grande. Operating under Chapter 303-304 of the TCEQ regulations, the Watermaster is required to regulate, monitor, and record the flow levels, patterns, and rates of water being diverted and used within the Watermaster's program area. 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 over 450,000 acres of irrigation water equally (Jarvis). This program

⁶ Porciones 67 and 68 are represented in green in **Figure 1**.

⁷ These grants are represented in blue in **Figure 1**.

⁸ A graphic illustration of key historical events is presented in **Exhibit 1**.



1895 – John Closner begins constructing several miles of canals and laterals on his San Juan Plantation. The current HCID2 Lateral A represents one of Closner’s earliest canals, making it the oldest canal in the District.

1904 – St. Louis Exposition is where Closner won the gold medal for his Rio Grande Valley Sugar.

1907 – John Kelley and C. E. Hammond purchased 20,000 acres of the total 45,000 acres that was to later become the Louisiana-Rio Grande Canal Company. This tract became known as the Kelley-Pharr tract.

1910 – Louisiana-Rio Grande Canal Company was incorporated on February 19, 1910. The first board of directors meeting took place in Brownsville on March 23, 1910.

1920 – Hidalgo County Water Improvement District No. 2 was formed after local farmers purchased the land and assets of the Louisiana-Rio Grande Canal Company. E.H. Griffith was named as the first president of the District.

1922 – District office moves from Pharr to San Juan.

1928 – Concrete Irrigation Pipe Factory begins operation.

1929 – Valley Iron Works bought from Banks Miller. The foundry, now called HCID2 Machine Shop, remains in operation today and uses many of the same techniques that were used in 1929. Remains the only foundry in the Valley to date.

1938 - WPA (Work Projects Administration) **canal improvement project** completed.

1983 – Completion of the BOR (Bureau of Reclamation) **Project** that placed many canals into pipe and relocated the pumping plant downstream to the current pumping site.

2003 – P.L. 107-351 Project Authorized the placement of the Wisconsin canal into pipe and relining of Lateral A with geomembrane and shotcrete (cost share assistance provided by BOR and North American Development Bank).

Sources: Brochu; National Register Form; Hinojosa 2003.

EXHIBIT 1. Key Historical Events Affecting the Organization and Development of the Hidalgo County Irrigation District No. 2 (1895-2003).

worked for only a few years. In 1956, Falcon Reservoir was drained below the desired minimum level, and combined with the lack of enforcement powers by the Watermaster, excessive and illegal pumping occurred along the Rio Grande. A landmark lawsuit ensued, *State of Texas v. Hidalgo County Water Control and Improvement District No. 18* (1969), commonly called the “Valley Water Suit” and took thirteen 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 the *Water Rights Adjudication Act* of 1967. Currently, the TCEQ is the state agency that manages the Watermaster Program. The executive director of TCEQ appoints one Watermaster per division. Currently, 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 2**).

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 right(s) account, 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 and 2004 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.⁹ No-charge water is priced to the districts based upon the type (i.e., water use category) of water and the year diverted.

⁹ 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 the district’s Watermaster-controlled allocation. That is, the district’s annual claim to Rio Grande flows is not reduced by any amount when it diverts under no-charge conditions. Note that no-charge water is not “free” as the district does incur certain costs such as the variable rate assessed by the Watermaster and energy costs to divert the no-charge water from the Rio Grande.

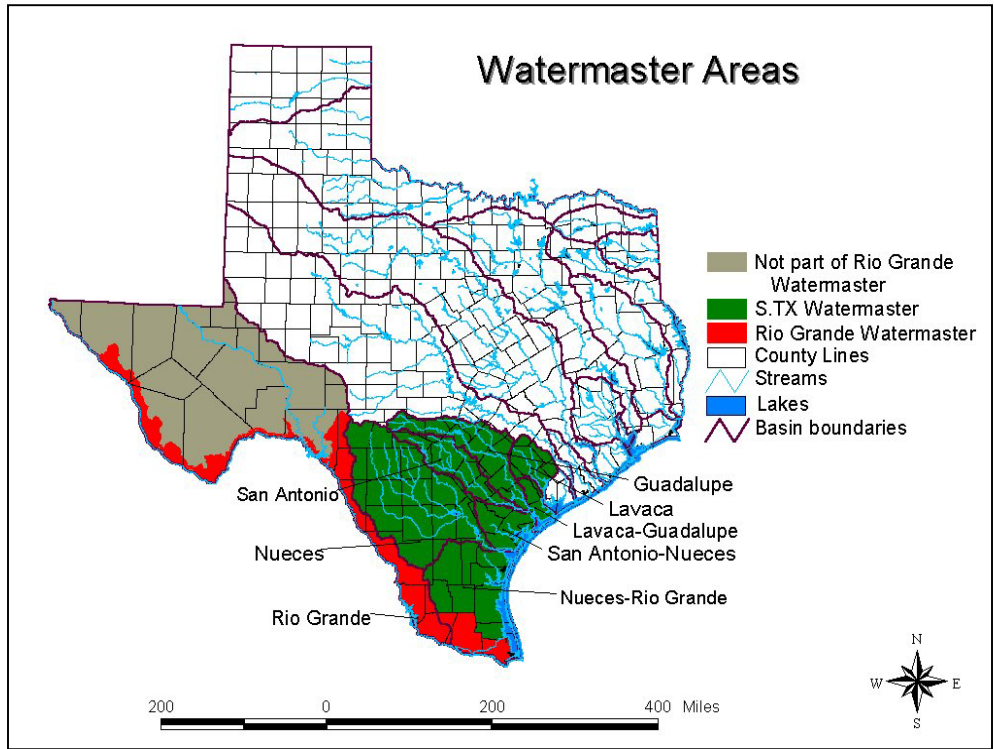


FIGURE 2. Geographical Location of the Watermaster Areas in Texas, 2004
(Texas Commission on Environmental Quality 2004).

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, each who 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., 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 and then again to

TABLE 1. TCEQ Rio Grande Watermaster Variable Assessment Rates for Fiscal Years 2003-2004 (Hinojosa).

Category of Water-Use	Fiscal Year Per Acre-Foot Price ^a	
	2003	2004
Municipal	\$0.2721	\$0.2509
Industrial	\$0.2721	\$0.2509
Irrigation	\$0.2177	\$0.2007
Mining	\$0.2721	\$0.2509
Hydroelectric	\$0.0136	\$0.0125
Recreation	\$0.2721	\$0.2509
Recharge	\$0.1360	\$0.1254
Secondary	\$0.1360	\$0.1254
Salt Water	\$0.0272	\$0.0250
Spreader Dam	\$0.1088	\$0.1003
Livestock/Domestic	\$0.2721	\$0.2509
Storage	\$0.1088	\$0.1103
Stock Raising	NA ^b	\$0.2509
Game Preserves	NA ^b	\$0.2509
Livestock	NA ^b	\$0.0501
Non-consumptive	NA ^b	\$0.2007
Reuse	NA ^b	\$0.1254
Public Parks	NA ^b	\$0.2007
Industrial Non-consumptive	NA ^b	\$0.0501
Multi Use	NA ^b	\$0.2509
Other	NA ^b	\$0.2509

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

^b New water-use category beginning in 2004.

survey the New Mexico-Chihuahua border in 1853. 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 IBC's name to the International Boundary and Water Commission (IBWC) and created additional duties. The 1944 Water Treaty, "U.S.-Mexico Treaty for Utilization of Waters of the Colorado and Tijuana Rivers and of the

Rio Grande,”¹⁰ 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 supply 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 4-9 of the 1944 Water Treaty deal directly with the distribution of the Rio Grande waters.¹¹ Article 4 defines specific allocation procedures from 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).

It is the provisions of sub-paragraph (c) of Paragraph B in Article 4 that has created a recent controversy relating to Mexico’s delivery obligations to the U.S.¹² Though the IBWC operates under broad treaties, specific agreements between the U.S. and Mexican governments come in the form of Minutes.¹³ Recent Minutes from the IBWC are evidence of attempts made to allow Mexico to repay its water debt to the U.S. in a timely fashion. As of January 2005, Mexico owes the U.S. approximately 718,000 acre-feet (ac-ft) of water (White). This number accounts for all of the deliveries from Mexico to date and assumes the minimum payments for the rest of the sixty-month cycle.

¹⁰ Commonly referred to as the 1944 Water Treaty.

¹¹ Excerpts of 1944 Water Treaty that are cited in the text are included in **Appendix G**.

¹² 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.).

¹³ 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).

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 ^a	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, and not named in Treaty	1/2 of Flows	1/2 of Flows
Measured Contributing Flows, and 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.

Chapter Summary

This chapter discussed significant historical events that took place in HCID2. Beginning with John Closser 1895, the HCID2 area has played an intricate role in shaping the Valley's irrigational practices. Many of the past decisions and events have formed 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 the irrigation districts. The requirements of the 1944 Water Treaty dictate the amount of the Rio Grande and its contributing flows that belong 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.

Chapter 2

District Description

The Hidalgo County Irrigation District No. 2 (HCID2) covers 72,442 acres within its 58.47-mile border and delivers water to approximately 31,700 acres of cropland each year (Hinojosa 2004). Though its operation is similar to the operation of other irrigation districts, each district is unique in its makeup and design. Each district is dependent upon the topography, infrastructure, past financial decisions, and the district's distinct individual surrounding area. HCID2 is no exception. With its large land coverage and advanced technology, HCID2 represents only one of the 29 different irrigation districts in the Valley.

First discussed in this chapter is HCID2s use of technology. HCID2 utilizes some of the most advanced systems found among irrigation districts in the Valley. Though all irrigation districts must adhere to the same rules and regulations, how and where each district diverts its water from the Rio Grande is exclusive to that individual district. The second section describes the water's release from Falcon Reservoir to HCID2s diversion point and into the District's system. As with all systems, there is a continuous need for maintenance and repair. Discussed in the third section are the most recent improvements to the District's water-delivery conveyance system. 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 HCID2 water-delivery system consists of both above-ground 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 its technology in order to improve operational efficiency.

In January of 2001, HCID2 purchased the SCADA (Supervisory Control and Data Acquisition) system and Wonderware® software program. These technologies permit the control of numerous aspects of water-delivery operations by remote radio contact and phone activation (Hinojosa 2004). The District uses SCADA to operate the river pumps, to operate one gate at the reservoir, and for monitoring water elevations at several locations.¹⁴ The SCADA system is an industrial control system that operates field equipment remotely, in this case by radio frequency and telephone line. The Wonderware® software is based upon the use of a system of “tags” that are specific to the operation being performed. These tags can be purchased for varying amounts of money, depending on the operations being performed.¹⁵ One tag allows you to perform one function or to activate/deactivate one piece of electronically operated equipment. For example, turning a switch on at a particular pump requires one tag. Turning the switch off again will require the use of another tag. If a pump operator wants to remotely view the amount of water being pumped at the Rio Grande pump station or at a lift point in the delivery system, another tag is required, and so forth.

The use of this technology appears to be expensive when one considers only its initial investment and set-up cost. The first phase of the SCADA system was \$50,000 (Hinojosa 2004). This phase included 10 sites (i.e., the 10 river pumps). The implementation of the new system was a result of unexpected river pump problems. Debris from the river and damage to pumps created the need for pumps to be monitored on a continuous basis (Hinojosa 2004). The installation and system set up is custom designed to meet the needs and requirements of HCID2. This process took approximately two to three weeks to complete. The first phase operates through a telephone line (or dial-up system). The system allows for each pump to be monitored by a computer that measures voltage, amperage, run time, amount pumped, and other factors. If a problem is detected within the system, the computer can be programmed to autodial up to 10 phone numbers.¹⁶ Once a contact is made, the computer provides the listener a code number that describes why the system failed. **Exhibit C2** illustrates the SCADA screen that is used to monitor each pump.

¹⁴ See **Exhibit C1** for an illustration of a SCADA overview screen used to monitor water levels and river pumps.

¹⁵ A “tag” is simply an operating function of the system. Each tag allows you to perform one function (e.g., turn on a pump, turn off a pump, open a gate, etc.). The number of tags purchased from the software company denotes a form of “licensing” that limits the number of functions performed by the system.

¹⁶ The computer will call the first telephone number on the programmed list and, if no one picks up, the computer calls the second number and so forth.

The second phase of technological improvements by the District expanded the use of the SCADA system to include: operating one reservoir gate, and monitoring the river elevation, basin elevation, and the second lift elevation (Hinojosa 2004). This phase is operated by radio frequency. These upgrades were made to improve monitoring efforts within the District (Hinojosa 2004). Future projects aimed at improving District operations with advanced technologies are planned. They are somewhat dependent, however, upon potential funding from the Legislature or other sources (Hinojosa 2004).

The system is monitored by the river pump operator and the second lift supervisor during the day. Weekend and evening operations are monitored on a rotation basis by second lift employees. HCID2 has at least 1-2 river pumps running on any given day (Hinojosa 2004). This continuous pumping requires continuous monitoring, which is made easier by the SCADA technology.

Diversion From the Rio Grande

HCID2 is located approximately 110 miles southeast of Falcon Reservoir (Hinojosa 2004). To request water from Falcon Reservoir, the District manager must contact the Rio Grande Watermaster and request a diversion certification. The Watermaster's office reports a 2 ½ to 3-day travel time to deliver water from the Falcon Reservoir to HCID2s point of diversion on the river. Extended travel times caused by aquatic weeds and low flow in the river have not affected HCID2 as much as other irrigation districts located further downstream (Hinojosa 2003).

HCID2s diversion point is located 1.8 miles downstream from the Hidalgo-Reynosa Bridge in downtown Hidalgo, directly on the Rio Grande (Hinojosa 2004). The water must first flow through a screen approximately 100 feet in front of the intake pipes. The floating barrier and submersed screen are used to keep aquatic weeds and debris from entering the intake pipes and potentially damaging the pumps and motors. There is a concrete bottom below the screen and intake pipes that requires silt removal approximately three times each year (Hinojosa 2003). Water enters the pumping facility through ten intake pipes, each measuring 72 inches in diameter. These intake pipes lead to the ten Aurora Vertical pumps driven by Westinghouse motors located directly alongside the Rio Grande (Hinojosa 2003).

The pump house contains all ten pumps that lift the water from the Rio Grande approximately 33 feet (**Exhibit C3 and C4**). Each pump is rated at 68 cfs¹⁷ and has a 400 horsepower electrical motor. These pumps were installed in 1983 as part of the Bureau of Reclamation (BOR) project (Hinojosa 2004). The HCID2 pump house is among the newer irrigation district pumping facilities found in the Valley (Hinojosa 2004).

The least amount of water HCID2 can extract from the river at any one time is around 50 cfs. The District does not typically operate more than six pumps at one time, making the typical peak pumping capacity 408 cfs (Hinojosa 2003). Running pumps are usually spaced apart from one another so as to maximize the amount of water pumped.¹⁸ The pumping plant operator rotates the use of each pump (Hinojosa 2003).

According to TCEQ rules, the Rio Grande Watermaster administers regulatory functions along the Rio Grande pertaining to diversions.¹⁹ The Watermaster records and certifies each diverter (i.e., irrigation district) along the Rio Grande based on §303.11 (TCEQ).²⁰ Each diverter must first have an authorized diversion site (TCEQ §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 the pump that will be used in the diversion process (TCEQ §303.11.b).

The diverter is also responsible for providing, maintaining, and operating meters that accurately measure the amount of water being diverted (TCEQ §303.11.e). HCID2s Rio Grande diversion meters are located directly behind the pump house and before the water runs into the feeder canal (**Exhibit C5**). Transducers are attached a discharge pipe and measure the amount of water being pumped (**Exhibit C6**). This data is recorded daily (when pumping) and sent to the Watermaster to document the amount of water being diverted from the Rio Grande by HCID2 (**Exhibit C7**).

A district is charged for its diversions according to the policy schedule found in **Table 3**. Water diverted between 90% and 110% of the amount requested is charged to the district at the requested amount (TCEQ §303.12.e.1). If a district pumps less than 90% of what was requested from the Watermaster, it is still charged 90% of that request

¹⁷ Cubic Feet Per Second (cfs).

¹⁸ When two pumps are running side-by-side during a low flow period, they will compete with one another for water, causing inefficient pumping. Inefficient pumping is when the pump is not meeting its maximum cfs level because the combination of water and air lowers the suction pressure. To prevent this phenomena, pumps are operated on an “every other one” interval.

¹⁹ “Diversions” and “pumping” are used interchangeably in this section.

²⁰ Excerpts of TCEQ Rules and Regulations that are cited in the text are included in **Appendix F**.

(TCEC §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% of the requested amount, then the district is charged for the exact amount of water that was pumped and could face penalties for this violation through the Watermaster (TCEQ §303.12.e.3). This rule is intended to discourage the diverting of requested water for downstream users.

TABLE 3. TCEQ 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%	100% of Request
> 110%	Actual Amount Diverted

Water-Delivery Infrastructure System

From HCID2s pumping facility, water travels through a discharge pipe, past a head wall, and into a feeder canal (**Exhibit C8**). The feeder canal allows for silt deposits to settle before the water moves into the settling basin. The HCID2 Settling Basin is 350 surface acres and holds approximately 1,700 acre-feet of water (Hinojosa 2004). The basin is approximately 4-5 feet in depth and is the only large storage reservoir within the District. The reservoir feeds Lateral A and the Main Canal. Lateral A is a concrete lined canal that travels eastward and services the southern portion of the District.²¹ The Main Canal is an earthen canal that travels north 5 ½ miles before it reaches the second lift. The one gate that separates the basin from the Main Canal is operated remotely through the SCADA system using radio frequency. The pump operator can monitor this gate from either the river or the second lift (**Exhibit C9**).

The second lift is the only relift within the HCID2 water-delivery infrastructure system (**Exhibit C10**). The lift includes six Aurora Vertical pumps that were purchased in 1983. Each pump has a 350 horsepower General Electric motor and is rated at 68 cfs. The pumps lift the water approximately 25 feet into both the Main Canal and pipelines that feed the remainder of the District.

²¹ Lateral A is one of the projects financially supported by the Bureau of Reclamation and the North American Development Bank in 2003. This project is discussed further in the ‘Improvements and Maintenance to the System’ section.

Once the water is relifted, it moves into gravity-flow infrastructure that delivers water to end-users. This gravity-flow approach allows the District to capitalize on nature's engineering to move water throughout the District with few relift pumps. HCID2 has more than 23 miles of lined canals, 47 miles of unlined earthen canals, and 239 miles of underground pipeline (Rister et al.) (**Figure 3**).

Improvements and Maintenance to the System

Similar to many large-scale operations that rely heavily on infrastructure, repairs and maintenance are necessary for HCID2s water-delivery system. In addition to daily maintenance, the water transportation system is continually being updated with improvements that will streamline HCID2s 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 HCID2 to schedule an ideal time for maintenance and repairs.

Along with maintenance and repairs, HCID2 is continually improving and updating its water-delivery system. In 1983, the District completed a \$20.6 million improvement project with the BOR (Hinojosa 2004). The 8½ year project placed several canals underground, lined other canals, and relocated the river pumping plant from the City of Hidalgo to its current location. HCID2 repairs canals, laterals, pipelines, and other infrastructure (e.g., pumps, gates, etc.) as needed (subject to financing limitations) throughout the District as part of continuous maintenance. HCID2 occasionally seeks federal assistance for larger improvement projects that require more funds than typical maintenance repairs (Hinojosa 2004).

In 2000, Congress enacted "The Lower Rio Grande Valley Water Resources Conservation and Improvement Act of 2000" (P.L. 107-576) which authorized the BOR to commence with the capital improvement projects of four irrigation districts in the Valley. In 2002, fifteen additional projects were authorized under House Resolution 2990, also known as the "Lower Rio Grande Valley Water Resources Conservation and Improvement Act of 2002 (P.L. 107-351)." HCID2s Lateral A and Wisconsin Canal Project were among the fifteen projects identified in 2002.

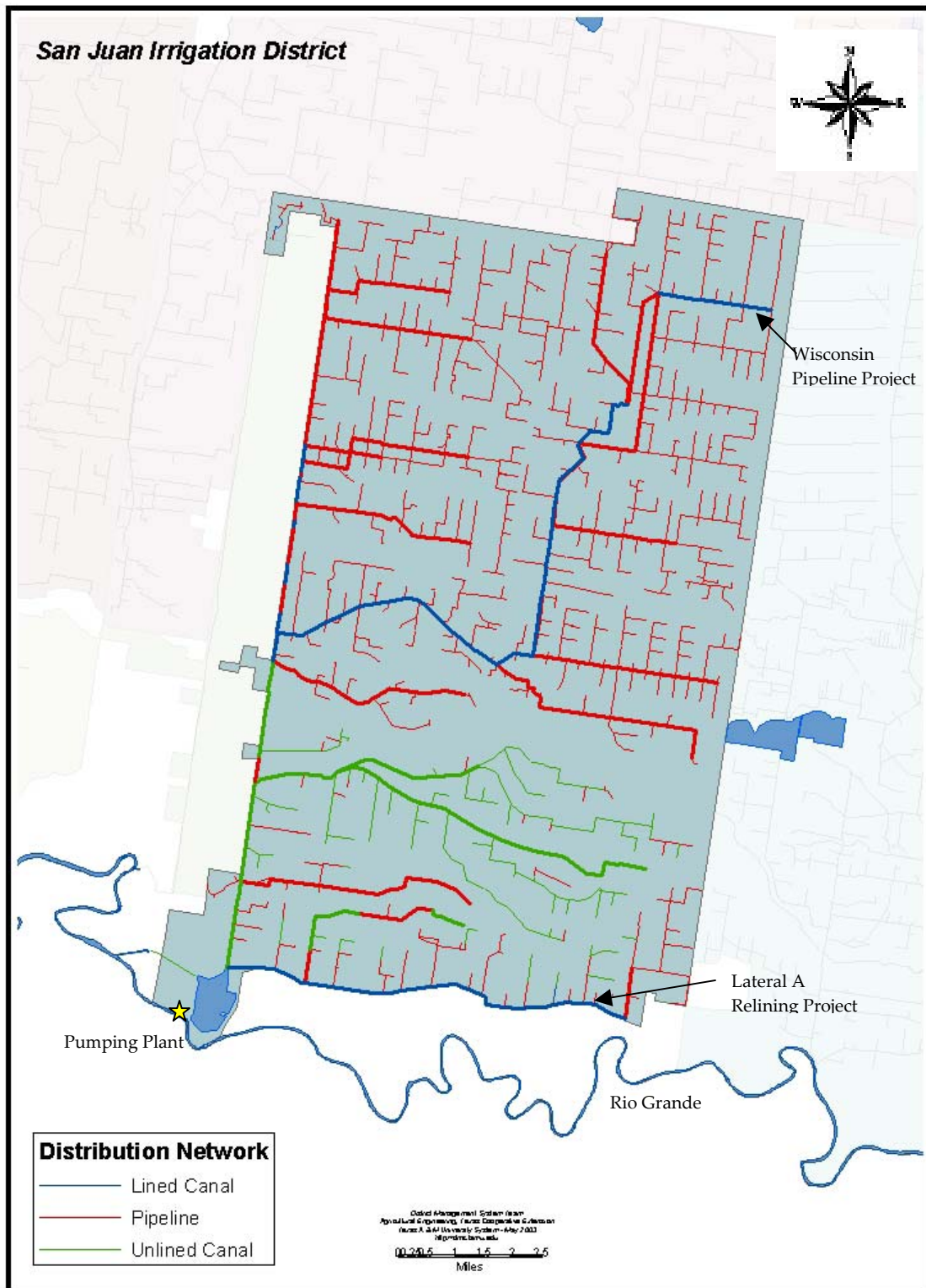


FIGURE 3. Illustrated Layout of Hidalgo County Irrigation District No. 2, Highlighting the Layout of Key Water-Delivery Infrastructure, 2003 (Fipps et al.).

In addition to the above legislation, the North American Development Bank (NADB), which is a bi-national development bank between the U.S. and Mexico, created the Water Conservation Investment Fund (WCIF) in 2002. The WCIF allocated \$80 million (\$40 million for the U.S. and \$40 million for Mexico) for the purpose of water conservation for the border region on both sides of the Rio Grande. HCID2 submitted its application to Border Environment Cooperation Commission (BECC) and received preliminary notification from NADB of a \$586,383 grant to be used for the Lateral A Project and a \$600,000 grant to be used for the Wisconsin Canal Project in 2003 (Hinojosa 2004). Both projects are now complete.

Lateral A Project

The project consisted of improvements to the 7.26-mile Lateral A that runs along the southern border of the District and serves 6,640 acres. Prior to this rehabilitation effort, the lateral was concrete lined and leaking. It was originally constructed in 1911 and last renovated in 1986 (Border Environment Cooperation Commission). The project consists of relining the lateral with a geomembrane liner and a 3-inch shotcrete covering, and reconstructing farm turnouts to facilitate water monitoring (Rister et al.). The membrane lining is a combination of a geomembrane and geotextile that reduces the seepage rate, with an approximate 50-year life (Border Environment Cooperation Commission). The membrane reduces seepage and is covered with shotcrete for clean-out tasks. Construction began September 2004 and was complete by the end of 2004.

Wisconsin Canal Project

The Wisconsin Canal Project was a 2-mile pipeline replacement in the upper Northeast portion of the District that serves 1,872 acres (Border Environment Cooperation Commission). A 48-inch flexible joint reinforced-concrete pipe replaced the previous concrete-lined canal. The pipe was buried alongside of the original canal within the right-of-way (Border Environmental Cooperation Commission). Farm turnouts were also replaced, to facilitate the monitoring of water use (Rister et al.). The new pipeline has a projected useful life of 50 years and construction of the pipeline was completed by the end of 2004.

Cropping Patterns and Water Use Trends

Cropping patterns in HCID2 have shifted over the last few years away from planting one crop per year to planting two to three crops per year on the same land. This has caused an increase in overall water use, even though total irrigated acreage is

declining. Currently, HCID2 irrigates approximately 29,000²² physical acres throughout the year (Hinojosa 2004). According to **Table 4**, farmers are moving away from cotton toward more profitable vegetable crops. See **Figure 4** for an illustration of this trend.

Approximately 79% of the District's irrigated acreage utilize furrow irrigation (Rister et al.). There are 32 acres that use sprinklers and 358 acres that use drip tape (Hinojosa 2004). Only a few farmers utilize the polypipe, gated pipe, drip irrigation, etc. A special turnout feature is required for such systems and is provided by the District for a fee (Hinojosa 2003). The most heavily irrigated sections of the District lie in the southern portion.

Water Rights

There are two separate types of surface water accounts within the State of 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 subcategories of irrigation water rights were identified: Class A and Class B. Class A rights were given to those entities who could prove prior documented water rights (i.e., riparian, prior appropriation, or Spanish/Mexican land grant). Class B rights were awarded to those entities who could only prove a history of diversion from the Rio Grande.

HCID2 currently has a right to 137,675 ac-ft of Class A irrigation water rights (Hinojosa 2003). This is roughly 9.8% of the total irrigation water rights below Fort Quitman. They also own 12,732 ac-ft of DMI water rights and 100 ac-ft of mining water rights (Hinojosa 2003). The DMI and Municipal water rights are used to supply water to the City of Pharr, the City of McAllen, North Alamo Water Supply Corp, the City of Jan Juan, the City of Alamo, and the City of Edinburg. See **Table 5** for a detailed list of the municipalities served.

²² This number is lower than the reported average 31,700 of cropped acreage, with the 31,700 acres including acreage that is double and triple cropped.

TABLE 4. Total Acreage Irrigated for Fiscal Years 1999-2003 (Hinojosa 2004 and Rister et al.).

Crop	Fiscal Year ^a					5-Year Average	Percentage of 5-Year Total
	1999	2000	2001	2002	2003		
Vegetable	9,315	9,056	9,611	9,408	9,591	9,396	30.0
Sorghum	6,854	7,047	6,779	7,298	6,414	6,878	22.0
Cotton	6,246	4,093	4,716	3,221	3,358	4,327	13.8
Corn	3,612	3,736	3,547	2,606	2,992	3,299	10.5
Fruit	1,675	1,579	1,530	1,532	1,072	1,560	5.0
Hay	1,252	1,667	1,444	1,654	1,049	1,435	4.6
Sugarcane	1,462	1,442	1,380	1,165	1,049	1,300	4.1
Melons	1,587	705	1,409	1,537	1,072	1,262	4.0
Pasture	1,000	996	1,102	1,257	760	1,023	3.3
Lawn/Golf Course	619	617	561	489	361	529	1.7
Other	516	177	342	355	215	321	1.0
Total	34,138	31,115	32,421	30,522	28,456	31,330	100.0

^a The fiscal year begins January 1 for HCID2.

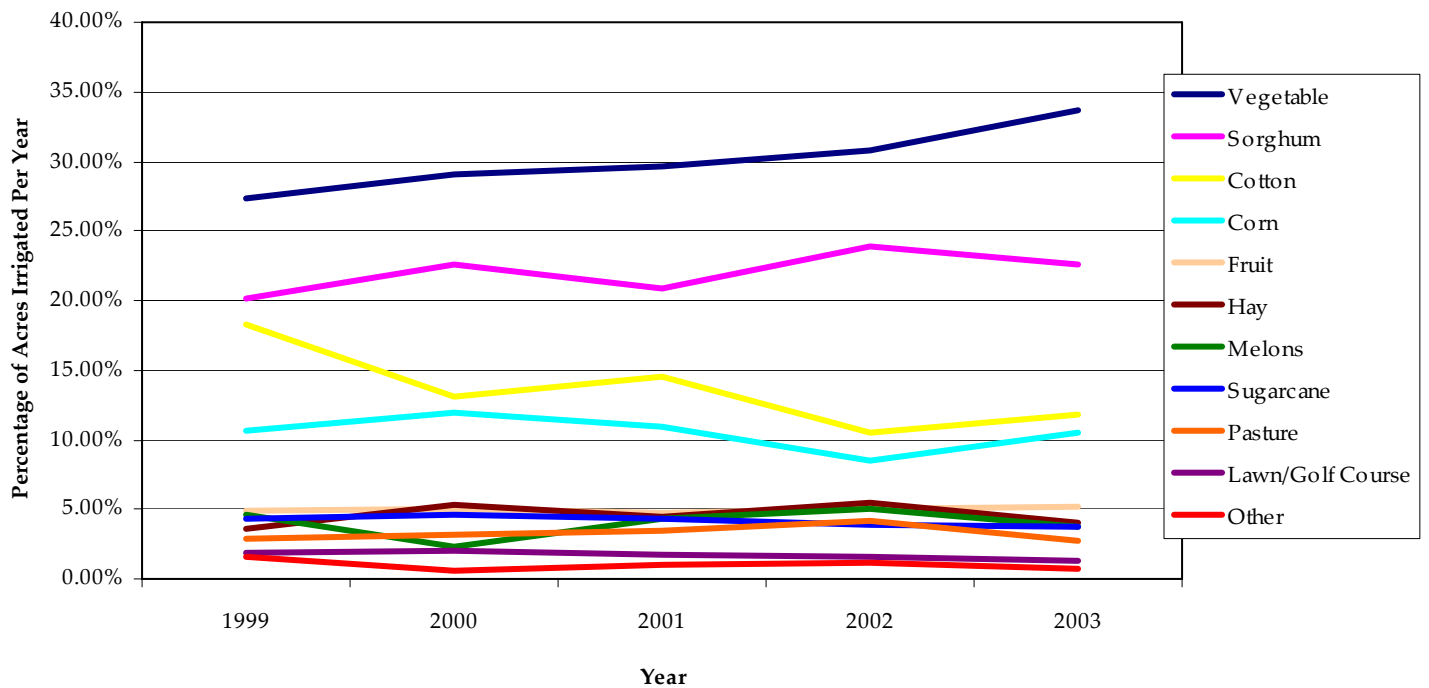


FIGURE 4. Graphical Illustration of Percentage of Total Acreage Irrigated Per Year for Fiscal Years 1999-2003 (Hinojosa 2004 and Rister et al.).

TABLE 5. Summary of Total Delivery to Municipalities for HCID2 (Hinojosa 2003).

Municipalities Served	Total Delivery in ac-ft
City of Pharr	8,320.44
City of McAllen	7,640.00
North Alamo Water Supply Corp	3,399.80
City of San Juan	2,706.74
City of Alamo	1,650.23
City of Edinburg	<u>1,556.65</u>
<i>Total</i>	25,273.86

The sale of any water rights must be approved by a vote of the 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 number of irrigation water rights owned by the district. Unlike municipal water rights that are given priority and are reset 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 factor²³ (i.e., two ac-ft of irrigation water rights are required to obtain one ac-ft of DMI water right).

Urban Areas

Several urban areas lie within the HCID2 boundaries. The cities of McAllen, Pharr, San Juan, and Alamo have populations that total approximately 216,000 (U.S. Census Bureau). With Highway 83 running through the center of the District, the cities are expanding along that corridor to the north and south. According to Hinojosa (2004), 88 subdivisions petitioned for exclusion in 2003.

²³ For further information regarding DMI conversion, see Chapter 2, page 18, in “Evolution of Irrigation Districts and Operating Institutions: Texas, Lower Rio Grande Valley” (Stubbs et al.).

If a subdivision is to be built inside of current District boundaries, the development company is required to obtain approval from HCID2 prior to building. This approval is to ensure that development will not occur on any of the District's easements or rights of way. If the land were excluded, the water rights would be converted to DMI use and made available to the water provider for that area. The water rights are not attached to the land, but rather are still owned by HCID2. The newly converted DMI water (not the water right) is made available for sale in the same manner that other municipal supplier accounts are handled.

For a subdivision to be excluded from the district, it must petition. Under §58.702-§ 58.713 of the Texas Water Code, 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 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 Water Code §58. 708) and the Board of Directors must conduct an open hearing for all parties involved (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 Water Code §58. 710).

Due to the costs associated with this process, HCID2 has instituted an application fee of \$50 per petition to all developers that desire to have their land excluded. Petitions for exclusion are collected throughout the year and one formal exclusion hearing is conducted annually. 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. Because most development areas are developed into less than one acre lots, they are excluded automatically without having to file an application with the district.

Chapter Summary

This chapter provides a descriptive overview of the Hidalgo County Irrigation District No. 2. First, the advanced technology that HCID2 employs allows for increased control and monitoring throughout the entire District. Also discussed is the water's release from Falcon Reservoir to HCID2s diversion point and into the District's system. HCID2 utilizes a 350-acre Settling Basin, 23 miles of lined canals, 47 miles of unlined canals, and 239 miles of underground pipeline. Infrastructure is only one aspect of the District. Also discussed are cropping patterns, water use, water rights and urban areas. All of these elements of the District were discussed such that the reader is provided a

“picture” of HCID2, thereby enabling an informative “look” into this District, as well as a base to compare to other irrigation districts.

Chapter 3

District Operation

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 implementation thereof and mechanisms employed may vary significantly from district to district.

This chapter discusses the operating practices of the Hidalgo County Irrigation District No. 2. 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 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 distinct aspects of a district. Finally, other special water districts that operate near HCID2 and the water conservation efforts in which HCID2 participates are discussed.

Organizational Hierarchy

HCID2 currently employs a total of 40 permanent employees and 10 seasonal employees (**Exhibit 2**). In addition, five board members comprise the Board of Directors and serve as elected officials that preside over the District. One General Manager supervises the operations of the District and is hired by the Board of Directors. The General Manager oversees the day-to-day operation of the District. The water operations department consists of 9 canal riders with one supervisor (i.e., Water Superintendent). Four employees are responsible for the operation of the pumping plants; one is in a supervisory role, two employees operate the second lift pump, and one employee operates the river pump. Operation of the river pump requires only one individual due to the increased use of technology to operate and monitor the pumps

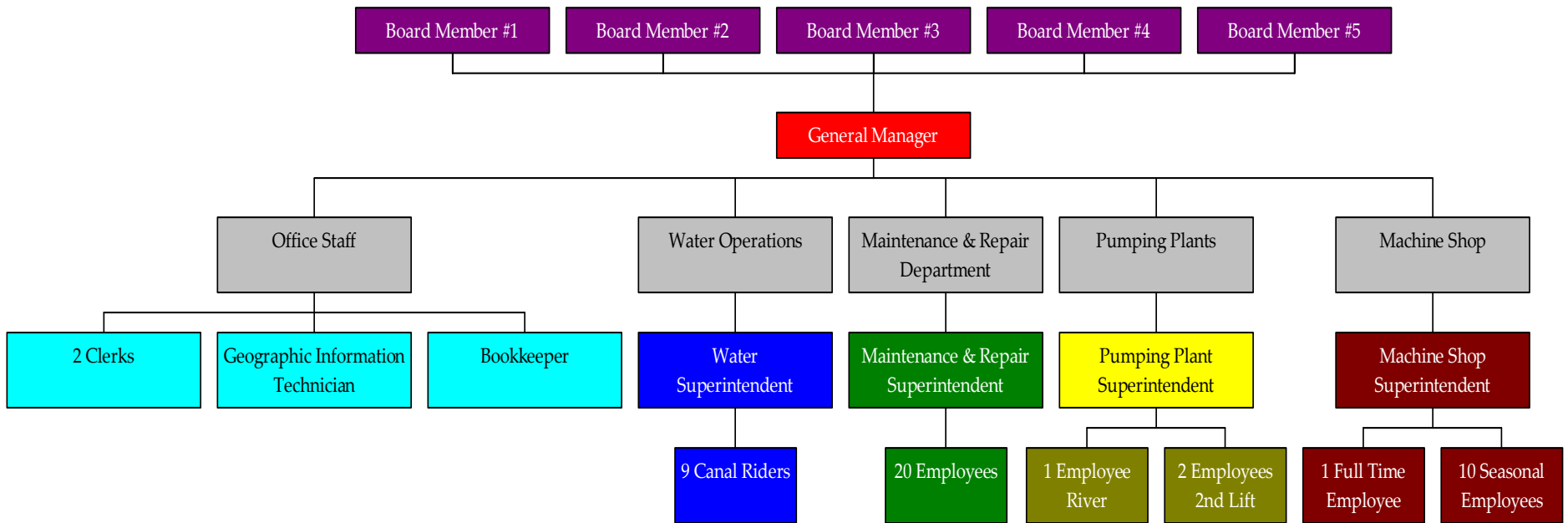


EXHIBIT 2. Hidalgo County Irrigation District No. 2 Organizational Chart, 2004 (Hinojosa 2004).

remotely. The office staff consists of two clerks, one Geographic Information Systems (GIS) technician, and one Bookkeeper. The maintenance department includes twenty employees and one supervisor. The machine shop (or foundry) employs only two fulltime year-round employees along with 10 seasonal employees during the winter months when the foundry is in full production (Hinojosa 2004).

Board of Directors

According to the Texas Water Code §58.071, a district's Board of Directors is a governing body that must consist of five individuals. All Board of 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 Water Code §58.072). Currently, five directors, all actively engaged in the agricultural profession, oversee the HCID2 (**Figure A4**). An at-large board election is held every year ending with an even number, and on the first Saturday in February (Hinojosa 2004). In February 2004, three board members were up for re-election; however, none were contested. If no one contests a current director(s) up for election, they are elected without contest and serve another 4-year term (Hinojosa 2004). The longest serving member has served since 1978. HCID2 has not had a board election since 1983 (Hinojosa 2004).

The Board of Directors set policy and vote on improvement projects within the district. Each project must win a majority of the votes to be implemented. Projects are first presented for consideration to the Board several months before there is a vote. Information is evaluated from a financial standpoint of whether adequate funds are available for a project to take place (Hinojosa 2004).

Allocation Procedures

As mentioned in the previous chapter, every irrigation district in the Lower Rio Grande Valley owns a certain 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) (TCEQ §303.21.b). The Watermaster allocates water using the following steps:

- 1) From the total usable storage of the Falcon and Amistad reservoirs, as reported by the IBWC, the dead storage²⁴ is deducted;
- 2) From the remaining amount, the 225,000 ac-ft of water that acts as the DMI reserve is deducted. This reserve is re-established at the end of every month;
- 3) Next the 75,000 ac-ft of operating reserve²⁵ is deducted; and
- 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 previous ending monthly balance for the irrigation account holders.

When the District needs water to be released from Falcon, 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 water that is requested from the Watermaster by a district is not diverted into the district system from the river, then 90% of the loss is 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.). Water loss that occurs during travel from Falcon 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. HCID2 has approximately 4,000 irrigation accounts (Border Environment Cooperation Commission). According to Hinojosa (2004), the HCID2 is not currently on allocation within the District.²⁶ Allocation procedures are in place in the event of severe water shortage. These allocation procedures are located in **Appendix D**.

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

²⁴ Dead storage is the amount of water behind the dams that cannot be removed because of hydrologic restrictions (TCEQ §303.22.a). This amount is not specified in §303.22.a.

²⁵ Operating reserve covers seepage, evaporation, and conveyance losses, and emergency requirements (TCEQ §303.21.c).

²⁶ When a District is not on allocation, farmers can purchase as much water as they would like, without quantity restrictions. The last time that HCID2 allocated water was on June 8, 1998 and on October 15, 2000.

the river at “no charge” to the district’s surface water account (Stubbs et al.). Currently, HCID2 takes advantage of no-charge water availability to refill the storage basin as well as for current irrigation needs (Hinojosa 2004). HCID2 is continuously pumping, therefore no-charge water is used throughout the system in place of irrigation water that would otherwise be ordered from the Watermaster’s office and charged toward the District’s account.

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 45 cfs of water to be released as no-charge and HCID2 has the capacity within their system to store the water, the General Manger can respond to the notice and begin pumping when notified by the Watermaster.

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. This does not mean that they sell the actual water right, but rather the water attached to that right for the authorized year. In order for a contractual sale, also know 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 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 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 (TCEQ §303.51).

There are two different types of water transfers, in-district and out-of-district. As discussed previously, farmers are not allocated water in HCID2. Therefore, a farmer does not have an individual account to which they are allocated water. The water that is purchased by a farmer within HCID2 is not allowed to be resold within the District or outside of the District with one exception (Hinojosa 2003). If a farmer within HCID2 owns water rights and wishes to have the water from those rights delivered to land outside of the District, there is a delivery fee of \$10.00 per acre. HCID2 does sell water outside of the District to other irrigation districts and producers.²⁷

District Revenue and Sales

Irrigation districts have several ways of generating revenue. They have the ability to tax land within the district, raise bonds, and set variable charges for water, transportation fees, penalty fines, flat rate fees, etc. HCID2 has not increased its rates since 1992 (Hinojosa 2003). HCID2s pricing structure is summarized in **Table 6**.

TABLE 6. Hidalgo County Irrigation District No. 2’s Pricing Table, 2004
(Hinojosa 2004).

<i>Irrigation</i>	<u>In-District</u>	<u>Out of District</u>
<ul style="list-style-type: none"> • Flat Rate • Variable Rate 	\$8.25 per acre \$7.50 per acre	NA \$10.00 per acre ^a
<i>Lawn-Watering</i>	\$15 per watering	NA
<i>Municipal</i> <ul style="list-style-type: none"> • Delivery Charge 	NA	\$0.085 per 1,000 gallons (\$27.70 ac-ft)
<i>Other</i> <ul style="list-style-type: none"> • Contract Water 	NA	\$25.00 Irrigation ^b \$50.00 DMI ^b \$100 Mining ^b

^a The water right must be owned by the landowner.

^b Charges apply for water contracted to be delivered outside of the District.

²⁷ These sales are determined by the Board of Directors and are discussed further in the ‘District Revenue and Sales’ section. Note that this is the sale of water rather than the sale of water rights.

The HCID2 assesses land within the District an annual flat-rate maintenance and operations fee of \$8.25 per acre, plus a variable rate charge of \$7.50 per acre per watering (approximately 0.5 ac-ft) (**Table 5**). For the first irrigation, this equates to a charge of \$15.75 (i.e., \$8.25 + \$7.50). Further, for residences with existing lawn watering hookups, the District charges \$15.00 per watering (**Table 5**). For water delivered outside the District (but using the District's delivery system), a \$10.00 per acre irrigated delivery charge is made only if the landowner owns the water right.

Irrigation Water Accounts

Water-use within HCID2 is not metered, meaning every farm gate opening does not have a meter attached to it that measures the exact amount of water that is delivered to the field. The District intends to monitor the turnouts coming off of Lateral A and the Wisconsin canal as part of the rehabilitation project. The District is responsible for monitoring the water use for this purpose (Hinojosa 2004).

Farmers purchase a water ticket from the District office and schedule a time and date for the irrigation to take place. Farmers can purchase as many as three water tickets at a time because farmers within HCID2 are not on allocation. There is a minimum 3-day notice requirement for all water deliveries.²⁸ At the designated time, the canal rider opens the farm gate to release the water onto the field. Canal riders determine, at the farm gate, how much water is placed on a field to equal one irrigation (or approximately 0.5 ac-ft).

It is the farmer's responsibility to have borders erected around the field prior to irrigating. A border is simply mounded soil surrounding the perimeter of the field to prevent runoff outside the irrigated acreage. If water spills outside the intended irrigated area, a fine of 6 times the \$7.50 rate for water (i.e., a total of \$45.00) per acre lost to waste is levied and also results in the shut off of water whether or not the full amount of water has been applied. This penalty is to prevent the wasting of water and only rarely happens according to Hinojosa (2003). If a ticket is not purchased and a landowner is not authorized to take water, they could be fined a maximum of \$200 or 30 days imprisonment or both. Offenders are billed for 6 times the cost of irrigation water (i.e., \$45.00).

Providing delivery of irrigation water to farmers within the District's boundaries is only one priority of HCID2. There are other options to generate additional revenue

²⁸ This notice time assumes a 2.5-day travel time from Falcon and a 0.5-day travel time within the District's system.

after obligations to the farmers within the District have been met. For example, one additional service that HCID2 can provide is allowing account holders who own their own water rights to use HCID2s infrastructure to pump and deliver their water for a fee. This fee is known as a delivery charge and is currently set at \$10.00 per acre.

Municipal Water Accounts

Another revenue source for the District is the selling of water to municipalities within the Valley. HCID2 delivers the most municipal water of all 29 irrigation districts (Hinojosa 2003). It delivers raw water to five municipalities and one water supply corporation. Some of the municipalities own their own water rights, but not the infrastructure required to deliver water from the river and instead rely on HCID2 to provide delivery services. In these instances where the municipality or water supply corporation owns their own water right, they pay HCID2 a delivery charge for the use of HCID2s delivery system. If the municipality or water supply corporation does not own enough water rights to meet the needs of its customers, it will purchase raw water²⁹ in addition to the delivery charge from HCID2.

HCID2 delivers water to the cities of Pharr, McAllen, San Juan, Alamo, and Edinburg, as well as the North Alamo Water Supply Corp. HCID2 holds contracts with these municipalities and water supply corporation for water supply. The contracts are broad based and refer to developmental easements, right-of-ways, and conversion of irrigation water to municipal when land is developed (Hinojosa 2004). Contracts do not specifically address compensation measures for these conditions (i.e., fixed water prices) (Hinojosa 2003). HCID2 is not the exclusive supplier of raw water to its municipal customers as many have supplemental contracts with other irrigation districts for the delivery of raw water.

HCID2 provides each municipality and water supplier with a contracted amount of water. The District does not convert water rights from irrigation to municipal on an annual basis. Conversions take place, on average every 5 years and in increments of 5,000 ac-ft DMI rights³⁰ (Hinojosa 2003). The infrequency of this process is for two reasons: (1) because the conversion factor of 2-to-1 reduces the base amount of water rights that allocations are based upon,³¹ and (2) because any water remaining in a municipal water account at the end of the year is lost according to the Watermaster's rules (i.e., simply goes unused when it could be sold) (Hinojosa 2003).³²

²⁹ A one time flow of water rather than the water right.

³⁰ I.e., 10,000 irrigation rights, because of the 2:1 conversion factor.

³¹ See 'Allocation Procedures' section, page 27.

³² Municipal water accounts are refilled at the beginning of the water year, whereas irrigation accounts are continuous and are not refilled every year. Irrigation districts attempt, as a normal order of

Lawn-Watering Accounts

Separate from delivering water to municipalities and the water supply corporation, HCID2 has 77 lawn-watering accounts (Hinojosa 2003). Lawn-watering accounts are established for residents that are both inside and outside of the District boundaries.

Lawn-watering accounts allow residents to connect to waterlines for the purpose of watering their lawns. Residents who are currently connected to the HCID2 system are charged \$15.00 per lawn watering and must purchase a watering ticket prior to watering. Similar to irrigators, if a ticket is not purchased and a landowner is not authorized to take water, they could be fined a maximum of \$200 or 30 days imprisonment or both. Typically, offenders are billed for 6 times the cost of irrigation water (i.e., 6 x \$7.50 = \$45.00). If a lawn water refuses to pay the amount fined, they are disconnected from the system. Currently, HCID2 is not expanding any lawn-watering accounts (Hinojosa 2003). Once land changes ownership, the account is abolished and the line is cut off from the system.

Other Special Districts

Drainage within the HCID2 area is the responsibility of the District if it is agricultural related. Run-off from fields and pastures is captured in ditches owned and maintained by HCID2. Due to urban growth and the exclusion of areas from the District, either the city or county takes over drainage maintenance for such properties. HCID2 collaborates with city and county officials to either sell the easement to the party that will maintain the drainage ditch, or contracts with one of the parties for the District to continue maintaining the ditch (Hinojosa 2003). HCID2 has no legal responsibility, however, to maintain any ditch after it has been removed from the District's boundary and taken out of agricultural use. Hidalgo County Drainage District No. 1 covers the entire HCID2 area. They are responsible for the drainage needs within the area that are not related to agriculture (Hinojosa 2004).

business, to sell all of the water in their municipal accounts before the year's end because they will be refilled according to the Watermaster's rules. Any water remaining in Municipal accounts at the end of the year thus represents lost revenue for the District.

Foundry

HCID2 has a very unique operating branch within its purview of operations. Located behind the HCID2 office headquarters is a fully operational foundry. The District purchased the foundry in 1929, then called Valley Iron Works, from Banks Miller. Today, the foundry, now called Hidalgo County Irrigation District No. 2 Machine Shop (Machine Shop), uses many of the original techniques dating back to the turn of the century.

Coal and limestone are brought in by railway car to heat the furnace. Cast iron is melted and poured into molds that have been packed with dirt (**Exhibit C11**). Once the molds cool, the finished product is sanded, lathed, and assembled before it is either used within the District or sold to other irrigation districts in the Valley (**Exhibit C12**).

The Machine Shop is the only manufacturer of irrigation canal parts (i.e., gates and valves) in the Lower Rio Grande Valley. The foundry only operates at full capacity during the winter, due to the extreme heat produced by the melted iron (Hinojosa 2003). To accommodate the increased workload, ten seasonal workers are hired in addition to the two full-time shop employees.

HCID2 previously owned and operated its own concrete pipe plant, located behind the foundry, and its own telephone system (Hinojosa 2004). The pipe plant began operations in 1928. When the pipe plant ceased to operate, the land on which the plant was located was sold to the City of San Juan for a park. The phone system is no longer in service either.

Conservation Efforts

The current water loss realized in the HCID2 water-delivery system is approximately 23% (Rister et al.). Unlike other irrigation districts to the south that have large, open, unlined, earthen resacas that incur significant evaporation losses, HCID2s losses primarily come from seepage within the water-delivery system. As part of its ongoing efforts, HCID2 continually repairs and rehabilitates portions of its delivery system to reduce seepage, thereby increasing its delivery efficiency. These efforts are exemplified in the recently completed Lateral A and Wisconsin pipeline projects discussed earlier in this report.

Another conservation tool is the adoption of drip and sprinkler systems by farmers within the District. 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. HCID2 does not offer any additional discounts for farmers that use conservation techniques on-farm. Currently, farmers serviced by HCID2 have 32 acres using a sprinkler system and 358 acres using a drip system. Because HCID2 delivers to five municipalities and one water supply corporation, the District is constantly pumping and the system is almost always charged because of the consistent demand (Hinojosa 2003). This alleviates much of the problem of push water³³ required to move the small amount of water needed by drip and sprinkler systems.³⁴ That is, the reduced water benefit provided by drip and sprinkler systems is often times negated by the constant need to have a system 'full and pressurized' for the smaller but more frequent applications of water typified by drip and sprinkler systems. Therefore, farmers and growers that utilize additional conservation efforts on-farm within the District do not actually put a strain on the system contributing to additional water loss as seen in some other irrigation districts.

Chapter Summary

This chapter reported on the operating practices of HCID2. The foundation of the HCID2 operations is the Board of Directors and the overall organizational hierarchy. Secondly, the allocation procedures (inside and outside) of the District describe how the District handles 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 HCID2, no charge water is used in place of the standard delivered water because the District is always pumping. Exactly how the irrigation district sells and distributes its water, as well as other revenue making activities, was discussed. Five municipalities, one water supply corporation, and Hidalgo County Drainage District No. 1 are other special water suppliers and districts that operate in and around HCID2. HCID2s historical self-sustaining ability is evident in their past ownership of a concrete pipe factory, telephone system, and current operating foundry. Finally, HCID2 relies on the efficiency of its delivery system through improvements and maintenance to help ensure that future water needs can be met.

³³ 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.).

³⁴ On-farm conservation systems adjacent to canals typically do not experience pressure problems relating to the operation of drip or sprinkler systems. Drip irrigation systems not adjacent to a canal are unable to operate without constructing a storage area. The HCID2 system cannot deliver the small volume of water utilized by a drip system with the amount of pressure that is also required (Hinojosa 2004).

Conclusion

The Hidalgo County Irrigation District No. 2 represents only one of the 29 irrigation districts in the Lower Rio Grande Valley. Though they follow the State and International guidelines, as do all Valley irrigation districts, they operate in a unique and discernable way that separates them from other Valley irrigation districts. HCID2 is not the only district to utilize GIS and SCADA technologies, underground pipe, lined laterals or other conservation tools; however, the combination and manner in which these tools are employed is what contributes to HCID2s distinctiveness.

This report illustrated a brief history of HCID2 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 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

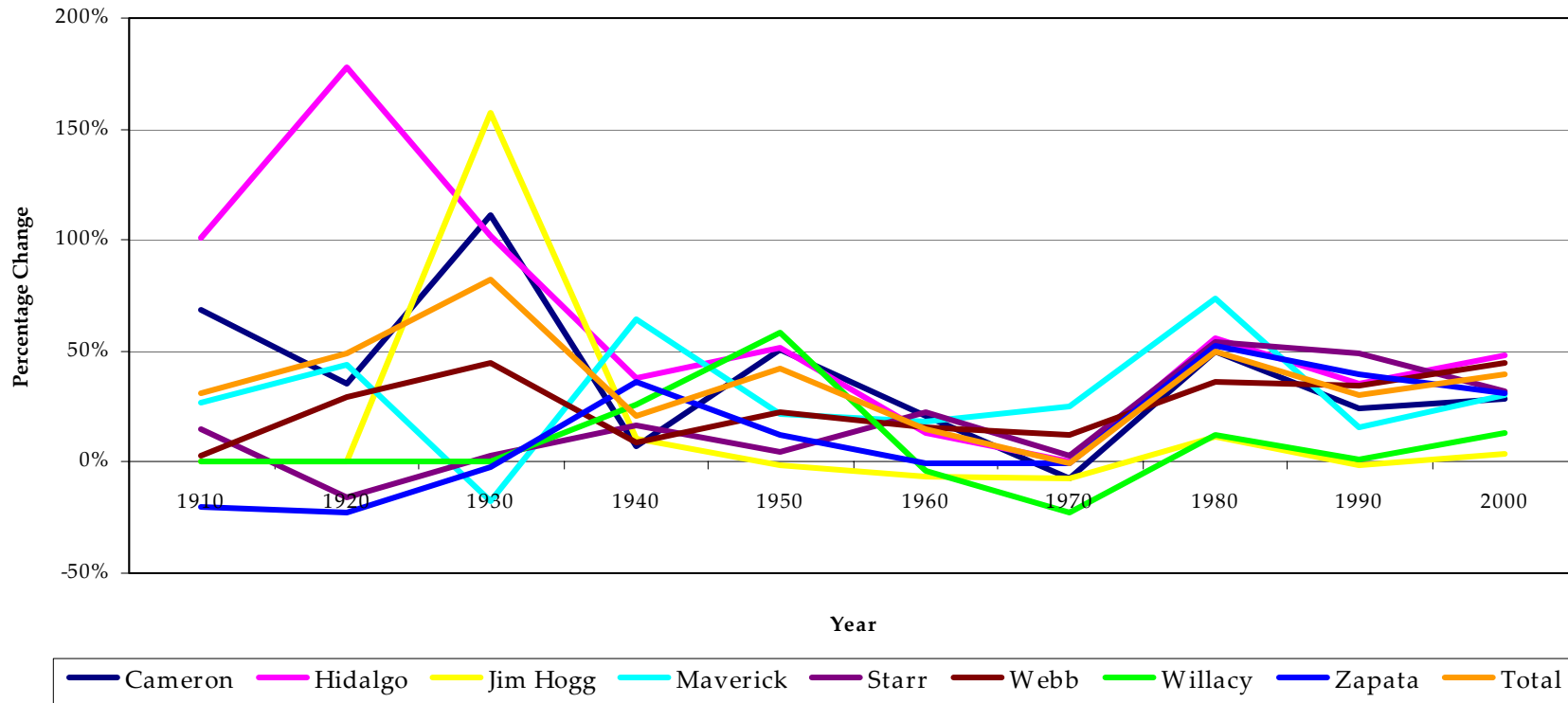


FIGURE A1. Graphical Representation of Lower Rio Grande Valley County’s Populations as a Percentage Change of Growth Per Decade, 1900-2000 (Forstall).

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
Bill Green	Irrigation	Santa Cruz ID
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 2004).

President	Allen Arnold
Vice-President	J.D. Dreibelbis
Secretary	Bert Forthuber
Assistant Secretary	Karl Obst
Member	M.G. Dyer

FIGURE A3. Hidalgo County Irrigation District No. 2's Board of Directors, 2004
(Hinojosa 2004).

Appendix B: Additional Tables

TABLE B1. Lower Rio Grande Valley County's 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 County's 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 Year	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

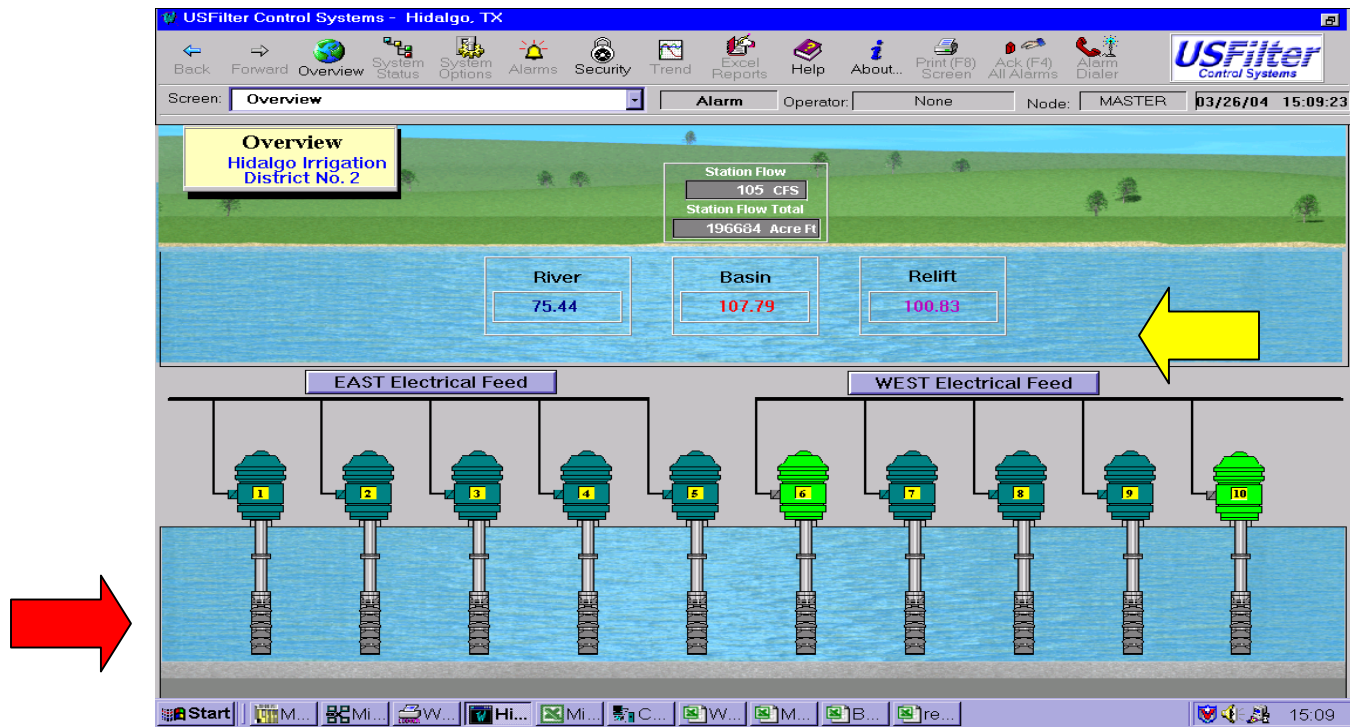


EXHIBIT C1. Overview Screen of the SCADA System (Hinojosa 2004). The yellow arrow indicates the three water levels monitored by the SCADA system. The red arrow indicates one of the ten river pumps. The bright green colored pumps represent active pumps and the dark green colored pumps represent inactive pumps.

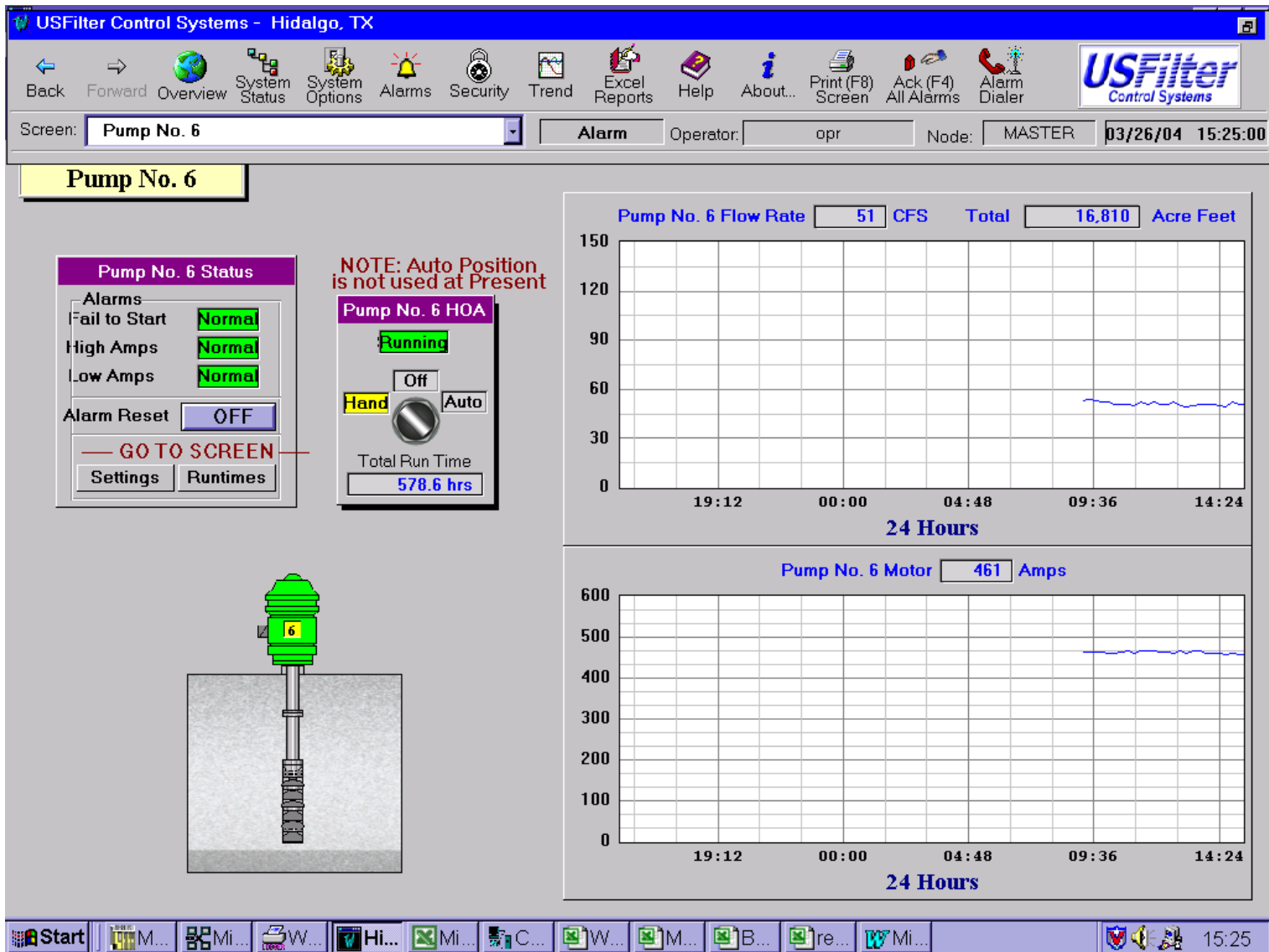


EXHIBIT C2. Sample SCADA Screen of Pump Number 6 (Hinojosa 2004).



EXHIBIT C3. Internal View of the HCID2 Pump House, 2003 (Stubbs).



EXHIBIT C4. Back View of the HCID2 Pump House, 2003 (Stubbs).



EXHIBIT C5. Meters Located Behind Pump House, 2004 (Hinojosa). The red arrow indicates where each meter is housed.

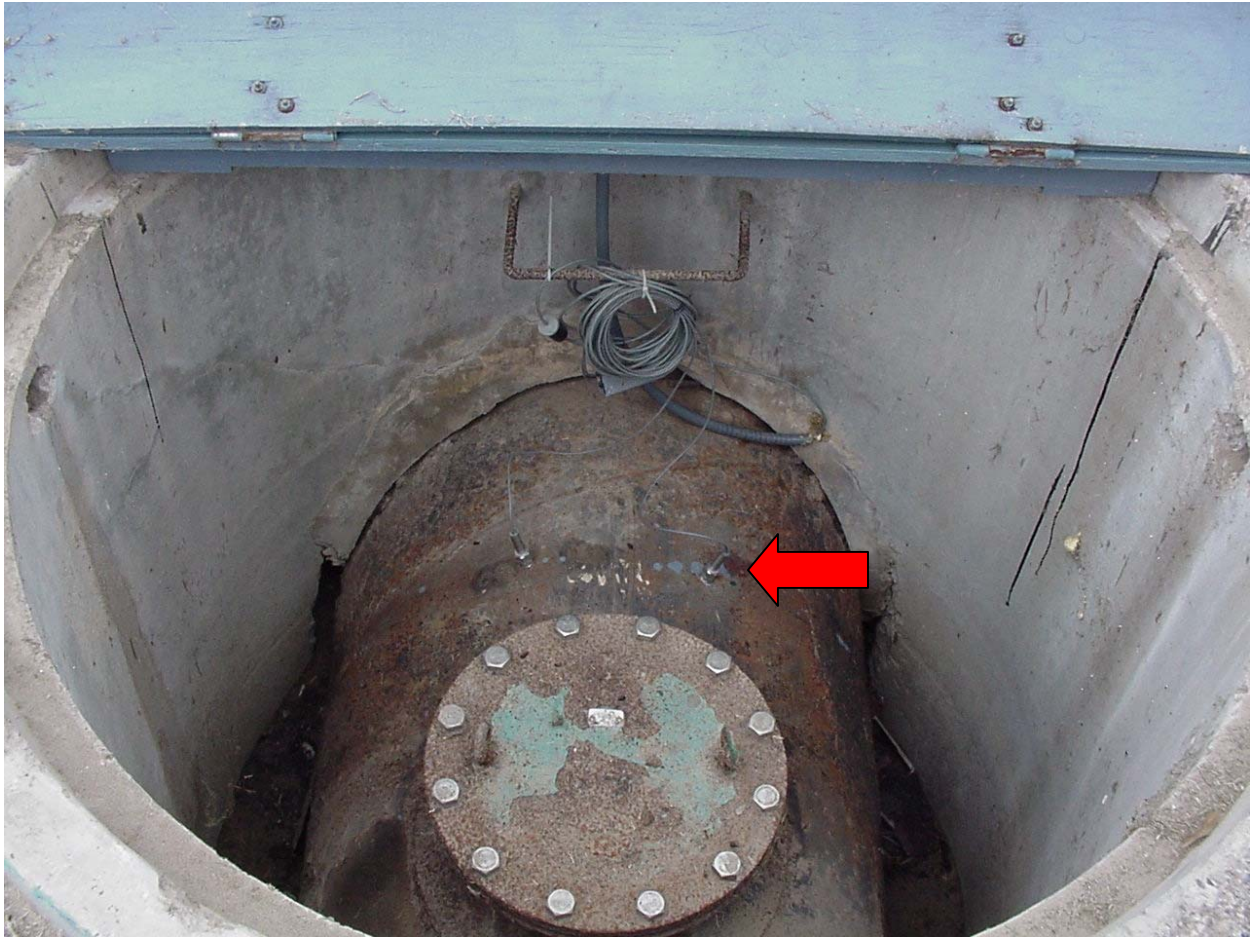


EXHIBIT C6. Metering Transducers in a 60-Inch Standpipe, 2004 (Hinojosa). The red arrow indicates the transducers that measure the amount of water being pumped.



EXHIBIT C7. HCID2s Pump House Meter Recorders Used by the TCEQ Watermaster, 2004 (Hinojosa).



EXHIBIT C8. HCID2s Feeder Canal, 2004 (Hinojosa).

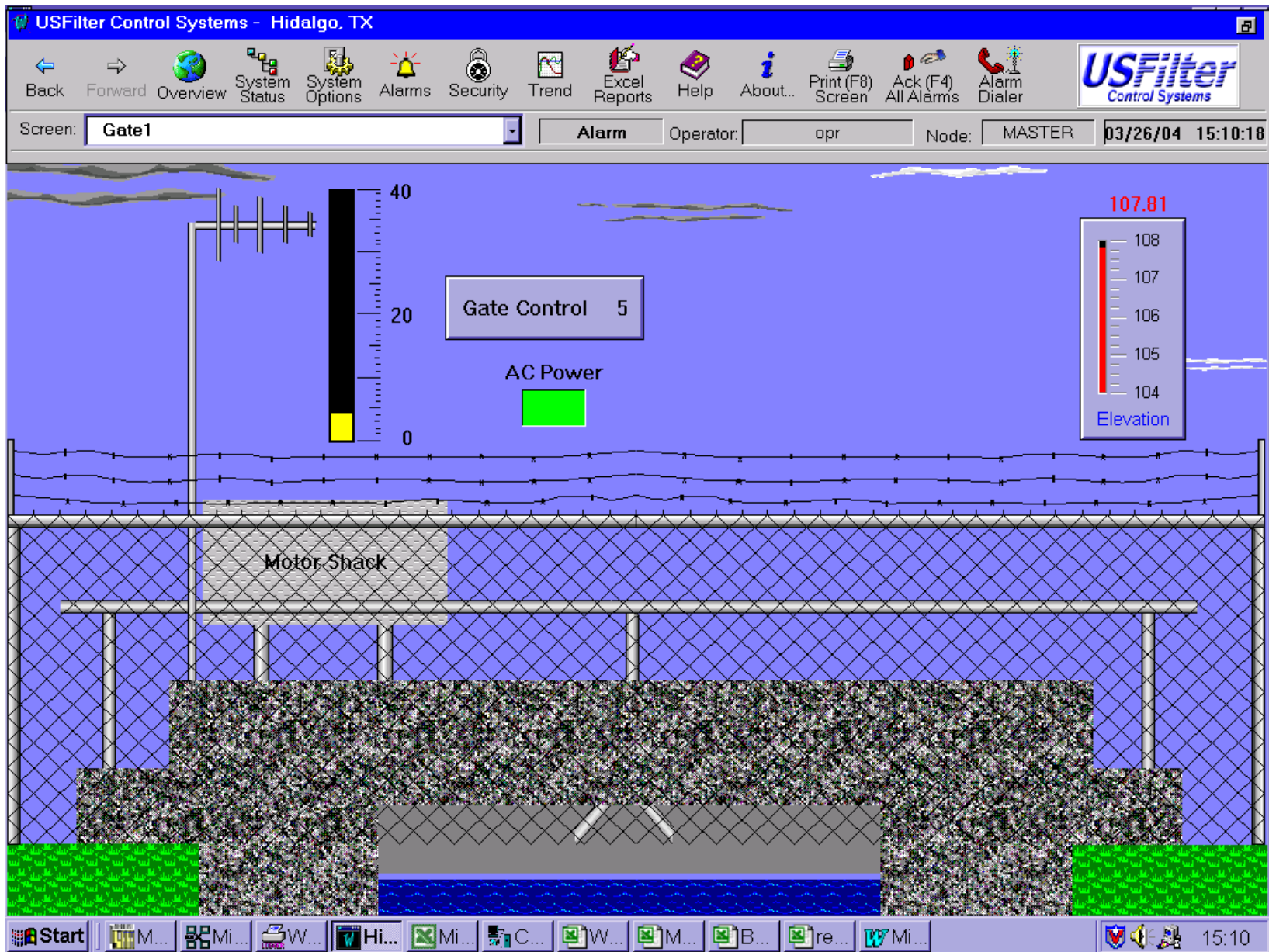


EXHIBIT C9. Monitoring Screen of the Reservoir Gate, 2004 (Hinojosa 2004).



**EXHIBIT C10. HCID2s Second Lift Pump House,
2003 (Stubbs).**



EXHIBIT C11. Dirt Molding Area at HCID2 Machine Shop, 2003 (Stubbs).
Molds are stacked in the background before they are packed with dirt and filled.



EXHIBIT C12. Completed Gates of Varying Size at HCID2 Machine Shop, 2003 (Stubbs).

Appendix D: Additional HCID2 Rules and Regulations

HIDALGO COUNTY IRRIGATION DISTRICT NUMBER TWO WATER ALLOCATION RULES AND REGULATIONS

The Board of Directors of Hidalgo County Irrigation District Number Two ("District") deems it in the best interest of the District to adopt rules and regulations dealing with the allocation of irrigation water in the event of a shortage in water supply from the Rio Grande. Accordingly, the following Rules and Regulations shall apply in periods of water supply shortage from the Rio Grande.

1. Activation of Water Allocation Program: Water allocation to irrigation users in the District will go into effect when the District's total irrigation water account storage balance in the Rio Grande Watermaster records amounts to a maximum of 3 irrigations for each flat rate acre in which all flat rate is paid and current, and for each net irrigable acre as shown by District records with respect to land in the IBWC Floodway.

The determination of the 3-irrigation level which activates the water allocation program will vary from year to year as acreage irrigated with the District changes. The calculation of the 3-irrigation level will be calculated by taking the flat rate and net floodway acreage multiplied by 2.0 acre feet. The 2.0 acre feet amount is derived from an historical assumption utilized by the District approximating the average water used by an irrigator per irrigation per acre. This assumption assumes that 6 inches of water per acres is applied and that there are 2 inches of water per acre lost in transporting water from the Rio Grande to the acre irrigated. Thus, the calculation: 6 inches + 2 inches of water loss = 8 inches x 3 irrigations = 24 inches of water, or 2.0 acre feet measured at the Rio Grande.

2. Water Allocation: As water is allocated to the District's irrigation account by the Rio Grande Watermaster in an amount reasonably sufficient for allocation to District irrigation users, the additional water allocated to the District will be

equally distributed to those irrigation accounts having a balance of less than 3 irrigations (or 2.0 acre feet equivalent) based upon flat rate or net floodway acreage.

The irrigation accounts shall be composed of the same parcels of land as identified by ownership for flat rate assessment purposes as carried in the records of the District.

3. Transfers: A water allotment may be transferred within the boundaries of the District from one irrigation account to another. The transfer of a water allotment from one irrigation account to another does not constitute irrigation for purposes of this program. The transfer of water may be made only by the landowner or landowner's agent who is authorized in writing to act on behalf of the landowner in the transfer of the water allotment from described land of the landowner covered by the irrigation account. A water allotment may not be transferred to land by a landowner outside the District boundaries.
4. Non-Use: Acreage in an irrigation account that has not been irrigated for any reason within the last two (2) consecutive years will be considered inactive and will not be allocated water. Any landowner whose land has not been irrigated within the last two (2) consecutive years may, upon application to the District expressing a desire to irrigate the land, receive future allocations; however, irrigation water allocated shall be applied upon the acreage to which it is allocated and such water allotment cannot be transferred until there have been two (2) consecutive years of use.
5. Amount of Water Charged to Water Allotment: The amount of water charged against a user's water allotment will be eight (8") inches per irrigation unless water is metered. Metered water is charged based on actual use. In order to maintain a parity in charging use against a water allotment between metered and non-metered deliveries, a loss factor will be applied to metered water. For parity purposes, therefore, the same percentage of loss will be applied to metered water as is the assumption for non metered water, i.e., 25 percent of amount diverted at the Rio Grande. Thus, in charging use in a non-metered water, i.e., 25 percent of amount diverted at the Rio Grande. Thus, in charging use in a non-metered situation, the 8 inches criteria will be used for each irrigation of an acre and in charging use in a metered situation, the actual metered amount plus 33 1/3% percent of the metered amount will be charged. It shall be a violation of these Rules and Regulations for a water user to use water that exceeds the amount of water contained in the users irrigation account.

6. Termination of Water Allocation: The water allocation program will remain in effect until (a) the District's total irrigation account storage balance as shown by the Rio Grande Watermaster's records exceeds 3 irrigations per acre as referred to in paragraph I above, and (b) the District's Board of Directors deems that the need for allocation no longer exists.
7. Penalties: Any person who willfully opens, closes, changes or interferes with any headgate or uses water in violation of these Rules and Regulations shall be considered in violation of Section 11.083, Texas Water Code, *Vernon's Texas Codes Annotated*, which provides for punishment by a fine of not less than \$10.00 nor more than \$200.00 or by confinement in the county jail for not more than thirty (30) days, or both, for each violation, and these penalties shall be in addition to any other penalties provided by the laws of the State and may be enforced by complaints filed in the appropriate court jurisdiction in Hidalgo County, all in accordance with Section 11.083; and in addition, the District may pursue a civil remedy in the way of damages and/or injunction against the violation of any of the foregoing Rules and Regulations.
8. Authority: The foregoing Rules and Regulations are adopted in accordance with the provisions of Section 58.127-58.132 of the Texas Water Code, *Vernon's Texas Codes Annotated*.
9. Effective Date of Rules: The effective date of this Rule shall be five (5) days following the date of Publication hereof and ignorance of the Rules and Regulations is not a defense for a prosecution for enforcement of the violation of the Rules and Regulations.

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 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.

(e) 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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Chapter 303 - Operation of the Rio Grande

(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
