

MANAGEMENT PLAN

BREWSTER COUNTY

GROUNDWATER CONSERVATION

DISTRICT

Table of Contents

District Mission and Goals-3-

Statement of Guiding Principles -3-

General Description of the District-4-

Location of the District-4-

Topography and Drainage 4-

Groundwater Resources -5-

Groundwater Management Area #4-5-

Surface Water Resources-7-

Projected Surface Water Supplies-7-

Projected Total Water Demand-7-

Historical Annual Groundwater Usage and Demand-7-

Groundwater Availability Modeling Information-7-

Management of Groundwater Supplies -8-

Actions, Procedures, Performance -9-

Methodology For Tracking Progress -9-

Goals, Management Objectives-9-

Performance Standards-10-

Appendix A – Groundwater Availability Model 07-08

Appendix B – 2007 State Water Plan Projected Water Demands
2007 State Water Plan Projected Surface Water Supplies
Projected Water Management Strategies
Estimated Historical Groundwater Pumpage (Brewster County)

DISTRICT MISSION AND GOAL

The mission of the Brewster County Groundwater Conservation District is to manage, protect, and conserve the groundwater resources of Brewster County, Texas while protecting the property right and promoting constructive and sustainable development in Brewster County.

The goal of the Brewster Groundwater Conservation District in pursuing its mission is the sustainability of the groundwater resources of Brewster County.

STATEMENT OF GUIDING PRINCIPLES

The groundwater resources of Brewster County (“the County”) are of vital importance to all citizens, and as the population of the County continues to increase, additional pressure will be placed on the groundwater resources of the County. The Brewster County Groundwater Conservation District (“the District”), managed and controlled locally, is the most practical means of directing development and preventing over-development of the natural resources of the County.

The District can achieve its mission and goals by increasing the quantity and quality of knowledge regarding the groundwater resources of the County, encouraging the most efficient use of groundwater, preserving and improving groundwater quality, and increasing public awareness and education of groundwater issues. Believing that local control of local resources is critical to the District’s mission and goal, the District will monitor the activities of the Texas Legislature and of the Far West Texas Water Planning Group, along with the rules and orders of state agencies which may affect the private ownership, use, and management of groundwater.

The District will work in cooperation with the Jeff Davis County Underground Water Conservation District, the Presidio County Underground Water Conservation District, the Middle Pecos Groundwater Conservation District, and the Culberson County Groundwater Conservation District to manage and protect those groundwater resources that are shared by any or all of the five counties.

A major threat to the mission of the District is management of the groundwater resources of Brewster County without a thorough understanding of the aquifers and their hydrogeologic properties. This Management Plan will be a tool for the directors of the District and for the managers of the District’s water resources, the landowners of Brewster County. The District’s directors regard all landowners as the District’s partners in managing our groundwater resources.

GENERAL DESCRIPTION OF THE DISTRICT

The District was created by the citizens of Brewster County through a confirmation election on November 6, 2001. The initial Board of Directors (“the Board”) was Tom Beard (Chairman), Bud Coffey, Mike Davidson (Vice Chairman), Rob Dean, Leo Dominguez, Billito Donnell, and Roland Pena (Secretary-Treasurer), and the current Board consists of Tom Beard (Chairman), Mike Davidson (Vice-Chairman), Rob Dean (Secretary-Treasurer), Leo Dominguez, Billito Donnell, Tom Santry, Hiram Sibley, and David Bynum (Ex Officio). At the time of the adoption of the original Management Plan, the District did not have a General Manager. Subsequently, the District hired a General Manager, and the General Manager at the time the Amended Management Plan was adopted is Conrad J. Arriola. The boundaries of the District are coterminous with those of Brewster County, Texas. The economy of the County and the District is dominated by agriculture, tourism, and Sul Ross State University. Agricultural income is derived primarily from beef cattle production, hunting, and outdoor recreation.

LOCATION OF THE DISTRICT

Brewster County, containing 6,193 square miles or almost 4 million acres, is the largest county in Texas. According to the Far West Texas Water Plan, there were 10,330 residents in the County in 2000. The County is located on the Big Bend of the Rio Grande. It is bounded on the northeast by Terrell and Pecos Counties, on the northwest by Jeff Davis County, on the west by Presidio County, and on the south and southeast by the Republic of Mexico. Alpine, which is located in the northwest part of the County, is the county seat. Other population centers are Marathon, in the northeast part of the County, and Lajitas, Terlingua, and Study Butte, in the south part of the County. Because Brewster County contains Big Bend National Park, Black Gap Wildlife Management Area, and Elephant Mountain Wildlife Management Area, as well as a portion of Big Bend Ranch State Natural Area, almost 25% of the County is publicly owned.

TOPOGRAPHY AND DRAINAGE

Topographically, the County consists of mountains, canyons, plateaus, valleys, and rolling plains. The altitude of the land surface ranges from 1,355 to 7,825 feet above mean sea level. Brewster County lies within the drainage systems of the Rio Grande and the Pecos River, which is also a tributary of the Rio Grande.

GROUNDWATER RESOURCES

Water-supply resources available to meet the needs of most water-use categories in the County (such as agricultural, municipal, recreational, industrial, manufacturing, and mining) occur almost exclusively as groundwater in the various water-bearing rock formations (aquifers) that underlie the County. These aquifers, as delineated by the Texas Water Development Board (“the TWDB”), include the Igneous, Edwards-Trinity (Plateau), Marathon, and Capitan Reef Complex. Although these aquifers, as delineated by the TWDB, only occupy approximately a quarter of the County, additional groundwater of variable quantity and quality exists in other or related aquifers throughout much of the rest of the County. The following description of each of the aquifers, including both quantity and quality, also addresses management needs required to prevent over-development of the resources:

IGNEOUS AQUIFER

The Igneous aquifer may be the most important groundwater source in the County since it serves the largest population, the City of Alpine and the surrounding community. The aquifer occurs in igneous (volcanic) rocks of Tertiary age that underlie and extend beyond the Davis Mountain region of Brewster, Jeff Davis, and Presidio Counties.

In the vicinity of Alpine, the aquifer occurs in the Cottonwood Springs Basalt rock unit where it extends several hundred feet below the land surface. Within the aquifer the water occurs in cracks, fractures, and vesicular zones in generally the upper segment of these volcanic rocks. Typically the top of lava flows is the most permeable because it often is a rubble zone caused by rapid cooling after the lava was deposited. The lower zone of a lava flow cools much slower, becomes very dense, and exhibits lower permeability. Wells located in Alpine’s Sunny Glen and Musquiz Canyon well fields, with yields ranging up to 250 gallons per minute, probably benefit from a combination of higher fracture density along faulted zones, focused recharge, and overlying alluvial cover. The freshness of the water quality, as exhibited by its typically low total dissolved solids content, indicates that water is transmitted relatively rapidly from the surface to the aquifer.

Continuous water-level records in the Musquiz well field demonstrate the aquifer’s rapid response to recharge derived from precipitation events. Higher water levels were evident in the early 1990s during a period of higher rainfall and then dropped in following years as less rainfall occurred. Recent water-level declines, such as those being experienced in the Sunny Glen well field, are the result of withdrawals exceeding recharge. Average annual rainfall for the past few years has been below normal, which has exacerbated the water depletion conditions in the well field by creating increased water demand and less recharge. At the same time, the water-supply needs of Alpine are increasing.

B. EDWARDS-TRINITY (PLATEAU) AQUIFER

The Edwards-Trinity (Plateau) aquifer occurs in the eastern one third and extreme northern part of the County and is used primarily for livestock and rural domestic supply. The aquifer consists of saturated sediments of the Cretaceous age Trinity Group formations and the overlying carbonate rocks (limestone and dolomite) of the Comanche Peak, Edwards, and Georgetown formations. Water in the aquifer generally occurs under water-table conditions and contains total dissolved solids of less than 1,000 milligrams per liter (“mg/l”). Water-level trends have not been monitored in this aquifer in Brewster County.

C. MARATHON AQUIFER

The Marathon aquifer occurs entirely within the north-central part of the County and is primarily used to supply municipal, domestic, and livestock water in and near the community of Marathon. Water of typically good quality, generally containing between 500 and 1,000 mg/l of total dissolved solids, occurs in numerous crevices, joints, and cavities within rock formations that have undergone complex folding and faulting. Although most wells in the area are less than 250 feet in depth, groundwater may extend to depths of several hundred feet. Well yields of the local municipal wells are approximately 300 gallons per minute, while yields from smaller domestic wells are significantly less. Like the Igneous aquifer, well yield is enhanced in areas where wells penetrate more densely fractured rock.

D. CAPITAN REEF COMPLEX AQUIFER

The Capitan Reef formed along the margin of the ancestral Delaware Basin, an embayment covered by a shallow Permian sea. In the northern part of Brewster County, rocks that compose this reef formation are exposed in the Glass Mountains. Although significant quantities of groundwater are withdrawn elsewhere from this aquifer, few wells exist in the Glass Mountains to attest to its production capability. Because the Glass Mountains are elevated above the surrounding area, it is likely that most of the water that penetrates the formation from rainfall probably leaks back to the surface along the slopes of the mountain. Therefore, other than for a few small-yielding wells, the Capitan Reef Complex aquifer is not likely to be a reliable source within Brewster County.

E. SANTA ELENA AQUIFER

The “Cretaceous” or “Santa Elena” aquifer apparently underlies much of Big Bend National Park and westward at least to Lajitas. Although both the Boquillas and Buda limestones, younger Cretaceous formations, often produce limited quantities of generally poor quality water, the Santa Elena formation holds an undetermined, but apparently significant quantity of good quality water between 1200 and 1500 ppm TDS, and is the source of many of the springs that flow into the Rio Grande in Big Bend Park, as well as

the major groundwater source for the development at Lajitas and the sole source of supply for the Study Butte/Terlingua water system. The geology and physical characteristics of water from this Santa Elena system are similar to water drawn from the Edwards Limestone, key component of the Edwards/Trinity aquifer which extends into eastern Brewster County. However, it is now known whether there is any connection between these units.

F. OTHER AQUIFERS

As mapped by the Texas Water Development Board, the aquifers that have been described above occur only over approximately one quarter of Brewster County. Except for the Big Bend National Park, very few groundwater characterization investigations have been conducted throughout the remainder of the mostly remote and sparsely populated parts of the County. Limited available well data does suggest that groundwater is often present but at varying depths and quality, and often not at dependable rates of yield. Wells in the Big Bend National Park area have been adequate in the past but long-term reliability may be somewhat uncertain. Groundwater supplies in the Terlingua-Study Butte area have also been studied to a limited degree, although the Study Butte Water Supply Corporation is now in operation and gathering data on wells which are believed to be primarily in the Santa Elena formation and which have contained varying levels of radioactivity. Wells in both of these areas — Big Bend National Park and Terlingua-Study Butte — penetrate various formations of Cretaceous age.

Groundwater Management Area #4 (Joint Planning Process)

Managed available groundwater is defined in Texas Water Code, Section 36.001 as “the amount of water that may be permitted by a district for beneficial use in accordance with the desired future condition of the aquifer.” The desired future condition of the aquifer may only be determined through joint planning with other groundwater conservation districts (GCDs) in the same groundwater management area (GMA) as required by the 79th Legislature with the passage of the House Bill 1763 into law. The District is located in GMA #4. The GCDs of GMA #4 have not completed the joint planning process to determine the desired future conditions of the aquifers in the GMA. Therefore, because GMA #4 has not completed the joint planning process, the District is unable to present a final value for the managed available groundwater.

SURFACE WATER RESOURCES

2007 State Water Plan Projected Surface Water Supplies Brewster County Groundwater Conservation District Brewster County

The only surface water in Brewster County is the Rio Grande, and, being fully permitted and subject several treaties with the Republic of Mexico, except to a limited extent, it is largely unavailable for use in the County. The District did consider water supply needs and water management strategies that are included in the adopted State Water Plan. According to the 2007 State Water Plan, Brewster County does not have any projected water needs, and therefore, does not have any water management strategies (Appendix B) to consider.

PROJECTED SURFACE WATER SUPPLIES

According to the *Far West Texas Water Plan, 2005*, the supply of available groundwater in Brewster County will be adequate to meet projected needs within fifty years provided additional water infrastructure is developed as is expected. Reference is directed to the Groundwater Availability Model and the tables attached to this Management Plan.

An estimate of the projected surface water supply within the District according to the most recently adopted State Water Plan is found in *Appendix B – 2007 State Water Plan Projected Surface Water Supplies*.

PROJECTED TOTAL WATER DEMAND

An estimate of the projected total water demands within the District according to the most recently adopted State Water Plan is found in *Appendix B – 2007 State Water Plan-Projected Water Demands*. Water demand in the County is expected to increase steadily.

HISTORICAL ANNUAL GROUNDWATER USAGE

Estimates of Historical Groundwater Pumpage for Brewster County were derived from the TWDB Water Use Survey and are located in Appendix B.

GROUNDWATER AVAILABILITY MODELING INFORMATION

An estimate of the annual amount of recharge from precipitation to the groundwater resources within the District is found in *Appendix A – Groundwater Availability model -07-08, Table #2.*

For each aquifer in the District, the estimate of the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers are found in *Appendix A – Groundwater Availability model -07-08, Table #2.*

An estimate of the annual volume of flow into and out of the District within each aquifer, and between aquifers, in the district is found in *Appendix A – Groundwater Availability model -07-08, Table #2.*

MANAGEMENT OF GROUNDWATER SUPPLIES

This Management Plan (“the Plan” or “this Plan”) has been adopted by the Board in accordance with Section 36.1071 of the Texas Water Code (“the Water Code”) and will remain in effect for a period of ten years unless modified by the Board prior to the end of the planning period. The District, in partnership with the landowners of the District, will manage the groundwater within the District in accordance with its mission and goal while seeking to maintain the economic viability of all resource user groups, public and private. With due consideration to the economic, cultural, historical, and environmental activities occurring within the District, the District will identify and engage in such activities and practices, which, if implemented, would result the sustainability of the groundwater resources within the District, including reductions of groundwater use where necessary for that result.

The District hopes, through cooperation of landowners, to monitor changing storage conditions of groundwater within the District.

The District will have Rules from time to time (“the District Rules”) which may regulate groundwater withdrawals by means of production limits and fees, spacing regulations, and export fees and requirements. The District may deny a well construction permit or limit groundwater withdrawals in accordance with the District Rules. The relevant factors to be considered in making a determination to deny a permit or limit groundwater withdrawals will include:

- (1) The projected effect on other wells, landowners, the environment, the economy of Brewster County, groundwater users in the District, and other relevant factors and;
- (2) The approved State and Regional water plans which were considered by the Board in drafting this Management Plan.

In pursuit of the District's mission of managing, protecting, and conserving the resource, while protecting property rights and promoting constructive and sustainable development in Brewster County, the District may be forced to require reductions of groundwater withdrawals from existing commercial or non-exempt wells. The District will not regulate domestic or livestock wells. To achieve this purpose, the District may, at the Board's discretion, amend or revoke any permit after notice and hearing. The determination to seek the amendment or revocation of a permit by the District will be based on aquifer conditions observed by the District from time to time, as well as those factors listed above in relation to initial permits.

ACTIONS, PROCEDURES, PERFORMANCE

The District will implement the provisions of this Plan and will utilize the provision of this Plan as guidelines for determining the direction or priority for all District activities. All operations of the District, all agreements entered into by the District, and any additional planning efforts in which the District may participate will be consistent with the provisions of this Plan. The District has adopted or will adopt the District Rules relating to the permitting of wells and the production of groundwater. The District Rules shall be as required by the Water Code and the provisions of this Plan. All District Rules will be enforced. The promulgation and enforcement of the District Rules will be based on the best technical evidence available.

The District shall treat all citizens equally. Citizens may apply to the District for a waiver in the enforcement of one or more of the District Rules on grounds of adverse economic effects or unique local conditions. In granting or denying any waiver to any District Rule, the Board shall consider the potential for adverse effects on adjacent landowners. The exercise of discretion in the granting or denying of any waiver by the Board, shall not be construed as limiting the power of the Board.

In the implementation of this Plan and in the management of groundwater resources within the District, the District will seek the cooperation of all residents, landowners, and well owners of the District. All activities of the District will be undertaken in cooperation and coordination with any appropriate state, regional, or local water management entity.

METHODOLOGY FOR TRACKING PROGRESS

The General Manager of the District will prepare and present an annual report of the activities of the District during the preceding calendar year, which, any other things considered relevant by the General Manager shall include the total number of wells drilled within the District in the preceding calendar year the number of wells registered in the District, including both exempt and non-exempt wells.

GOALS, MANAGEMENT OBJECTIVES PERFORMANCE STANDARDS

The goals, management objectives, and performance standards of the District are:

1. **GOAL:** Provide for the most efficient use of groundwater, conservation, and for the long-term sustainability and conservation of the groundwater resources.

1.1 MANAGEMENT OBJECTIVE & PERFORMANCE STANDARD:

Prepare and distribute minutes of each meeting of the Board and make them available to the press and public within two weeks after approval by the Board, stressing the Board's efforts to increase efficient use of groundwater, conservation, and sustainability.

1.2. MANAGEMENT OBJECTIVE & PERFORMANCE STANDARD:

In at least one meeting of the Board annually, the District will register and permit the total number of wells, unless exempt by the District Rules.

1.3. MANAGEMENT OBJECTIVE & PERFORMANCE STANDARD:

The District will maintain completion reports or acceptable alternatives for each new well drilled within the District that is submitted by the driller.

2. **GOAL:** Control and prevent waste of groundwater.

2.1 MANAGEMENT OBJECTIVE & PERFORMANCE STANDARD:

File and discuss at each meeting of the Board all reports of wasteful practices within the District that are reported to the District and consider appropriate measures. The number of wasteful practice reports received by the District in the preceding calendar year will be included in the annual report to the District Board.

3. **GOAL:** Address drought conditions.

3.1. MANAGEMENT OBJECTIVE & PERFORMANCE STANDARD

File and discuss at each meeting of the Board, drought emergency contingency plans received since the last meeting. The number of drought contingency plans

received in the preceding calendar year will be included in the annual report to the District Board.

4. **GOAL:** Address in a Quantitative Manner the Desired Future Conditions of the Groundwater Resources in the District. This category of management goal is not applicable to the District because GMA 4 is currently in the process of developing the desired future condition of the groundwater resources in the GMA 4 and the desired future conditions of the groundwater resources has not yet been defined. The District is coordinating with other groundwater conservation districts in GMA 4 to define the desired future conditions of the aquifers, as required by Texas Water Code 36 Section 36.108. The District will review and evaluate the GAM simulation results and other available data as a participant in the GMA 4 process. The GMA 4 process incorporates a provision to determine if revisions are needed regarding total aquifer storage and groundwater availability. GMA 4 anticipates developing the desired future conditions of the aquifers in the GMA on or before the statutory deadline of September 1, 2010

TEXAS WATER CODE SECTION 36.1071 MANAGEMENT GOALS DETERMINED TO BE INAPPLICABLE IN THIS DISTRICT

1. **GOAL:** Control and prevention of subsidence.

1.1. RATIONALE FOR DETERMINATION OF INAPPLICABILITY:

The rigid geologic framework of the region precludes significant subsidence from occurring.

2. **GOAL:** Address conjunctive surface water management issues.

2.1. RATIONALE FOR DETERMINATION OF INAPPLICABILITY:

There is no surface water in the District except for the Rio Grande and water in creeks and impoundments within the District from rains, runoff from rains, and springs.

3. **GOAL:** Address natural resource issues.

3.1. RATIONALE FOR DETERMINATION OF INAPPLICABILITY:

The District has no documented occurrences of endangered or threatened species dependent upon groundwater resources except in Big Bend National Park,

4. **GOAL:** Address Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, Brush Control where appropriate and cost effective.

4.1. Conservation

4.1.1 RATIONALE FOR DETERMINATION OF INAPPLICABILITY

The District does not have the resources to impact this goal.

4.2. Recharge Enhancement

4.2.1 RATIONALE FOR DETERMINATION OF INAPPLICABILITY

The District does not have the resources to impact this goal.

4.3. Rainwater Harvesting

4.3.1 RATIONALE FOR DETERMINATION OF INAPPLICABILITY

The District does not have the resources to impact this goal.

4.4. Precipitation Enhancement

4.4.1 RATIONALE FOR DETERMINATION OF INAPPLICABILITY

The District does not have the resources to impact this goal.

4.5. Brush Control

4.5.1 RATIONALE FOR DETERMINATION OF INAPPLICABILITY

The District does not have the resources to impact this goal.