

WATER MANAGEMENT PLAN
FOR THE
LOWER COLORADO RIVER BASIN

EFFECTIVE SEPTEMBER 20, 1989

INCLUDING

AMENDMENTS APPROVED BY
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
THROUGH JANUARY 27, 2010

AND

DROUGHT CONTINGENCY PLAN CHANGES
APPROVED BY THE LCRA BOARD OF DIRECTORS
THROUGH JUNE 16, 2010

DEDICATION

This revision of LCRA's Water Management Plan is dedicated to Dr. Quentin W. Martin (1946-2003).

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VOLUME 1

WATER MANAGEMENT PLAN FOR THE LOWER COLORADO RIVER BASIN

PREFACE

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A. Background

The “business” of water resources management in Texas, and throughout the nation, is in the midst of transition and transformation. The transition is largely the result of ever increasing demands and competition for renewable but limited water supplies and a growing awareness of the limits of “traditional” water supply management strategies. Additionally, the spectra of long-range shifts in global climatic patterns have injected a new element of uncertainty in water resources planning and management. Clearly, the past may no longer be a valid guide to the future.

In response to new challenges and uncertainties, it is imperative that water management institutions, at all levels, adopt a balanced, flexible, and feasible approach that gives due weight to all the conflicting demands on the water, including the heavy economic dependence of the farmers on historic uses of irrigation water, rapidly emerging public interest in recreation, and environmental values. The challenge is to recognize both the historic uses and the forces of change, transform emerging problems into new opportunities, and guide the institutions of water resources management toward a new era where clean water in Central Texas is recognized as a scarce commodity.

On April 20, 1988 Judge J. F. Clawson of the 264th Judicial District of Bell County, Texas, signed the Final Judgment and Decree relating to LCRA’s and the City of Austin’s respective water rights. (See Appendix 1A, Volume II).¹ This settlement was the product of a long series of negotiations among LCRA, the City of Austin, and the Texas Water Commission (TWC), predecessor agency of the Texas Commission on Environmental Quality (TCEQ).

¹ The Appendices for Volume II of the Water Management Plan are also being updated at this time.

Under the Final Judgment and Decree, LCRA was granted the right to use 1,500,000 acre-feet annually from Lakes Buchanan and Travis. As part of this settlement LCRA was required to determine the Combined Firm Yield of both Lakes Buchanan and Travis. An interim level of Combined Firm Yield of 500,000 acre-feet was established by the Texas Water Commission (TWC) (predecessor to TCEQ) with an understanding that LCRA would establish the basis for the Combined Firm Yield calculation and submit it to the TWC. The amount of water available for use in excess of the Combined Firm Yield is considered interruptible water and may be sold only on an interruptible basis subject to annual availability and certain rules and conditions required by the TWC.

The purpose of this document, Water Management Plan for the Lower Colorado River Basin (WMP), is to define LCRA's water management programs and policies in accordance with these requirements.

The WMP is not a static document. As LCRA's blueprint for its operation of the Lakes Buchanan and Travis, the WMP is periodically revised to reflect changes in water demands. The last revision was completed by LCRA in February 1997 and approved by the Texas Natural Resources Conservation Commission (TNRCC) (predecessor to TCEQ) in 1999 (herein referred to as the 1999 WMP). The present revision was submitted to TCEQ in May 2003 and approved by TCEQ on January 27, 2010. The most notable changed condition over the last five years has been a significant increase in projected municipal and industrial (firm) water demands. With this large projected increase in firm water demand, the WMP must be adjusted to give a compensating reduction in the interruptible stored water supplies available since firm water demands take priority. This reduction will be achieved by revising the annual interruptible stored water supply curtailment policy adopted in this WMP. Revisions to the WMP require approval by LCRA's Board of Directors, followed by approval by the TCEQ. Such revisions become amendments to LCRA's water rights for Lakes Buchanan and Travis.

The allocation of water to various types of use in the WMP is also reviewed on an annual basis by LCRA. LCRA will continue to provide to the TCEQ an Annual Report on or before March 1.

B. Executive Summary

1. Legal Authority

The legal authority underlying the development of the WMP is derived from four principal sources:

- (1) The Final Order of Adjudication of the water rights of the Lower Colorado River Authority;
- (2) The Enabling Act of the Lower Colorado River Authority;
- (3) General law of the State of Texas, particularly the Texas Water Code; and
- (4) The water policies of the Lower Colorado River Authority Board of Directors.

In combination, the authorities establish and define LCRA's responsibility to develop and implement a WMP. In particular, the final adjudication of LCRA's water rights includes provisions relating to

the manner in which LCRA will manage the Highland Lakes and the Colorado River above and below the Highland Lakes and directed LCRA to prepare and submit a proposed WMP to the Texas Water Commission, predecessor agency to the TCEQ. This document was initially developed and is periodically revised by LCRA pursuant to that directive.

2. Summary of Water Management Plan

a. Key Elements of the Water Management Plan

The key elements of the WMP include the following:

- (1) Lakes Buchanan and Travis and the Colorado River will be managed together as a single system for water supply purposes.
- (2) LCRA will manage the system to maximize the beneficial use of water derived from inflows below the Highland Lakes.
- (3) LCRA will manage the system to stretch and conserve the waters stored in Lakes Buchanan and Travis.
- (4) All demands for water from the Colorado River downstream of Lakes Buchanan and Travis should be satisfied to the extent possible by run-of-river flows of the Colorado River.
- (5) Inflows should be passed through Lakes Buchanan and Travis to honor downstream senior water rights only when those rights cannot be satisfied by the flow in the river below the Highland Lakes.
- (6) The firm, uninterruptible commitments of water from Lakes Buchanan and Travis should not exceed the Combined Firm Yield.
- (7) The water from Lakes Buchanan and Travis will be available on an interruptible basis as long as LCRA's ability to meet the demand for firm water is not impaired.
- (8) Water shall not be released through any dam solely for hydroelectric generation, except during emergency shortages of electricity, and during other times that such releases will be needed for another beneficial purpose.
- (9) Competing demands on the system include water quality matters, flood control, water supply, recreation and tourism, hydroelectric power, instream flows and bays and estuaries.

- (10) The Combined Firm Yield of Lakes Buchanan and Travis is determined to be 535, 812 acre-feet, including that portion allocated to O.H. Ivie Reservoir, which is owned and operated by the Colorado River Municipal Water District.
- (11) To supply existing firm water commitments, including commitments to the environment as proposed herein and the allocation of firm water to O. H. Ivie Reservoir, during a repetition of the critical drought would require an average of 442,350 acre-feet per year to be released, diverted, or otherwise committed from storage in Lakes Buchanan and Travis.
- (12) LCRA's Board of Directions has reserved 50,000 acre-feet of the remaining Combined Firm Yield of Lakes Buchanan and Travis for the future needs within LCRA's 35-county water service area, particularly those areas now using ground water supplies that are becoming depleted or are of poor water quality.
- (13) The four downstream irrigation operations (Gulf Coast, Lakeside, Garwood and Pierce Ranch) will have first priority for all the interruptible stored water in the annual allocation process to the extent of their Conservation Base acreage or Priority Allocation acreage, whichever applies.
- (14) In recognition of the importance of recreation and tourism demands, additional sales of interruptible stored water, other than for the four irrigation operations pursuant to a semiannual allocation, will be limited based on the volume of water in Lakes Buchanan and Travis. The supply of interruptible stored water available for the January through June period will be based on the January 1 storage levels in Lakes Buchanan and Travis taken separately. The supply for the July through December period will be based on the minimum of the maximum storage levels in April, May and June in Lakes Buchanan and Travis taken separately. No sales will occur if either lake is less than 94% of its maximum conservation capacity. If both lakes are at their maximum conservation capacity as calculated above for either six-month period then such interruptible stored water sales will be limited to a total of 30,000 acre-feet for that year. For projected lake volumes between 94% and 100% of conservation capacity, such interruptible stored water sales will be limited proportionately, based on the storage reservoir with the lowest percentage of capacity on January 1 as calculated above.
- (15) Instream flow needs will be met by the release of stored water from Lakes Buchanan and Travis to maintain the daily river flows at no less than the critical instream flow needs in all years. Daily river flows will be maintained at the target instream flow needs in those years when the four major irrigation operations are not curtailed, to the extent of inflows each day to the Highland Lakes as measured at the upstream streamgages. Releases of stored water will be a combination of firm and interruptible water supplies. Firm stored water will be supplied in years when the four major

irrigation operations' interruptible stored water supplies are curtailed. Interruptible stored water will be supplied in all other years. Total commitments of the Combined Firm Yield from Lakes Buchanan and Travis for instream flow maintenance will be an average of 27,380 acre-feet per year, with a maximum of:

- (a) 51,100 acre-feet in any one year;
- (b) 85,700 acre-feet in any two consecutive years;
- (c) 114,200 acre-feet in any three consecutive years;
- (d) 147,700 acre-feet in any four consecutive years;
- (e) 184,500 acre-feet in any five consecutive years;
- (f) 212,200 acre-feet in any six consecutive years;
- (g) 246,500 acre-feet in any seven consecutive years; and
- (h) 273,800 acre-feet in any eight to ten consecutive years.

- (16) Bays and estuary needs will be met by releasing monthly stored water from Lakes Buchanan and Travis to meet target inflow needs of 1.03 million acre-feet per year if January 1 storage level in Lakes Buchanan and Travis combined is greater than 1.7 million acre-feet. Critical inflow needs of 171,120 acre-feet per year will be met in all years with releases of stored water from Lakes Buchanan and Travis. In years when the January 1 combined storage in Lakes Buchanan and Travis is less than 1.7 million acre-feet but greater than 1.1 million acre-feet (*i.e.* 86% and 55% full, respectively), one hundred and fifty percent (150%) of critical inflow needs (256,680 acre-feet per year) will be met, subject to the available monthly storable inflows into Lakes Buchanan and Travis. Releases of stored water will be a combination of firm and interruptible water supplies. Firm stored water will be supplied in years when the four major irrigation operations' interruptible stored water supplies are curtailed. Interruptible stored water will be supplied in all other years. Total commitments of the Combined Firm Yield from Lakes Buchanan and Travis for bays and estuaries (estuarine inflows) will be an average of 6,060 acre-feet per year, with a maximum of:

- (a) 20,660 acre-feet in any one year;
- (b) 23,570 acre-feet in any two consecutive years;
- (c) 23,680 acre-feet in any three consecutive years;
- (d) 32,220 acre-feet in any four consecutive years;
- (e) 40,800 acre-feet in any five consecutive years;
- (f) 41,400 acre-feet in any six consecutive years;
- (g) 47,800 acre-feet in any seven consecutive years; and
- (h) 60,600 acre-feet in any eight to ten consecutive years.

- (17) The total firm stored water commitment for both environmental purposes will be an average of 33,440 acre-feet per year. Estimated interruptible stored water supplied

during the critical drought for both purposes will be an additional 23,030 acre-feet per year.

b. Key Elements of the Drought Management and Drought Contingency Plans

The key elements of the Drought Management and Drought Contingency Plans (DMP/DCP) include the following:

- (1) A 10-year time period from 2000-2010 is the time frame for the DMP/DCP.
- (2) The DMP/DCP establishes criteria for the curtailment of stored water that is committed through contract or by LCRA Board resolution.
- (3) Establishes a criteria for interruptible stored water supply curtailments that protects firm demands, establishes a Reserve Storage Pool, and provides for gradual curtailment in order to protect the full demand of first crop rice in all years of the critical drought.
 - (a) **Open Supply** - If the total January 1 storage in Lakes Travis and Buchanan combined is equal to or greater than 1,400,000 acre-feet, then LCRA will supply all interruptible stored water demands. This assumes 273,000 acre-feet of interruptible storage water is sufficient to irrigate a total of 83,700 acres within the four irrigation operations, with seventy percent (70%) of that acreage being irrigated for a ratoon, or second, crop of rice.
 - (b) Curtailment occurs in stages when the combined storage in Lakes Buchanan and Travis on January 1 is less than 1.4 million acre-feet and greater than 325,000 acre-feet. If combined storage on January 1 is between 1.4 million acre-feet and 1.15 million acre-feet, the interruptible stored water supply available will vary beginning at 273,000 acre-feet available at 1.4 million acre-feet of storage and decreasing at a rate of approximately 31,200 acre-feet for each 100,000 acre-foot decrease in combined storage until a value of 195,000 acre-feet available at a combined storage of 1.15 million acre-feet. When the combined storage in Lakes Buchanan and Travis on January 1 is less than 1,150,000 acre-feet, the interruptible stored water supply available will vary beginning at 195,000 acre-feet available at 1.15 million acre-feet of storage and decreasing at a rate of approximately 4,250 acre-feet for each 100,000 acre-foot decrease in combined storage until a value of 160,000 acre-feet available at a combined storage of 325,000 acre-feet.
 - (c) Cutoff of interruptible supply for the coming year occurs when combined storage in Lakes Buchanan and Travis on January 1 is less than or equal to 325,000 acre-feet.

- (d) Review and cancel the curtailment of interruptible stored water for the irrigation operations at any time during the year prior to July 31, if the combined storage in Lakes Buchanan and Travis is projected to be equal to or greater than 1.4 million acre-feet anytime in July.
- (e) Reserve Storage Pool - Cutoff of all interruptible supplies when combined storage in Lakes Buchanan and Travis is less than or equal to 200,000 acre-feet.
- (f) Allow each irrigation operation the option of a fixed maximum amount of interruptible stored water or all the water necessary to cultivate a maximum acreage agreed upon by the operation and LCRA.
- (g) LCRA encourages its firm water customers to implement long-term water conservation measures year-round to meet the goals included in their water conservation plans. LCRA will implement a public awareness campaign on water use and conservation.
- (h) Whenever total storage in Lakes Buchanan and Travis is at or below 1.4 million acre-feet, LCRA requests its firm water customers implement the voluntary water use reduction measures contained in their drought contingency plans, with a target reduction goal of five percent.
- (i) Whenever the total storage in Lakes Buchanan and Travis is at or below 900,000 acre-feet, LCRA will ask all its firm water customers to implement mandatory water use reduction measures in their drought contingency plans, with a target reduction goal of 10 - 20 percent. LCRA will also begin discussions with firm water customers to develop a specific stored water curtailment plan, to be approved by the LCRA Board and TCEQ.
- (j) During a drought more severe than the Drought of Record, LCRA will implement a mandatory pro rata curtailment of a minimum of twenty percent among all of its firm water supply customers according to the amount of firm water to which they are legally entitled under the terms of their contract and consistent with the curtailment plan approved by the LCRA Board and TCEQ. If lake levels continue to drop below 600,000 acre-feet, the mandatory pro rata curtailment percentage may be increased as determined by the LCRA Board. All uses of interruptible stored water will be totally cutoff prior to and during any mandatory curtailment of firm stored water customers.

- (k) Require legally enforceable local drought contingency plans for LCRA firm water customers and the four major irrigation operations.

TABLE P-1, below, summarizes these plan elements.

TABLE P-1. DROUGHT CONTINGENCY PLAN SUMMARY TABLE

A	B	C	D	E	F	G	H
Drought Response Levels and Stages	Water Use Reduction Goals	Water in Storage (acre-feet)	Status (Date)	Actions Affecting Interruptible Supplies	Actions Affecting Firm Supplies	Actions Affecting Instream Flows	Actions Affecting Matagorda Bay Freshwater Inflows
1		Full	January 1	Full Supply ↓	Full Supply Voluntary Conservation; Public Awareness Campaign	1. Full Supply for Critical Needs 2. Supply for Target Needs Limited to Storable Inflows	Supply for Critical and Target Needs Limited to Storable Inflows
2		N/A	January 1 or July 1 – Other customers (either Lake Travis or Buchanan less than 94% full)	1. Interruptible Supplies Cease for All Customers Except Four Major Irrigation Operations 2. Full Supply for Four Major Irrigation Operations	↓		↓
3		Less than 1,700,000	January 1	↓	↓	↓	1. Supply 150% of Critical Needs Limited to Storable Inflows 2. Cease Meeting Target Needs
5	Firm Stage 1: Voluntary Conservation Interruptible Level 1: Initial Curtailment	5% of firm demand *0-30% of interruptible demand	January 1 At Any Time – Conservation	Begin Curtailment for Four Major Irrigation Operations with interruptible stored water ranging from 273,000 acre-feet available at storage of 1.4 million acre-feet to 195,000 acre-feet at storage of 1.15 million acre-feet	Full Supply Begin Voluntary Drought Measures	1. Full Supply for Critical Needs Only 2. Cease Meeting Target Needs	
6	Interruptible Level 2: Steeper Curtailment	Less than 1,150,000	January 1	Continued Curtailment for Four Major Irrigation Operations with interruptible stored water ranging from 195,000 acre-feet at storage of 1.15 million acre-feet available to 160,000 acre-feet at storage of 325,000 acre-feet		↓	
7	*NOTE: Interruptible water use reductions are built-in to the interruptible stored water curtailment schedule.						

TABLE P-1. DROUGHT CONTINGENCY PLAN SUMMARY TABLE

	A	B	C	D	E	F	G	H
	Drought Response Levels and Stages	Water Use Reduction Goals	Water in Storage (acre-feet)	Status (Date)	Actions Affecting Interruptible Supplies	Actions Affecting Firm Supplies	Actions Affecting Instream Flows	Actions Affecting Matagorda Bay Freshwater Inflows
8			Less than 1,100,000	January 1 - Environmental Flows At Any Time - Conservation	↓	↓		Supply Only for Critical Needs Limited to Storable Inflows
9	Firm Stage 2: Requested Mandatory Conservation	10-20% of firm demand	Less than 900,000	At Any Time During Year	↓	Full Supply Request Mandatory Drought Restrictions Meet with Firm Customers to Develop Curtailment Plan TCEQ and LCRA Board Approve Curtailment Plan		↓
10	Firm Stage 3: Pro-Rata Curtailment	20% or more of firm demand	Less than 600,000 If Drought Worse Than Drought of Record*	At Any Time During Year	Interruptible Supplies Cease, Unless Drought Less than 36 Months in Duration, then Interruptible Supplies Cease No Earlier than Following July 31 or Jan. 1, which ever comes first	Curtail Firm Customers on Prorata Basis with Other Firm Users According to Approved Plan	Curtail on Prorata Basis with Other Firm Users	Curtail on Prorata Basis with Other Firm Users
11	Interruptible Level 3: Cutoff Supplies	100% of interruptible demand	Less than 325,000	January 1	Interruptible Supplies Cease			
12	Interruptible Level 4: Cutoff Supplies	100% of interruptible demand	Less than 200,000	At Any Time During Year	↓	↓	↓	↓
13	<p>*NOTE: Drought Worse than Drought of Record defined by all of the following conditions occurring simultaneously at any time:</p> <ol style="list-style-type: none"> 1. Combined Storage in Lakes Travis and Buchanan being less than 600,000 acre-feet. 2. Drought duration of at least 24 months. 3. The cumulative inflow deficit of the current drought exceeding that of the drought of record by at least 5% for a minimum of six consecutive months. 4. Declaration of the LCRA Board based on all three of the above conditions occurring simultaneously. 							

C. Definitions

To understand the WMP, it is important to know the definitions of the key legal and hydrologic terms used in this plan. The major terms are defined below and should be considered specific to LCRA.

adjudication - a court proceeding to determine all rights to the use of water on a particular stream system.

beneficial use of water - use of the amount of water that is economically necessary for a purpose authorized by law, when reasonable intelligence and reasonable diligence are used in applying the water to that purpose. Such uses include domestic use, municipal uses, industrial use, agricultural use, hydroelectric power, navigation, fish and wildlife, etc. The benefit may vary from one location to another and by custom. Beneficial uses are defined by statute in the Texas Water Code.

combined firm yield - a specific amount or quantity of water stated in acre-feet that represents the maximum average annual demand that can be met from a reservoir system during a simulation of a repetition of the system's Drought of Record, while honoring the full extent of upstream and downstream senior water rights.

conservation base acreage - the historical 10-year average acres irrigated at a total of 5.25 acre-feet of water per acre irrigated.

curtail - to reduce the supply of water being provided through a diversion by reducing the amount of water served under the contract for a specific period of time. Curtailment may occur during drought or other emergency conditions.

critical drought period - the period of time during which the reservoir system was last full and refilled, and the storage content was at its minimum value.

cutoff(water) - to discontinue, or to terminate completely, the supply of water provided under contracts for diversion for a certain period of time. Cutoff may occur during drought or other emergency conditions.

diversion demand - the water pumped from a water body for beneficial use.

domestic water use –use of water by an individual or a household to support domestic activity. Such use may include water for drinking, washing, or culinary purposes; for irrigation of lawns, or of a family garden and/or orchard; for watering of domestic animals; and for water recreation including aquatic and wildlife enjoyment, but does not include water used to support activities for which consideration is given or received or for which the product of the activity is sold.

drawdown - the lowering of the water level in a water body by diversion, pumping, or release.

drought - a prolonged period of dryness or lack of rainfall that has a significant effect on water or water-related uses.

drought of record - the drought that occurred during the critical drought period.

firm water - a supply of stored water that is drawn from the combined firm yield of the reservoir system. Such supplies are diverted or otherwise committed under a contract or resolution issued by the LCRA Board.

firm yield - the maximum average annual supply of water that can be supplied from a water source without shortages during a repetition of the critical drought period.

gaging station - particular site on a stream, canal, or lake where systematic observations of hydrological data are obtained.

instream flow - the specific amount of water needed to flow in a stream or river to support aquatic life, minimize pollution, or for recreational use, usually stated as a daily mean discharge values in cubic feet per second.

interruptible stored water - stored water supplied pursuant to contract or resolution, where the contract, resolution or special conditions defining the commitment specifically provides that such commitment is “subject to interruption or curtailment.”

irrigation - The use of water for the irrigation of crops, trees, and pasture land, including, but not limited to, golf courses and parks, which do not receive water through a municipal distribution system.

reserve storage pool - a storage level that, when reached at any time during the year, would require the total cutoff of all water for interruptible use.

run-of-river flows - the natural flow in the river that is available under law at a given point on the river at a given instant in time to honor a right with a given priority date. This flow is determined by hydrologic studies that assume that all reservoirs and diversions under upstream junior rights do not exist. Rights to use run-of-river flows for beneficial uses, rights to store inflows in reservoirs, and pass-through of inflows and releases from reservoirs, are regulated by the TCEQ.

storable inflows - the actual daily inflows to the reservoir system minus the daily pass throughs from the reservoir system required to meet downstream senior water rights.

storage capacity - the quantity of water that can be contained in a reservoir.

streamflow - rate of flow of water that occurs in a natural channel.

water conservation - those practices, techniques, and technologies that will: (1) reduce the consumption, loss or waste of water, (2) improve the efficiency in the use of water, or (3) increase the recycling and reuse of water, so that a water supply is made available for future or alternative uses.

water right - a legally protected right, granted by law, to impound, divert, convey, or store state water and put it to one or more beneficial uses.

CHAPTER 1

INTRODUCTION TO THE WATER MANAGEMENT PLAN

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A. Goals of the Water Management Plan

The 1988 Final Judgment and Decree adjudicating LCRA’s Highland Lakes water rights required LCRA to submit a reservoir operations plan describing how LCRA would determine the amount of firm and interruptible stored waters and how LCRA would manage the waters in Lakes Buchanan and Travis and the Colorado River. The Water Management Plan for the Lower Colorado River Basin (WMP) was developed using the following goals and guidelines as provided in the Final Judgment and Decree:

1. Lakes Buchanan and Travis and the Colorado River will be managed together as a single system for water supply purposes.
2. LCRA will manage the system to maximize the beneficial use of water derived from inflows below the Highland Lakes.
3. LCRA will manage the system to stretch and conserve the waters stored in Lakes Buchanan and Travis.

To achieve the goals stated above, LCRA will manage the system according to the following guidelines:

1. All demands for water from the Colorado River downstream of Lakes Buchanan and Travis should be satisfied to the extent possible by run-of-river flows of the Colorado River;
2. Inflows should be passed through Lakes Buchanan and Travis to honor downstream senior water rights only when those rights cannot be satisfied by the flow in the Colorado River below the Highland Lakes;
3. The firm, uninterruptible commitments of water from Lakes Buchanan and Travis should not exceed the Combined Firm Yield;

4. The water from Lakes Buchanan and Travis will be available on an interruptible basis as long as LCRA's ability to meet the demand of its firm water customers is not impaired;
5. Water shall not be released through any dam solely for hydroelectric generation, except during emergency shortages of electricity and during other times that such releases will be needed for another beneficial purpose.

B. LCRA Act

Through the passage of the LCRA Act by the Texas Legislature in 1934, LCRA was established as a "conservation and reclamation district" consisting of ten counties that comprise the watershed of the lower Colorado River. Those ten counties are Blanco, Burnet, Fayette, Colorado, Llano, Travis, Bastrop, Wharton, San Saba, and Matagorda. The LCRA Act was amended in 1993 to expand LCRA's water service area to include all or part of an additional twenty-four counties. In 1999, the LCRA Act was amended to include Williamson County in LCRA's water service area and was again amended in 2001 to allow LCRA to enter into an agreement with the San Antonio Water System (SAWS) to provide water. LCRA's current water service area is depicted in Figure 1-1. The 1999 amendment contains specific restrictions on LCRA water sales to Williamson County. Similarly, the 2001 amendment contains very lengthy and detailed restrictions and study requirements prior to any transfer of water to SAWS. The Highland Lakes system is comprised of two water storage reservoirs, Lakes Buchanan and Travis, and three intermediate pass-through reservoirs, Lakes Inks, LBJ and Marble Falls. Lake Austin, the last of the lakes in the chain, is owned by the City of Austin but operated by LCRA under agreement and may be referred to as part of the system from time to time. Technical data on each of the dams and lakes is included in Appendix 2A of Volume II.

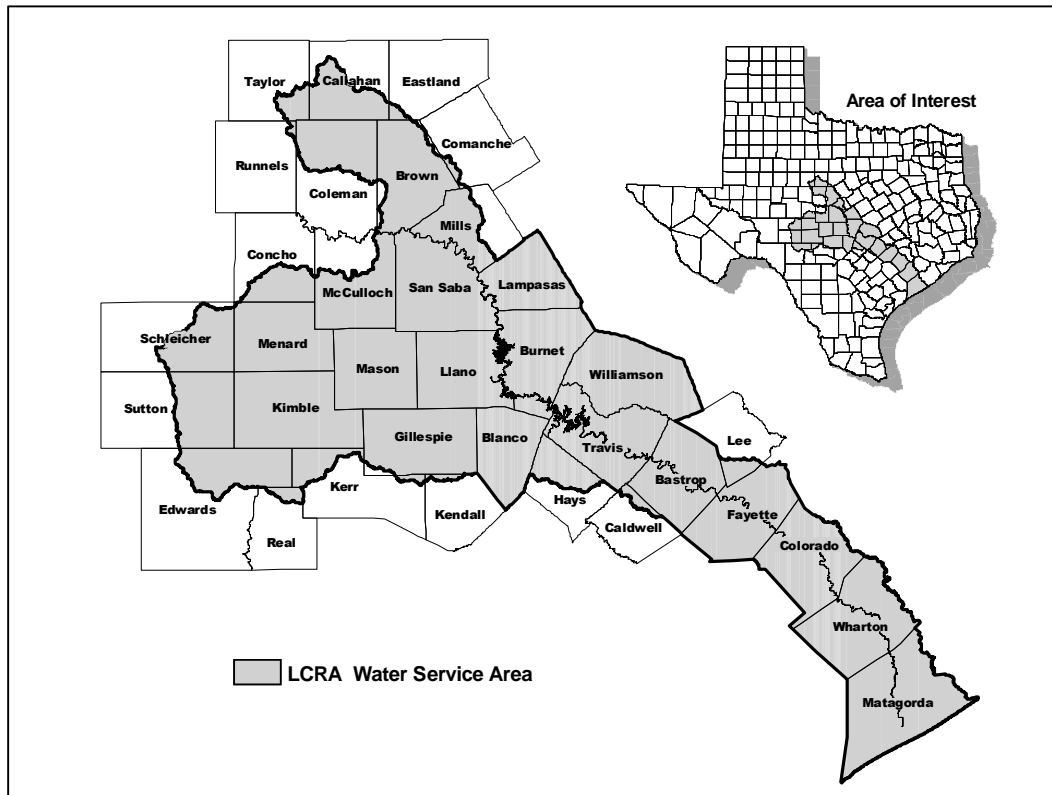


Figure 1-1. LCRA Water Service Area as of January 1, 2003.

LCRA has been delegated the responsibility of harnessing the Colorado River and its tributaries and making them productive for the people within LCRA's water service area.

The Act establishes LCRA's mission in four areas--water, electric energy, conservation and lands. In water, LCRA is empowered to control floods and control, store, sell, preserve and distribute the waters of the Colorado River and its tributaries. The waters are to be used for beneficial purposes including irrigation, generation of electric energy, reclamation of arid lands and the creation of lakes for water storage. LCRA is required to prevent flood damage to people and property by the Colorado River and to control the uses of the surface of the lakes it created.

Consistent with the control of the waters, LCRA is empowered to develop, distribute, and sell the energy created through hydroelectric generation both inside and outside the 10-county district. Later legislation allowed LCRA to expand its electric generation capabilities beyond hydropower through developing fossil fuel generation facilities.

As a conservation and reclamation district, LCRA is to conserve and develop the lands, forests and water of the district and to study and correct both artificial and natural sources of pollution that may affect the ground and surface waters within the district. LCRA is also empowered to provide water and wastewater treatment services within the district.

During the construction of the dams and development of the Highland Lakes system LCRA acquired large tracts of land that surround the reservoir system. The Act authorizes LCRA to develop, manage, and promote the use of these lands for parks, recreational facilities and natural science laboratories and to promote the preservation of fish and wildlife. LCRA must also provide public access to, and use of, its lakes and lands for recreation.

Each of the many purposes, functions, and uses of the elements of the river—the lakes, the lands, the ground and surface waters, the bays and estuaries—must be considered as parts of an integrated system.

The WMP describes the issues and conflicts that LCRA must recognize and, where possible, resolve.

C. LCRA Water Resources Management – History and Guiding Principles

It is important to consider the historical context in which this WMP has evolved. In the early years of LCRA's existence, the predominant priorities in water resources management were to moderate and control the floods and droughts in the Lower Colorado River Basin. This was accomplished through the construction of dams in the Hill Country west of Austin, which created the Highland Lakes.

The results have been impressive. The ravages of floodwaters have largely been controlled. These same dams have also provided a dependable source of water supply for municipal, industrial, agricultural, and mining uses. Additionally, the Highland Lakes provided the source of inexpensive, renewable electrical energy, and recreational opportunities for the citizens and communities of Central Texas. In sum, the work of LCRA in its early years provided the foundation on which much of the present day population and economy of Central Texas depend.

Notwithstanding the successes of the past, in developing a WMP for the river, LCRA today faces an array of water management issues and opportunities that were scarcely envisioned a half-century ago.

Recreation has emerged as a major use, both on the lakes and the river. Maintaining the aquatic habitat in the river channel and in the bays and estuaries is a major use, as is water quality and the use of the river to sustain a growing population and economy. This intensified competition among the various users of the water resource is placing increasing stress on the ecological and environmental resources supported by the Colorado River. LCRA, in partnership with the State of Texas, local governments, and private interests, must confront these challenges as we develop a meaningful WMP.

LCRA's WMP is grounded in these key principles:

- (1) LCRA recognizes the supremacy of the State of Texas, acting through the TCEQ, as the ultimate authority for water resources management and as the arbiter of disputes involving the allocation of water from the Colorado River and its tributaries. LCRA, within the intent and meaning of its legal authority, is the steward of the water rights granted to it by the State of Texas. Further, LCRA recognizes the responsibilities and prerogatives conferred upon local political subdivisions of the State and the rights of private citizens and corporations.

- (2) Many water management issues and opportunities are regional in scope and effect. Solutions and strategies must be built upon regional consensus and action. LCRA considers its role as one of consensus-building among competing users of Colorado River water and among the public and private interests concerned with the management of the Colorado River.
- (3) LCRA, in exercising its responsibilities as a steward of the water resources of the Colorado River and its tributaries, will strive to maximize the beneficial use of Colorado River water and achieve a sustainable balance among the competing demands on the system. In pursuing this objective, LCRA will implement management procedures and programs addressing:
 - (A) The efficient management of available water supplies as an integrated system;
 - (B) Water demand management measures including long-term conservation measures and short-term drought contingency measures;
 - (C) Protection and, where possible, enhancement of water-related environmental values; and
 - (D) Future water supply development and augmentation.

D. LCRA's Comprehensive Water Policy Review and Public Stakeholder Process

LCRA has approached the development of the WMP as much more than a set of complex engineering tools to serve as guidelines for operating the structures on the Colorado River system. The development of the WMP stimulated a comprehensive review of how LCRA has developed and operated the Highland Lakes and the lower Colorado River system for the past 60 years to meet the needs of the area it serves.

As a foundation for the prior versions of the WMP, LCRA conducted a comprehensive review of the policies and programs that guide and shape the way LCRA manages the river system. This review was conducted as a series of meetings held as joint public meetings of the LCRA Board's Planning and Public Policy and Natural Resources Committees. The meetings were designed to use staff expertise and information from outside experts to analyze the environmental, social, economic and legal factors that shape the issues that LCRA faces in managing the Colorado River system.

An important part of these public meetings was the involvement of the State agencies, environmental groups, business, industry and agricultural interests, wholesale electric customers and other constituencies whose interests are affected by LCRA policies. The process was designed to assure that participation was effective in informing LCRA of public views and also so that these constituencies would be better informed about the issues involved in the policy decisions. An issues inventory was developed and briefing papers were prepared for each of the meetings. Summaries of the meetings elements were developed and distributed to the LCRA Board and members of the public.

As a result of the Board and the public review, LCRA adopted a set of water and flood control policies to address many of the issues in water quality and water supply that face LCRA today and

will continue to face the agency well into the future. These policies undergo periodic review and revision by the LCRA Board. (See Appendix A, Volume I for the most current versions of these policies).¹ These policies, read in conjunction with LCRA's Certificates of Adjudication for the Highland Lakes, have formed the foundation of LCRA's WMP.

In developing the initial WMP and all of its subsequent revisions, LCRA has sought broad public participation through the work of an Advisory Committee and a series of public information and input meetings in the LCRA district. The Advisory Committee included over two dozen representatives from varied interests in the river basin. Taking part in the process were State and local officials, rice farmers, representatives of tourism and recreation interests, coastal sports and commercial fishing interests, business and industry and economic development representatives and environmental interest group leaders. The other major water right holders on the Lower Colorado River were also active participants on the Advisory Committee.

The purpose of the Advisory Committee has been to provide information to LCRA on the attitudes and interests of the major organizations and groups concerned with the allocation and management of LCRA's water resources. LCRA management and staff appreciate the commitment of time and energy made by the Advisory Committee. The Advisory Committee has actively participated in the development of the technical studies and the analysis of the policy options during every revision of the WMP. In addition, they aided LCRA by providing information on the WMP to the public and the local news media. Many of the policy concepts and alternatives found in the WMP are the direct result of suggestions made by the Advisory Committee. However, neither the report as a whole, nor any portion thereof, necessarily reflects the views of the Advisory Committee or any member of the Advisory Committee.

E. Organization of the WMP

Volume I of the WMP is organized as follows:

- (1) Chapters 1-3 of the WMP describe the issues and conflicts in the demands on the Colorado River system and lays out the policies and management actions LCRA will use to accommodate the variety of demands on the system.
- (2) Chapter 4 of the WMP describes the issues and conflicts in the demands on the Colorado River system during drought periods and sets forth the policies and

¹ Since the WMP's last approval in 1999, the LCRA Board of Directors has amended or consolidated several of its policies related to water. Board Policy 502 "Interbasin Transfers" and Board Policy 504 "Water Resources Management" were repealed by the LCRA Board on June 21, 2000 and combined, with amendments, into Board Policy 501 "Water Resources Management," initially adopted on Aug. 18, 1999 and subsequently amended June 21, 2000, Sept. 18, 2002, and November 16, 2005. Board Policy 503 "Lowering of LCRA Operated Lakes" was amended on Oct. 20, 1999, Sept. 18, 2002, and October 20, 2004. Board Policy 507 "Water Quality Leadership" was amended on December 13, 2000. Board Policy 509 "Water Conservation" was last amended on June 21, 2000. Board Policy 508 "Water Pricing Policy" is included, but has not been amended since December 16, 1988, but a reformatted version of the policy is contained in this submission.

management actions LCRA will use to address the competing demands for water in times of shortage based on 2010 projected demands for water.

- (3) Chapters 5-6 of the WMP describe the engineering and hydrological models and data sources and the process for the determination of the Combined Firm Yield of Lakes Buchanan and Travis.

Volume II of the WMP is a compilation of several technical appendices used to develop the WMP.

- 40,800 acre-feet in any five consecutive years;
- 41,400 acre-feet in any six consecutive years;
- 47,800 acre-feet in any seven consecutive years; and
- 60,600 acre-feet in any eight to ten consecutive years.

The total firm stored water commitment for both purposes will be an average of 33,440 acre-feet per year. Estimated interruptible stored water supplied during the critical drought for both purposes will be an additional 23,030 acre-feet per year.

8. Summary

To supply the demands of the preceding commitments for firm water existing during a repetition of the critical drought would require an average of 442,350 acre-feet per year to be released or diverted from storage in Lakes Buchanan and Travis, assuming the proposed changes to firm commitments to instream flows and freshwater inflows to the bays and estuaries are accepted. This commitment is summarized below in Table 3-1.

Table 3-1. Existing Firm Water Commitments as of April 2003	
O.H. Ivie Reservoir	90,546
City of Austin	122,084
Contracts from Lakes Buchanan and Travis	119,838
LCRA Water Utilities and Facilities	6,911
LCRA Power Plants	63,851
South Texas Project	5,680
Instream Flows/	27,380 (annual average)
Bays and Estuaries	6,060 (annual average)
TOTAL	442,350 acre-feet/year

Out of concern for the future needs of the many areas in LCRA's 35-county water service area, including areas now using ground water supplies that are becoming depleted or are of poor water quality, the LCRA Board committed to reserving 50,000 acre-feet of the remaining Combined Firm Yield.

This leaves an uncommitted balance of the Combined Firm Yield of 60,952 acre-feet per year with the commitments of firm supply to instream flows and freshwater inflows to the bays and estuaries as adopted by the TCEQ in 1999. Or, as indicated in Table 3-1, if the proposed changes to these commitments are accepted, the uncommitted balance of the Combined Firm Yield will drop to 43,462 acre-feet per year.

C. Annual Allocation of Firm and Interruptible Stored Water

Each year, LCRA will determine the amount of water that is available for interruptible commitments to supply the uses authorized under LCRA's Certificates of Adjudication.

No interruptible stored water will be supplied to cities or other industries that should be served on a firm basis. Interruptible stored water will be limited to irrigation or other similar uses where the value of water is well below firm water rates and the purchase is for one year only. New contracts for firm and interruptible stored water are subject to the Water Contract Rules as specified in Appendix 3 of Volume II.

In November of each year, LCRA determines the amount of water that is available in the following year to meet firm and interruptible demands in the system. LCRA manages the conservation storage of the reservoirs by using the interruptible stored waters to increase the average yield of the system.

Should an emergency occur that causes a demand for additional allocations of water to either firm or interruptible stored water contract holders, any interested party may petition the LCRA Board for such additional purchases.

1. Allocation of Firm Water

The amount of water required to meet the firm demand within the system for the preceding year will be calculated in early October. This amount will be compared to the projections for that year, and any variations will be noted and documented. LCRA will solicit information and projections of use from all of its firm supply contract holders and other firm uses provided for by resolution of the LCRA Board. This information will be used to develop a projection of firm demands for the coming year.

LCRA will assess the contents of Lakes Buchanan and Travis as of November 1 to project the storage levels for January 1 of the next year. Inflows into Lakes Buchanan and Travis from the upstream tributaries will be added to this preliminary storage level based on the minimum annual inflow from the period of drought.

This process will allow LCRA to reserve sufficient water in the system to meet all firm demands for one year beyond the year being considered for allocation.

Estimates for firm demand commitments for the next year will be subtracted from the total water supply available. The amount of water remaining will then be available for interruptible allocation for that year.

2. Allocation of Interruptible Stored Water

As part of the overall allocation process, every November LCRA will determine the amount of water that is available in the following year for interruptible contracts. LCRA may make commitments for interruptible stored water for terms in excess of one year. However, the allocation of interruptible stored water to be supplied under such commitments will be determined on an annual basis. All interruptible commitments are subject to full or partial curtailment.

3. Priority Uses in the Allocation of Interruptible Stored Water

In the allocation process, priority will be given to the irrigation operations (Lakeside, Gulf Coast, Garwood, and Pierce Ranch) to firm-up run-of-river water rights associated with individual irrigation operations. The LCRA Board will establish, by resolution, a Conservation Base number of acres determined by the historical (10-year) average acres that have been irrigated by Lakeside and Gulf Coast irrigation operations. The amount of surface water to be used for irrigation under this Conservation Base is based upon a limit of 5.25 acre-feet of water per acre irrigated (see Table 3-2). The priority allocation for Garwood irrigation operation is based on a contract that defines LCRA's commitment to supply interruptible stored water to the Garwood irrigation operation to the extent necessary to firm up the 133,000 acre-foot-per-year run-of-river water right associated with the Garwood irrigation operation. The priority allocation for Pierce Ranch is based on a contract that defines LCRA's commitment to supply interruptible stored water to Pierce Ranch. These contractual commitments to Garwood and Pierce Ranch are not based on a "Conservation Base acreage" calculation, but the 5.25 acre-foot-per-acre duty will apply to the acreage irrigated.

The Conservation Base acreage for the Lakeside and Gulf Coast irrigation operations will be served without charge for the amount of water designated under each operation's run-of-river rights. In years when the amount of run-of-river water is projected to be insufficient to serve the Conservation Base and the priority allocations for Garwood and Pierce Ranch, the annual allocation of interruptible stored water will provide back-up for those rights. The charge for the allocation of interruptible stored water shall be at the prevailing interruptible stored water rate set by the LCRA Board or, in the case of Garwood and Pierce Ranch, in accordance with their respective contracts with LCRA.

TABLE 3-2 CONSERVATION BASE ACREAGE OR OTHER PRIORITY ALLOCATION OF INTERRUPTIBLE STORED WATER				
	<u>LAKESIDE</u>	<u>GULF COAST</u>	<u>GARWOOD¹</u>	<u>PIERCE³</u>
Acres x Duty²=Ac. Ft.	26,000 x 5.25 = 136,500 acre-feet	24,300 x 5.25 = 127,575 acre-feet	32,000 with 100,000 acre-feet.	25,000 with 20,000 ac. ft. (Max. 30,000 ac. ft.)
Conservation Base⁶ Or other Priority Allocation	see above	see above	see above	see above
% R-O-R Rts.⁴	44.6%	58.6% ⁷	93.1%	0% ⁸
% Stored Int.⁵	55.4%	41.4% ⁷	6.9%	100% ⁸
¹ Garwood Irrigation Company and LCRA entered into a contract dated December 10, 1987, which defines LCRA's commitment to supply interruptible stored water to Garwood and the terms for curtailment during periods of shortages. This contractual commitment to Garwood is not based on a "Conservation Base Acreage" calculation, but the 5.25 acre-foot-per-acre duty will apply to the acreage irrigated. In 1998, LCRA purchased the assets of Garwood Irrigation Company, including its water rights. Under the terms of the 1998 agreement, LCRA has committed to supply up to 100,000 acre-feet annually consisting of run-of-river under the LCRA-owned Garwood water rights and LCRA interruptible stored water.				
² Duty set by TCEQ (5.25 Ac.Ft./Ac.) for rice irrigation.				
³ LCRA has entered into a contract with Pierce Ranch regarding LCRA's commitment to supply interruptible stored water to Pierce Ranch and the terms for curtailment during periods of shortage. This contractual commitment to Pierce Ranch of 20,000 acre-feet annually based on a rolling five-year average with a 30,000 acre-feet maximum in any calendar year is not based on a "Conservation Base Average" calculation, but the 5.25 acre-foot-per-acre duty will apply to the acreage irrigated. The Pierce Ranch operation needs may also still be met through exercise of Certificate of Adjudication No. 14-5477D.				
⁴ % of Conservation Base or other Priority Allocation likely to be supplied by run-of-river rights (<i>i.e.</i> estimated reliability of the water right)				
⁵ % of Conservation Base or other Priority Allocation expected to be supplied by Interruptible Stored Water based on reliability of run-of-river rights.				
⁶ LCRA purchased 55,000 acre-feet of water rights from Pierce Ranch and transferred these water rights for diversion and use within the Lakeside service area, which is currently 28,300 acres				
⁷ % based on water used for 37,000 acres (194,250 acre-feet)				
⁸ % based on water use for 7,200 acres (37,800 acre-feet)				

4. Use of Interruptible Stored Water for Recreation

Interest groups around the Highland Lakes, such as marina owners and other tourist and recreation industry members represented by the Highland Lakes Tourist Association expressed the need for recreation to be given some priority in the allocation of interruptible stored water.

In developing the annual interruptible allocation process, LCRA has considered the needs of the recreation industry around the lakes and proposes establishing some use of the interruptible stored waters to maintain lake levels in Lakes Buchanan and Travis. These levels would be above the possible minimal drawdowns of the lakes under the operating rule curve and would be established in recognition of LCRA's public interest responsibilities.

The conflict between supplies of interruptible stored water being held in the lakes for recreation or being released and sent downstream for agricultural irrigation and public recreation is one of the most difficult issues for LCRA to balance. The rice farmers have a historic claim to a "first call" on the water used for rice farming as shown in Table 3-2. However, LCRA believes that the needs and interests of the recreation industry that has developed around the Highland Lakes must be heard and given due consideration.

Once the first priority allocation of interruptible stored water has been made to supply the Conservation Base of the Lakeside and Gulf Coast irrigation operations and LCRA's contractual commitments to the Garwood and Pierce Ranch irrigation operations, LCRA staff will make recommendations to the LCRA Board for the remainder of the interruptible stored water available for supplying other authorized uses under LCRA's water rights. In recognition of the economic benefits to the recreation industry in the Highland Lakes region, the WMP establishes a process to consider the levels of Lakes Buchanan and Travis.

LCRA will limit additional sales of interruptible stored water, other than for the four irrigation operations' Conservation Base or Priority Allocation acreages, based on the combined volume of water in Lakes Buchanan and Travis at certain times of the year. To provide for more flexibility to supply interruptible stored water in normal and wet years, the supply allocation formula is based on a semi-annual allocation process using the following policies:

1. Interruptible stored water supply available (other than to the four major irrigation operations) for January through June in any year is based on the minimum of the separate storage levels, as percent of maximum water conservation capacity) in Lakes Buchanan and Travis on January 1 of that year according to the schedule provided in Table 3-3.
2. Interruptible stored water supply available (other than to the four major irrigation operations) for July through December in any year would be based on the minimum for Lakes Buchanan and Travis of their separate maximum storage levels (as percentage of capacity) in April, May and June of that year. That is, the maximum percent full for each lake over April through June would be compared and the lower

of the two percentages selected. The water supply allocation for July through December is also given in Table 3-3.

3. Maximum supply available in any year is 30,000 acre-feet, with the semi-annual allocation based on a typical municipal monthly demand distribution.

TABLE 3-3. MAXIMUM INTERRUPTIBLE STORED WATER AVAILABLE FOR SALE, EXCLUSIVE OF SALES FOR THE CONSERVATION BASE OR PRIORITY ALLOCATION ACREAGE OF THE FOUR IRRIGATION OPERATIONS

Minimum of the Maximum Reservoir Storage for Either Lakes Travis or Buchanan Either on January 1 or over the months of April, May and June (As Percentage of Full Water Conservation Capacity)	Maximum Additional Interruptible Stored Water Available for Sale in January Through June (Acre-feet)	Maximum Additional Interruptible Stored Water Available for Sale in July Through December (Acre-feet)
≤94	0	0
95	2,170	2,830
96	4,330	5,670
97	6,500	8,500
98	8,670	11,330
99	10,830	14,170
100	13,000	17,000

No maintenance, except for emergencies that would require the lowering of Lakes LBJ, Marble Falls, and Inks, will be permitted if the refilling of those lakes would result in substantial loss of hydropower generation benefits or other costs. Periodic lowering and refilling of Lake Austin will be done when requested by the City of Austin and consistent with LCRA Board Policy 503-Lowering LCRA-Operated Lakes.

5. Publication of Allocation of Firm and Interruptible Stored Water

LCRA will publish the results of the allocation process and notify the LCRA Board, the firm supply contract holders, and any existing or potential interruptible contract holders of the results.

6. Monthly and Quarterly Operations

The operational rule curve will be applied to the system on a monthly basis to determine how the system is responding to current conditions as compared to historical operations. This will allow LCRA to optimize reservoir operations on a real time basis and to determine if adjustments to the amount of interruptible stored water should be considered. The monthly allocation model serves to continually evaluate inflows into the system, to evaluate risks, and to assess system reliability. The monthly analysis would detect early signs of drought and allow LCRA to develop and implement contingency measures in a timely fashion.

At minimum, a quarterly system operations report showing inflows to the system, monthly releases for firm and interruptible commitments, and important operating characteristics will be provided to the LCRA Board.

D. Summary of LCRA's Water Conservation Plan and Programs

Although LCRA has had extensive water conservation programs since the late 1980s, it did not formally adopt a water conservation plan until 1998. This plan was updated to reflect water conservation and drought contingency planning requirements under Senate Bill 1 and approved by the LCRA Board of Directors in April 2000. In March 2009, the LCRA Board of Directors approved water conservation goals and strategies that will be phased in over several years to reduce overall water use in the basin. The 2009 LCRA Raw Water Conservation Plan meets the requirements of Chapter 288 of the TCEQ rules as a wholesale water supplier for municipal, irrigation and industrial customers, as a retail supplier of water to irrigation operations, and as an industrial user of water at LCRA power plants. The Plan discusses separate water conservation strategies for municipal wholesale water customers, LCRA irrigation divisions, LCRA power plants, and other nonagricultural and agricultural irrigation, recreation and industrial uses. The following provides a summary of LCRA's plan.

1. Wholesale Municipal, Industrial and Other Firm Water Supply Strategies

Water conservation and reuse are viewed as important strategies for mitigating the effects of urban growth on the region's water resources, particularly in the Austin and surrounding areas. In addition to reducing future municipal water demands, municipal water conservation and reuse can make important contributions toward satisfying the water and wastewater service requirements of growing urban populations and economics.

LCRA's municipal water conservation programs are predicated on the fact that the implementation of conservation measures must occur in partnership with customers and stakeholders. Many water utilities have limited or no programs for water conservation, while the City of Austin (accounting for more than 70 percent of all municipal water use in LCRA's water service area) has one of the most aggressive conservation programs in Texas. As such, the focus of LCRA's programs is to increase water-use efficiency to reduce the waste of water throughout the water service area. Strategies are listed below.

a. Water Measurement and Accounting

The LCRA Water Contract Rules impose requirements on LCRA's water customers to properly measure water diversions. One of the provisions specifically requires all meters to be accurate within +/- 5 percent of the indicated flow over the possible flow range. LCRA personnel read these meters on a monthly basis. Each customer is required to provide third-party verification of meter testing and calibration to LCRA staff each year. LCRA-owned and-operated water utilities must also follow these rules.

b. Monitoring and Records Management

LCRA maintains records of water distribution and sales through several monitoring and billing systems. A Windows-based system provides a central location for water billing information and an automated way to compile and present that information.

c. Conservation-Oriented Rates

LCRA's wholesale raw water rates were designed to encourage water conservation. The water rate is 42 cents per 1,000 gallons or \$138 per acre-foot. However, any water used above the contracted amount increases to \$262.20 per acre-foot. Customers also are allotted a reservation charge of \$69 per acre-foot for water reserved but not used.

LCRA has also developed increasing block rates for all retail water utilities.

d. Contractual Requirements

According to LCRA Board Policy 509 - Water Conservation, all future water sales contracts and water utility agreements shall contain "appropriate conditions requiring conservation measures that are economically feasible." LCRA's Rules for Water Conservation are updated periodically to meet the requirements of Chapter 288 of TCEQ's rules for water conservation and drought contingency plans.

All plans must be reviewed and approved by LCRA staff before contracts are signed. Each customer agrees that, in the event that it furnishes water or water services to a third party that in turn will furnish the water or services to the ultimate consumer, the water conservation requirements shall be met through contractual agreements between it and the third party.

In April 2007, the LCRA Water Contract Rules were amended to clarify that LCRA will determine the reasonableness of the quantity of any raw water contract request. The reasonableness of the quantity requested is evaluated based on many factors, including the applicant's water conservation plan, delivery or system losses, and other factors. Agency and industry standards are used in LCRA's assessment, including but not limited to the TWDB Water Conservation Task Force Best Management Practices Guidebook. To the extent the applicant requests a water supply based on standards other than those commonly used, the applicant must submit a written justification describing the reasons these standards were not

employed and how the water supply needs were calculated.

e. Technical Assistance

LCRA has worked with communities and cities in its water service area for the past two decades to demonstrate the effectiveness of water conservation in reducing water consumption and wastewater flows. This effort ranges from providing sample water conservation programs, to developing conservation and drought contingency plans and landscape ordinances, to providing planning and equipment for plumbing retrofit programs.

f. Public Education and Outreach

LCRA began implementing the Water IQ program in Central Texas in 2006. The program uses a diverse set of tools to reach the public with water-saving tips and information, including television, radio, and print ads; billboards; electronic advertising; and community outreach with key audiences. In 2008, the City of Austin, LCRA, and the City of Cedar Park collaborated on the Water IQ: Know your Water campaign. Recognizing that water conservation outreach programs can be costly and consumers may become confused hearing mixed messages from water suppliers, LCRA and two cities pooled their resources on a shared outdoor water efficiency campaign. By reaching a consensus on a few key outdoor watering recommendations, the three entities were able to transmit a valuable regional message that reached a broad range of customers throughout the 10-county area.

Additional LCRA outreach and education efforts include the promotion of the Texas Hill Country Landscape Option to promote landscape best management practices, continued involvement in the Major Rivers education program, natural science education programs at LCRA nature parks, and the use of video tutorials and other water efficiency tips on the LCRA Web site. In 2008, TWDB and LCRA jointly updated the Major Rivers curriculum to correlate with the latest education standards and to add additional “hands-on” activities such as a new outdoor water use and conservation activity.

g. Future Conservation Strategies

In January 2009 LCRA staff proposed a comprehensive strategic plan for municipal, industrial and non-agricultural irrigation water conservation — based on results of the research and considering input from stakeholders and customers — to the LCRA Board. This comprehensive program will include a variety of strategies to save water, including incentive programs through which LCRA will partner with its customers to offer water-saving fixtures such as high-efficiency toilets; requirements that new construction meet standards for soil depth and irrigation systems; and expansion of LCRA’s education outreach efforts to provide useful information to consumers. Elements of the program will be phased in over the next several years.

2. Irrigated Agriculture Conservation Strategies

As the largest user of water from the lower Colorado River system, irrigated agriculture provides the best opportunity for reducing the overall demand through conservation programs. Beginning in 1986, LCRA initiated a major program to increase irrigation water use efficiency in rice irrigation systems. Rice cultivation accounts for more than 90 percent of all irrigation in LCRA's water service area.

LCRA's efforts in irrigation water conservation have been and continue to be focused on promoting water conservation at its irrigation operations: Lakeside, Gulf Coast and Garwood. These systems, along with one other privately owned major irrigation company, account for approximately 65 percent of the surface water irrigation in Colorado, Wharton, and Matagorda counties. The LCRA irrigation operations do not provide water for other wholesale customers or public water suppliers.

Substantial water savings resulted from irrigation conservation programs implemented in the Lakeside and Gulf Coast Irrigation Operations. Combined between the two operations, LCRA saved about 41,500 acre-feet annually from 1989 to 1996. This savings is approximately 13 percent of the projected water use that would have occurred without conservation practices in place. Conservation strategies implemented in the operations include the following:

a. Water Measurement

From 1989 to 1997, LCRA invested about \$1.3 million for improvements in the water delivery system, structure standardization, purchase of electronic measurement devices for daily measurements, and customer education. Starting in 1993, LCRA began selling irrigation water in the Lakeside and Gulf Coast systems at a price based on a mix of acreage and water use. Formerly, LCRA provided water to individual customers of the irrigation operations only on the basis of acreage irrigated. In 2009, the LCRA Board approved a project to complete similar improvements to the Garwood system to enable on-farm water measurement which include the purchase of in-canal check structures to improve water distribution as well as structure standardization. Initial funding of \$250,000 was approved recently from HB1437 funds. This project began in the fall of 2009 and is anticipated to be complete by 2012. This strategy is anticipated to save at least 3,400 acre-feet per year and possibly as much as 10,000 acre-feet per year.

b. Canal Maintenance (Water Loss) Program

In 1987, LCRA initiated an irrigation canal rehabilitation project for improving canal conveyance efficiency, reducing power consumption, and improving canal system management. In this project, from 1987 to 1996, LCRA invested about \$1.5 million for regrading and selectively removing high water-consuming trees and vegetation from about 210 miles of canal; replacing about 300 water control structures, and modifying pump utilization schedules. The large majority of effort was in the Gulf Coast system. Prior to the implementation of this project, canal water loss in the Gulf Coast system was about 55 percent and in the Lakeside system was

about 25 percent. Following the implementation, based on recent analysis, this loss has come down to about 30 percent in the Gulf Coast system and about 20 percent in the Lakeside system.

With the completion of the canal rehabilitation project, LCRA has implemented a routine preventive maintenance program. This effort is expected to maintain existing canal operation efficiencies within the Lakeside and Gulf Coast systems. The Garwood canal system is in relatively good shape, with losses running at about 20 percent, similar to that found in the Lakeside system.

c. Customer Outreach

To facilitate communication with irrigation customers, LCRA created the Lakeside and Gulf Coast Farmer Advisory Committees in 1984. Garwood Irrigation Operation customers formed a farmer advisory committee in 1999, shortly after LCRA acquired the system. These committees represent the interests of customers of the irrigation systems. They also provide forums for LCRA to inform the farming community on LCRA's water conservation programs and to stimulate discussion on potential farming practices that can reduce water use. The HB1437 program also has an advisory committee, as required by the legislation. This committee was reappointed in 2009 and is actively involved in reviewing HB1437 activities.

LCRA initiated agricultural water conservation efforts in the mid 1980s through funding \$90,000 to the Texas A&M University Agricultural Research and Experiment Station for developing the "Less Water, More Rice" program. The emphasis of this program was to deliver water conservation messages to rice irrigators. Based on the preliminary results of "Less Water, More Rice," improved cultivation and management practices (e.g., precision land leveling, multiple inlet systems, etc.) can reduce on-farm water use by 25 to 30 percent.

d. House Bill 1437

In May 1999, the Texas Legislature passed House Bill 1437, which allows LCRA to sell up to 25,000 acre-feet of water from the Colorado River to public water suppliers in Williamson County. The HB 1437 legislation requires "no net loss" of water in the Colorado River watershed and authorizes an additional charge to be added to the base water rate to fund strategies to ensure that an equal amount of water is conserved, replaced or offset. Funds collected from the additional charges are to be used for the development of water resources or other water use strategies to replace or offset the amount of surface water transferred. In 2000, LCRA entered into a water supply contract with the Brazos River Authority to provide water to Williamson County communities. A 25 percent surcharge is applied to the standard water rate to provide income to the Agricultural Water Conservation (Ag) Fund. In 2004, the LCRA Board authorized an engineering study and public meetings to develop a plan for implementing the HB 1437 program. The results of this study lead to the revised LCRA Board Policy 501, which defined the term "no net loss," and the development of a short-term plan to implement conservation projects that would allow the water transfer to occur under the provisions of the HB 1437 legislation. This short-term implementation plan has been updated recently and was finalized in October 2009.

The HB 1437 Agricultural Water Conservation Program was developed in 2005 in order to provide grants from the fund to eligible producers to construct on-farm water conservation projects. From 2006-2009, this program has provided grant funding to precision level a little over 19,000 acres, saving an estimated 4,750 acre-feet of water each year, mostly in the Lakeside and Garwood Irrigation Divisions. An annual report is prepared yearly showing details of current demand projects, current planning efforts, program results (including volume conserved and available for transfer), financial details about the Ag Fund, and a program outlook for the next year. To date, approximately \$1.875 million has been spent on this program. Recently, the LCRA Board authorized an additional \$200,000 to fund precision land leveling cost-share projects in 2010 and \$250,000 to begin the Garwood measurement project. In 2009, LCRA contracted with a PhD student at the University of Texas' LBJ School to complete a statistical model to verify water savings from the precision land leveling grant program. This work is expected to be completed in 2010.

3. Industrial Water Conservation Strategies

a. Fayette Power Project

The Fayette Power Project (FPP) has an extensive conservation and reuse program. The power plant conserves and reduces the amount of water diverted from the river. This helps maintain the integrity of the cooling reservoir dam by properly controlling the water level. FPP developed a plant water balance that indicates water usage. It was found that unique opportunities existed at FPP that do not exist at other plants, mainly because of its size and the reuse design from the no-discharge ponds. Highlights of reused water and wastewater include:

- Water reuse from the reclaim pond in the Unit 3 Flue Gas Desulfurization (FGD).
- Reverse osmosis reject water reused in the FGD or returned to the lake.
- Reuse of ash pond water for Units 1 & 2 bottom ash and economizer fly ash removal.
- Reuse of wastewater treatment plant effluent in the ash pond or reclaim pond.
- Reuse of the fly ash runoff pond water in the reclaim pond.
- Reuse of the coal runoff water in the ash pond in times of drought.

Additional conservation measures for FPP include converting the bottom ash system on Units 1 and 2 to a dry system, using reclaimed pond water in place of raw water for dust suppression, recycling stormwater from the coal pile runoff pond back to the reservoir, recycling stormwater from the reclaimed water pond to the reservoir, distributing information and training about water conservation and leak detection to employees, and revising the irrigation system to use wastewater or alternative water sources.

b. Lost Pines Power Park (includes Sim Gideon and Lost Pines 1 Power Plants)

The largest water conservation and cost reduction measure at the facility is the implementation of a Lake Bastrop elevation level management policy, whereby the lake level is managed to an elevation that is eight to 14 inches below the spillway for multiple reasons. By maintaining an

average 12-inch drop in elevation, there is a reduction in the surface area of Lake Bastrop from 915 surface acres to 875 acres. This is a 4.4 percent reduction in the natural evaporation loss rate. Another benefit is the opportunity this level provides to capture rainfall runoff and never incur any loss by overflowing the spillway. Additionally, all the water used at Sim Gideon in the production of high purity boiler water, such as blowdown, backwash, and reverse osmosis reject waters, are returned to Lake Bastrop for reuse, which reduces the power plant's water consumption from Lake Bastrop. Additional conservation strategies include seasonally managing the lake level to optimize rainfall capture and further minimize natural evaporation rates, converting old plumbing fixtures to high efficiency models, distributing of information and training about water conservation and leak detection to staff, and revising the irrigation system to use wastewater or an alternative water source such as rainfall.

c. Thomas C. Ferguson Power Plant

The Thomas C. Ferguson Power Plant currently reuses approximately 450,000 gallons of water from its demineralization process. The water is reused by mixing it with Lake LBJ water and using it as clarifier makeup. Reusing this water has eliminated a discharge outfall to the Colorado River. Additional conservation strategies include converting old plumbing fixtures to high efficiency models, distributing information and training about water conservation and leak detection to staff, and revising the irrigation system to use wastewater or an alternative water source such as rainfall.

CHAPTER 4

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A. Introduction

1. Background

On September 20, 1989, the Texas Water Commission, the predecessor agency to the TCEQ, issued its Order approving LCRA's Water Management Plan (see Appendix C, Volume I) for the Highland Lakes and the lower Colorado River. The Commission's Order included a requirement for LCRA to submit, within one year, a Drought Management Plan (DMP) with the Commission for its review and approval. On December 23, 1991, the Texas Water Commission issued its Order approving the DMP. (See Appendix D, Volume I). TCEQ subsequently adopted specific rules requiring water suppliers, such as LCRA, to develop a Drought Contingency Plan (DCP). LCRA's initial DCP was modeled after the most recent DMP approved by the Commission in 1999. As part of this WMP revision, LCRA proposes to fully incorporate into the WMP the LCRA's DCP, with modifications.

Chapter 4 describes the Lower Colorado River Authority's DMP, as required by the water rights granted to LCRA, as well as LCRA's DCP, as required by Commission rules (collectively DMP/DCP). Although the water resources available in the lower Colorado River are considered

as a system, only waters used under LCRA's water rights are addressed by this DMP/DCP.

LCRA recognizes that its responsibility and authority under this DMP/DCP is subject to and shall not conflict with the authority of any Watermaster operation the TCEQ may establish on the Colorado River. Moreover, LCRA recognizes that the Commission has jurisdiction to resolve any and all disputes regarding the allocation of stored water from Lakes Buchanan and Travis, notwithstanding the procedures and guidelines set forth in this DMP/DCP.

2. The Lower Colorado River System

The lower Colorado River is considered to be the lower portion of the drainage basin of Colorado River beginning in San Saba County and continuing to Matagorda County on the Texas Gulf Coast (see Figure 1-1). The river flows through nine of the ten counties that make up LCRA's statutory water district.

The upper portion of LCRA's district is part of the Texas Hill Country. In the Hill Country, the river is largely controlled by a series of five dams and their reservoirs--Buchanan, Inks, Wirtz, Starcke, and Mansfield. Marked by steep slopes and shallow rocky soils with outcroppings of granite and limestone, the Hill Country ends abruptly in the Balcones Fault region near the edges of Austin. At Austin is the Tom Miller Dam that creates Lake Austin. From the eastern edges of Austin the river broadens out, snaking through the dark rich Blackland Prairie soils and then rolls gently downstream through the sand and shale of the coastal plains.

Water from the Colorado River and its tributaries is used for a variety of purposes to support the citizens and economy in the LCRA district. These uses include public water supply, manufacturing, cooling water for electric generating plants, irrigation, agriculture and mining. The water to supply these uses comes largely from the natural runoff into the Colorado River. However, the Colorado River Basin is subject to recurrent, severe droughts and devastating floods resulting in wide ranges of river flows. To provide an assured water supply and to relieve flooding, the LCRA, with the help of the Federal government, constructed the Highland Lakes reservoir system.

The development of LCRA's dams and reservoirs on the Colorado River, accomplished in the years from 1939 through 1951, changed Central Texas in many ways. Beginning by controlling the devastating floods on the river, using the river's power to generate electricity, and creating a secure and reliable water supply, LCRA has helped to stimulate the growth and development of the region. The lower Colorado River's water resources satisfy a wide variety of uses, many of which have changed and will continue to change in concert with the changes in the environment and the growth and development of the region.

3. Major Water Rights Holders

The largest water right holders in LCRA's water district also use the majority of the water (Table 4-1). LCRA holds the largest rights, with rights to use up to 1.5 million acre-feet per year from

Lakes Buchanan and Travis. Some of the other large water right holders downstream of Lakes Buchanan and Travis have priority dates earlier than that of LCRA's Highland Lakes permits. These rights belong to the City of Austin, Corpus Christi (portion of Garwood), LCRA for Pierce Ranch, and the LCRA's Garwood, Lakeside and Gulf Coast Irrigation Operations. These rights are considered as senior in time and superior to LCRA's right to store water in the Highland Lakes. Hence, any inflows to the Highland Lakes that need to be diverted for use under these rights must be passed through the Lakes for use downstream. There are also some large water rights downstream of Lakes Buchanan and Travis that have junior priority dates.

**TABLE 4-1 MAJOR WATER RIGHTS AND AUTHORIZED RIGHTS
IN THE LOWER COLORADO RIVER BASIN, LISTED IN ORDER OF PRIORITY
(Acre-Feet/Year)**

LCRA (GARWOOD)	133,000
CORPUS CHRISTI (GARWOOD)	35,000
CITY OF AUSTIN (LAKE AUSTIN)	250,150
LCRA (GULF COAST)	228,570
LCRA (LAKESIDE)	107,500
LCRA (PIERCE RANCH)	55,000
CITY OF AUSTIN (Remainder of Certificate of Adjudication No. 5471)	46,403
LCRA (Lakes Buchanan and Travis)	1,500,000
CITY OF AUSTIN (Certificate of Adjudication No. 5489)	35,456
STP NUCLEAR OPERATING COMPANY and LCRA	102,000
LCRA (Gulf Coast junior portion)	33,930
LCRA (Lakeside junior portion)	78,750
TOTAL	2,606,759

4. Historic Operation of the Highland Lakes

Lakes Buchanan and Travis serve as the water supply and flood control reservoirs in the Highland Lakes system. Since their construction in the late 1930s and early 1940s, the water storage in these lakes has fluctuated dramatically in response to extreme floods and droughts. The lakes were at their lowest levels in 1952 when Lake Buchanan was at 983 feet mean sea level (msl) and Lake Travis was at 614 feet msl. The highest water surface elevations were in 1991 for Lake Travis (710.4 feet msl) and in 1991 for Buchanan (1021.37 feet msl).

Operational management of the lakes has also changed over time. A major use of the dams in the 1940s and 1950s was for hydroelectric power generation. That use became secondary to water supply purposes when LCRA developed its fossil fuel electric generation stations. As a result of the Final Judgment and Decree for LCRA's water rights, the use of water for hydroelectric generation was formally subordinated to higher uses except during emergency shortages of electricity, and during other times to the extent that such releases will not impair

LCRA's ability to satisfy all existing and projected demands for water from Lakes Buchanan and Travis pursuant to all firm commitments and all non-firm, interruptible stored water commitments.

5. Purpose and Legal Considerations

The purpose of the DMP/DCP is to specify how LCRA will contract and supply firm and interruptible stored water supplies during a repetition of the critical Drought of Record. In managing the stored water from Lakes Buchanan and Travis, LCRA must

- Define the conditions under which water shortages exist, and
- Specify the actions to be taken by LCRA to mitigate the adverse effects of such shortages.

The overall goals of the DMP/DCP are to:

- Extend available water supplies.
- Preserve essential uses of water and protect public health and safety during extreme shortages of supplies.
- Equitably distribute among LCRA's water customers any adverse economic, social and environmental impacts associated with drought-induced water shortages.

The scope of the DMP/DCP must adhere to the findings of the State District Court's Final Judgment and Decree, adjudicating LCRA's water rights, as well as the 1989 Water Commission's Order approving the WMP and TCEQ rules concerning drought contingency plans. The scope of the DMP is limited to the curtailment of LCRA's interruptible stored water supplies to insure that there is sufficient firm water available to meet projected demands for such water through a repetition of the Drought of Record and also addresses how LCRA will provide water for environmental flow needs. Firm water is subject to curtailment only if it is determined that the drought in effect is worse than the Drought of Record. The DCP also addresses water use reduction goals required by TCEQ's Chapter 288 rules and establishes more detailed procedures for pro rata allocation of interruptible stored water during periods of curtailment.

In times of shortage of supply caused by drought or emergency, LCRA, in accordance with Section 11.039 of the Texas Water Code, will first curtail and distribute the available supply of interruptible stored water among all of its interruptible stored water supply customers on a pro rata basis, so that preference is given to no one and all interruptible stored water supply customers suffer alike. Although projected firm demands for stored water for the next ten years are significantly greater than demands included in the last revision to WMP, these projected needs are still significantly less than the total firm water supplies available.

If the shortage of supply caused by the drought is worse than the Drought of Record, then LCRA must curtail and distribute the available supply of firm water among all of its firm water supply customers on a pro rata basis, so that preference is given to no one and all firm water supply

customers suffer alike.

In the annual allocation of interruptible stored water supplies, LCRA follows the priority order of water use as specified in Section 11.024 of the Texas Water Code and the WMP.

Similarly, in making additional commitments of firm water supplies, LCRA must also follow the priority order of uses given in Section 11.024 of the Texas Water Code.

As noted above, a goal of the DMP/DCP is to determine how to allocate available water supplies when there is not sufficient supplies to meet projected water demands even after reasonable, cost-effective water conservation efforts have reduced the water demands. Therefore, the DMP/DCP does not emphasize water conservation practices that should occur all the time, not just in drought conditions. LCRA has major programs to encourage conservation in water use. These programs are summarized in Chapter 3 of this WMP.

As discussed previously, the WMP, and the DMP/DCP, require periodic revision to reflect changes in water demands. The last revision was completed by LCRA in February 1997 and approved by TCEQ in March 1999. Significant changes in demand, as discussed below, have necessitated the present revision.

The most noticeable changed condition over the last five years has been a significant increased projection of municipal and industrial (firm) water demands. The WMP approved in 1999 projected the ten-year future firm demands within LCRA's service area at about 280,000 acre-feet annually for 2005. Based on the analyses for Regional Plans pursuant to the Senate Bill 1, the ten-year projected demands are now projected to be about 360,100 acre-feet per year for 2010 (see Table 4-2). The primary reason for this increase is additional water needs to meet population and economic growth in the Austin area, including domestic water use around the Highland Lakes.

With this large projected increase in firm water demand, the WMP must be adjusted to give a compensating reduction in the interruptible stored water supplies available since firm needs take priority. This reduction can be achieved by revising the annual interruptible stored water supply curtailment policy adopted in the WMP.

B. Water Users and Interest Groups

1. LCRA Firm Water Customers

LCRA manages the Highland Lakes for the benefit of all users. LCRA supplies water under its water rights for the Highland Lakes to numerous municipal water supply systems, manufacturers, and power generating plants. As of May 2003, LCRA had over 110 contracts for firm water supplies. The total contractual commitments and reservations of firm water from Lakes Travis and Buchanan at the time was about 318,364 acre-feet per year. This number does not include any commitment to instream flows or freshwater inflows to the bays and estuaries or the amount

allocated to O. H. Ivie Reservoir. Annual use of firm stored water was about 35-36 percent of the 318,364 acre-foot amount.

The major concern of firm water customers is that sufficient supplies be allocated to insure that their demands for water are fully satisfied even during severe drought conditions. An additional concern for those customers pumping water directly from Lakes Buchanan and Travis is that the lake levels remain sufficiently high for them to continue to use their existing water intake structures. Extending intake facilities further into the lake to follow retreating shorelines can be very expensive. Most of the intakes can accommodate water levels at the historical low lake levels of 614 feet msl on Lake Travis and 983 feet msl on Lake Buchanan.

2. Agricultural Interests

a. Historic Claims to the Waters of the Colorado River

The waters of the Colorado River have served the rice farming industry of the Texas Gulf Coast counties of Colorado, Wharton and Matagorda counties since 1885 when the first rice crops were planted near Eagle Lake, Texas. When legislation creating LCRA was first proposed in the Texas Legislature in 1933, promises were given to the rice producers and other farmers that the waters stored behind the dams proposed for the LCRA system would be available to serve their needs when the natural flow of the river diminishes in dry years.

Rice is the major crop irrigated in the most downstream three counties in the LCRA water district. While some rice producers in the region irrigate their crops with pumped groundwater, the major source of water for irrigation is from the waters of the Colorado River, either under run-of-river water rights, or from releases of interruptible stored water from Lakes Buchanan and Travis. Approximately 40% of the water used to irrigate in the three counties comes from groundwater. The majority, 60%, is supplied from surface water. Approximately 379,300 acre-feet, which is about 56% of the annual water use of the Colorado River and the Highland Lakes, is used for rice farming. During an average year, about 30% of the total surface water used for irrigation comes from the interruptible stored water in Lakes Buchanan and Travis.

When LCRA has purchased irrigation operations (Gulf Coast in 1959, Lakeside in 1983, and Garwood in 1998) and their associated senior water rights from private firms, LCRA made certain commitments to the farmers to provide water from Lakes Buchanan and Travis as back-up to the run-of-river rights.

b. Concerns of the Agricultural Interests

The primary concern of the agricultural interests is how LCRA will curtail the interruptible stored water during times of shortage. The producers understand the interruptible concept because, in essence, the waters were always interruptible. The WMP formalizes the understanding of how the water supply--both run-of-river and stored water--is managed.

3. Recreation and Tourism Interests

The waters of the Colorado River and the Highland Lakes serve a variety of recreational and tourism interests in Central Texas. In the WMP, LCRA recognizes the economic interests of the tourism and recreation industry around the Highland Lakes through a commitment to limit its sales or commitments of interruptible stored water, other than to satisfy the four irrigation operations' Conservation Base acreage or Priority Allocation acreage, based on the volume of water in Lakes Buchanan and Travis, as described later in this Chapter.

While the WMP sets minimum projected reservoir storage levels for Lake Travis and for Lake Buchanan, the lakes will most likely have fallen below these levels during even a brief drought period. Economic hardship on the owners of the many marinas, small recreation businesses (bait stores, fishing camps, restaurants, campgrounds), and larger businesses, such as motels, could last much longer than the drought conditions. Many of the marinas on Lake Travis have the ability to move boat docks further out into deeper water and are willing to bear the added operational costs of such moves to stay in business. On Lake Buchanan, the shallow nature of the shoreline allows little flexibility in moving docks and other facilities. Some residents and other lake users have expressed concerns about the lack of access to the lakes during low elevations. Most of LCRA's boat ramp facilities and private boat ramps and launches become unusable when Lake Travis falls below 640 feet msl and Lake Buchanan falls below 1000 feet msl. Additionally, water hazards such as tree stumps and rock areas increase as reservoir levels recede, restricting more of the lake surface available for sail and power boating.

Lake area Chambers of Commerce, residents, and representatives of the tourism industry are also concerned about the elevation of the lakes area during low water periods even when a true drought is not in effect. There is a concern that first time visitors will not return to the area having once experienced low water levels in the reservoirs, thus dampening potential future economic growth.

River recreation interests downstream of the Highland Lakes are also concerned that drought conditions will leave stretches of almost dry riverbed and that water quality will deteriorate severely during drought periods.

4. Concerns for Instream Flows and Freshwater Inflows for the Bays and Estuaries

The Colorado River is the largest single source of freshwater flowing into the Lavaca-Tres Palacios estuary through channels in the Colorado River Delta. The Lavaca-Tres Palacios estuary is one of the largest of the seven major and three minor estuaries along the 370 miles of Texas Gulf shoreline. The bays and estuaries of this system provide a rich environment for wildlife, commercial seafood harvest, recreation, and aesthetic opportunities.

Average inflow to the bay has been 2.9 million acre-feet per year. Of that inflow, about 34 percent came from the Coastal Basins, 22 percent from the Lavaca River Basin, and 44 percent from the Colorado River. Freshwater inflows influence estuarine biological productivity by

lowering salinity, increasing nutrients, and providing sediments. In 1991, the U.S. Corps of Engineers re-routed the Colorado River into West Matagorda Bay to increase biological productivity by increasing the amount of freshwater entering the estuary. However, a storm blocked the new route until its channel could be dredged in 1992, when it became fully functional.

The Colorado River contributes freshwater to the estuary directly from the river and indirectly through return flows from rice fields irrigated from the river. Prior to the 1991 change, an average of 1.3 million acre-feet annually from the Colorado River entered the estuary at the mouth of the river, with about 150,000 acre-feet contributed through irrigation return flows. With the change in the Colorado River delta in 1991, the full average of 1.8 million acre-feet of annual flow of the Colorado River now enters Matagorda Bay.

Estuaries and their associated wetlands are a transition zone between the fresh water and marine environments and serve as the nurseries for over 97% of the fishery species in the Gulf of Mexico. Thus, the levels of salinity, nutrients, and sediments determined by freshwater inflows is critical for high estuarine production. Fluctuation of estuarine conditions from severe droughts, floods, and hurricanes results in a shift of the biological elements of the system and can directly affect the production and survival of many plant and animal species.

During the rice irrigation season, even under drought conditions, the instream flow needs should be satisfied as a result of natural inflows and return flows downstream of the Highland Lakes, pass-throughs of inflows to the Highland Lakes required to honor downstream senior water rights, and releases of interruptible stored water flowing downstream to the irrigation operations. Under current water demand conditions, it is in the winter months, when the portions of inflows required to be passed through the reservoirs to honor downstream senior rights are low and when downstream demands for stored water are also low, that it is most likely that instream flows will need to be supplemented with firm stored water releases. However, should interruptible stored water for irrigation be curtailed or cut off, the periods of low flow in the river would be extended and additional water would be demanded to serve these needs for periods of time.

While it is difficult to estimate the full effect of inadequate instream flows or inadequate inflow to the bays and estuaries, it is clear that many plant and animal species in the food chains would be severely stressed and that productivity would be lessened if the condition persisted for an extended period of time.

C. Projected 2010 Surface Water Demands During Droughts

1. Introduction

To properly allocate available water supplies in the DMP/DCP, LCRA must project the future water demand on those supplies. The DMP/DCP is based on conditions that may occur in the next decade. This ten year planning period was chosen because the critical drought period used to determine the Combined Firm Yield of Lakes Buchanan and Travis lasted approximately a

decade. Further, the estimates of future water demands are most accurate in the near future. If the critical drought were to repeat itself beginning now, the maximum demands during the drought period would be those in year 2010. Thus, a ten year planning period was used for the development of the DMP/DCP.

Total estimated surface water use in LCRA's 35 county water service area (Figure 1-1) in 2000 was approximately 675,800 acre-feet annually, including water released to maintain instream flows in the lower Colorado River. About 56% of water diverted was used for rice irrigation in the four major irrigation operations located in Colorado, Wharton and Matagorda Counties. The next largest demand for surface water is the City of Austin, with approximately 134,000 acre-feet yearly averaged over the last ten years for municipal use and steam-electric power generation. In general, City of Austin's use has been increasing steadily, with a use of 163,800 acre-feet for the year 2000.

LCRA supplies water to two general categories of water demands: firm and interruptible. Firm demands presently include the water for municipal, domestic, industrial, steam-electric power generation, some irrigation, and instream flow maintenance purposes. Currently, interruptible stored water is used almost entirely for agricultural irrigation, specifically rice irrigation, and for environmental needs. As noted earlier, the most noticeable changed condition over the last five years has been a significant increased projection of municipal and industrial water (firm) demands. With the large projected increase in firm water demand, the DMP/DCP must be adjusted to give a compensating reduction in the interruptible stored water supplies available since firm needs take priority.

Surface water demands in LCRA's water district over the next decade have been projected by LCRA staff based on drought-condition weather, population growth, water use patterns, and economic development, as outlined in the Senate Bill 1 regional water plan for Region K. The assumptions used in projecting 2010 demands are described in the following sections.

2. Projected Firm Water Demands

a. Municipal, Manufacturing, Steam-Electric, and Domestic Water Demand Projections

LCRA staff allocated Senate Bill 1 2010 projected demands using a 1996 water use distribution. Actual water use in 2000 and projected water demands for 2010 are shown in Table 4-2.

The water demand for STP and the Austin power plants may be met by using unregulated run-of-river flows under separate water rights associated with those facilities, supplemented as necessary with stored water. The arrangements for satisfying these demands at STP and at LCRA power plants are described in more detail in Finding 58 of the September 7, 1989 Order of the Texas Water Commission approving LCRA's WMP. The 2010 demands included in this WMP for these facilities reflect those provided to the Senate Bill 1 Regional Planning Group (Region K) by the City of Austin and the South Texas Project Nuclear Operating Company.

Today, LCRA has only a handful of firm water contracts for domestic water use. Unfortunately, most of this water is taken from the Highland Lakes by landowners that do not have contracts with LCRA. Absent a contract, most if not all of these diverters have no legal claim to the water they are diverting. At some point, LCRA may choose to pursue enforcement of its water rights to curtail these unauthorized diversions. Total domestic water use is projected to increase to 6,273 acre-feet by 2010. As water supplies become more and more scarce, many landowners are likely to realize the benefit of a firm water contract that better protects their water supply during drought conditions. Thus, for purposes of this WMP, LCRA has estimated that approximately 5,000 acre-feet of domestic water use will come under contract with LCRA over the next ten years.

TABLE 4-2. REPORTED 2000 AND PROJECTED 2010 ANNUAL FIRM SURFACE WATER DEMANDS UNDER DROUGHT CONDITIONS		
Water Demand Category	2000 Reported Water Use (Acre-Feet)	Projected 2010 Water Demand (Acre-Feet)
Highland Lakes Municipal	23,100	37,200
Manufacturing (Excluding Austin)	8,500	11,500
City of Austin Municipal and Manufacturing	153,300	187,931
City of Austin Power Plants*	10,400	13,500
LCRA Power Plants	22,000	29,500
South Texas Project (STP)*	64,800	47,000
Instream Flow Maintenance & Estuarine Inflows	14,500	**33,440
Total	296,600	**360,071
*Firm water demands for STP and the City of Austin may be met from run-of-river flows, if they are available, under their existing water rights.		

****Based on the 2003 revision resulting from the effect of the new trigger for curtailment of interruptible stored water supplies from Lakes Buchanan and Travis and freshwater inflow needs of the Matagorda Bay, as described in this Chapter.**

b.Instream Flow Demands

LCRA completed the initial instream flow needs study in 1992. The study identified two sets of instream flow needs: critical flows and target flows. The recommended instream flows for the Colorado River downstream of Austin are in Table 2-1.

LCRA will continue with the reservoir operation procedure to release stored water from Lakes Buchanan and Travis to maintain daily river flows as follows:

1. LCRA will release stored water and pass storable inflows to maintain no less than the critical instream flow needs in all years as set forth in Table 2-1, including maintaining, on an instantaneous basis, instream flows of 46 cfs and 500 cfs critical flows as set forth in Table 2-1 during the times those respective flow values are in effect, and
2. In those years when the four major irrigation operations are not curtailed, LCRA will schedule the passage of inflows to lakes Buchanan and Travis that are legally available for storage, as measured at the upstream stream gages, to maintain the target flows as set forth in Table 2-1 as a daily average. Furthermore, during those times when target instream flow requirements are in effect and when such inflows are sufficient to allow LCRA to satisfy the daily target flow requirement at the Bastrop gage, LCRA will also schedule the passage of these inflows to maintain the following minimum flows, as measured at any time at the Bastrop gage:

Month	Minimum Flow (cfs) 100% of the time	Minimum Flow (cfs) 95% of the time
January	266	
February	269	
March	233	
April	244	287
May	492	579
June	355	418
July	295	347
August	165	
September	201	
October	208	

November	241	
December	264	

In rare instances, LCRA's ability to meet the instream flow requirements set forth in this WMP may be impaired by certain unavoidable constraints such as the capacity of its hydro-generation units and hydro-generation scheduling mandates as well as unforeseen diversions, unforeseen changes in flow conditions downstream, and adjustments to the ratings of the applicable gages.

This recommendation fully meets the most important instream flow needs at all times and meets the target flows during periods of normal or above normal streamflow conditions.

To fully honor this commitment, LCRA will use both firm water and interruptible stored water. Firm water is only supplied in years when the interruptible stored water supply is curtailed for the four major irrigation operations. The actual annual releases of stored water will vary from year to year depending on hydrologic conditions.

For the 2003 update, it is estimated that an annual average of about 27,380 acre-feet of firm water is needed to meet these instream flow commitments, with the remainder coming from interruptible stored water supplies. Therefore, the present annual commitment for instream flows of 12,860 acre-feet of firm water is recommended to be increased to 27,380 acre-feet per year. In addition to firm water, interruptible stored water will be provided to meet instream flow needs. The estimated interruptible stored water to be supplied during the critical drought will be an additional 8,590 acre-feet/year. Demands for both firm and interruptible stored water for instream flow needs were estimated from the simulated results of the water supply alternative that was recommended for the 2003 update of the WMP. The recommended water supply alternative represents a careful balance of environmental and irrigation impacts based on results from various scenarios that were considered.

The releases for instream flows generally, but not always, contribute to meeting the Critical or Target freshwater inflow needs of Matagorda Bay. However, the timing for these instream flow releases is independent of the monthly freshwater inflow needs for the bay.

c. Freshwater Inflow Demands

The water demands for maintaining the ecological balance of coastal bays and estuaries have been determined in 1997 by LCRA, in cooperation with TPWD, TWDB and TNRCC (predecessor to TCEQ). As indicated in Table 2-4, estimates of freshwater inflow needs (FIN) from the Colorado River at Bay City are 1.03 million acre-feet annually for the target needs and 171,000 acre-feet yearly to meet critical needs. Historically, an average of approximately 1,800,000 acre-feet flows annually in the Colorado River at Bay City.

For the 2003 WMP update, LCRA has recommended a change in the reservoir operation procedure for releasing stored water from Lakes Buchanan and Travis for estuarine needs after a careful balance of environmental and irrigation impacts from the results of various scenarios that

were considered. LCRA will release stored water from Lakes Buchanan and Travis to maintain monthly estuarine inflows at:

1. the target inflow needs in those years when the combined storage in Lakes Buchanan and Travis on January 1 is greater than or equal to 1.7 million acre-feet, to the extent of storable inflows each month to Lakes Buchanan and Travis, as measured at the upstream stream gages;
2. one hundred and fifty percent of the critical inflow needs in all years when the combined storage in Lakes Buchanan and Travis on January 1 is less than 1.7 million acre-feet and greater than 1.1 million acre-feet, to the extent of storable inflows each month to Lakes Buchanan and Travis, as measured at the upstream stream gages; and
3. the critical inflow needs in all years when the combined storage in Lakes Buchanan and Travis on January 1 is less than 1.1 million acre-feet, to the extent of storable inflows each month to the Highland Lakes, as measured at the upstream stream gages.

With the recommended intermediate estuarine inflow reservoir operation procedure of increasing the release of stored water from Lakes Buchanan and Travis in years when the combined storage is between 1.1 and 1.7 million acre-feet, the estuarine ecosystem will receive more freshwater inflows during moderate droughts than it would have under the WMP as approved in 1999. For any given month, LCRA will compensate for any deficit in releasing stored water to meet freshwater inflow needs during the following month by releasing additional stored water from the Lakes Buchanan and Travis. LCRA will not account for the inflow in the following month in making such release to make up for the previous month's deficits.

The reservoir operation procedure of releasing stored water for the freshwater inflow needs are based on the following:

- both Target and Critical FIN are provided with stored water;
- Target FIN are used as the estuarine inflow demands during years of plentiful water;
- water supply needs for the four major irrigation operations from the interruptible stored water supply were balanced carefully with the environmental needs while assessing the impacts from the results of various scenarios that were considered;
- the frequency and duration of high salinity conditions in Matagorda Bay are kept relatively low; and
- the Critical FIN are met about 80 percent of the months during the critical drought.

This recommendation will require an estimated 205,060 acre-feet of stored water during the ten-year critical drought for estuarine inflows. However, not all of this is from the Combined Firm

Yield of Lakes Buchanan and Travis. Similar to the instream flow demands, both firm water and interruptible stored water are used to meet the freshwater inflow needs. Firm water is only supplied in years when the interruptible stored water supply is curtailed for the four major irrigation operations. An annual average of about 6,060 acre-feet of firm water should be allocated, with the remainder coming from interruptible stored water supplies to meet freshwater inflow needs. The estimated annual interruptible stored water supplied during the critical drought will be an additional 14,450 acre-feet/year. The recommended changes are based on the alternative that was selected for the 2003 update based on a careful balance of environmental and irrigation impacts from the results of various scenarios that were considered.

For purposes of estimating required releases of water from Lakes Buchanan and Travis to meet the instream flow or freshwater inflow requirements of this WMP, LCRA will rely on stage data obtained from the gaging system jointly maintained and operated by the U.S. Geological Survey and LCRA for determining these requirements. If the ratings used to convert stage to flow published by LCRA and the USGS are not identical at the time required releases are estimated, LCRA will exercise its discretion to rely on the latest updated rating of the gage.

3. Projected Interruptible Stored Water Demands

a. Interruptible Stored Water Customers

LCRA presently supplies interruptible stored water to four major irrigation operations. These operations are: Pierce Ranch Irrigation Company, and LCRA's Garwood, Lakeside and Gulf Coast Irrigation Operations. These operations have associated with them very early run-of-river rights to divert surface water from the Colorado River, to the extent it is available, to satisfy customer needs up to their permitted amounts. These run-of-river rights are all senior to LCRA's water rights in the Highland Lakes. Thus, LCRA may impound only that portion of the inflows to the Highland Lakes remaining after passing through inflows to the extent needed to honor these and any other downstream senior water rights.

These four operations are primarily concerned with the growing of rice although there are some turf and row-crops grown within these operations. Virtually all irrigation water is pumped from the Colorado River. Only the Lakeside Irrigation Division has the use of a small amount of groundwater for irrigation purposes.

b. Projected Rice Irrigation Water Demands

The projected average annual irrigation water demand for 2010 is about 438,200 acre-feet annually (Table 4-3). Water to supply that need will come from both interruptible stored water and run-of-river sources. Statistical analysis by LCRA staff indicates that agricultural water diversions at these operations are influenced by the number of acres planted, rainfall, and evaporation. Planted acreage is the strongest statistical predictor of agricultural water use, but is also the most difficult to forecast since annual acreage varies greatly. Rice acreage is largely governed by the federal farm support program, which is currently undergoing changes. It is

premature to forecast the ultimate impact of these changes on the rice industry in LCRA's water district.

Because of the many variables that impact total water diversions at the irrigation operations, a conservative projection was made of future rice irrigation water acreage. First crop acreage for each operation was projected to be equal to the largest acreage cultivated over the last ten years. The projected first crop acreage, as well as 2000 actual first crop acreage, is given in Table 4-3. The Lakeside Irrigation Division has cultivated more acreage in the last ten years, but has used groundwater to meet the excess water needs.

The projections of second crop acreage are based on a fraction of the first crop acreage. The fraction used is the ratio of the second crop to first crop acreage in the year of greatest first crop acreage over the past ten years. These fractions are 0.44, 0.83, and 0.96, respectively, for Gulf Coast, Lakeside and Garwood. Second crop acreage for Pierce Ranch is taken as 6% of the total second crop acreage for Gulf Coast, Lakeside and Garwood.

The actual use of water for irrigation is highly variable, with relatively large differences from year to year. Water diversions projected for each irrigation operation, except Pierce Ranch, are calculated from predictive equations that consider rainfall and evaporation conditions, as well as acreage, during each irrigation season (Martin, 1990). These projected demands are based on rainfall and evaporation conditions expected during the duration of a repetition of the critical drought period experience from 1947 through 1956. The projected demands from Pierce Ranch are taken as 9% of the total projected demands of the other three major irrigation systems. This percentage reflects Pierce Ranch's historical proportion of total diversions over the past ten years adjusted for the major water reductions through water conservation.

TABLE 4-3. REPORTED YEAR 2000 AND PROJECTED ACREAGE AND SURFACE WATER DEMANDS FOR IRRIGATION				
Irrigation System	Reported 2000 First Crop Acreage (Acres)	Reported 2000 Water Use (Acre-Feet)	Projected Year 2010 First Crop Acreage (Acres)	Projected Year 2010 Water Use (Acre-Feet)
Gulf Coast	18,800	152,200	30,300	155,600
Lakeside	23,500*	117,800	27,500	135,600
Garwood	15,000**	83,200	21,200	109,000
Pierce Ranch	4,500**	26,100	4,740	36,000
Other Senior Rights	0	0	1,000	2,000
Total	61,800	379,300	84,740	438,200
* Includes acreage supplied from groundwater.				
** Estimated				

Adjustments are also made to the water demand estimates developed from the equations to reflect ongoing water use efficiency improvement programs. Aggressive water conservation efforts are projected to reduce the water diversions at the Gulf Coast Division by over 25% by 2010, from historical 1968-1986 period usage levels. The water demands for the other three major irrigation operations are expected to decline as well due to water conservation efforts, with 5% total cumulative reductions by 2010, from patterns of historical usage.

To estimate the demand for interruptible stored water supply for irrigation needs, a table of acreage was developed for the irrigation operations that included the likely allocation of various amounts of interruptible stored water between first and second rice crop. Such table was developed based on several assumptions.

Allocation of interruptible stored water supply to the individual irrigation operations was according to the following formula:

$$\text{Interruptible Stored Water Supply} = 0.5 * \text{Average annual interruptible stored water usage over past 10 years} + 0.5 * \text{Highest year of interruptible stored water usage within past 10 years.}$$

Using the last ten years of interruptible stored water usage, it was found that each irrigation operation is entitled to the following percentages of interruptible stored water supplies available:

Gulf Coast	.425
Lakeside	.425
Garwood	.063
Pierce Ranch	.088

Pierce Ranch was not included in the acreage table since there is not a reasonably accurate predictive equation for water use at Pierce Ranch. To represent Pierce Ranch's needs, water use and acreage were assumed at 9 % and 6 %, respectively, of the combined water use and acreage, respectively, of the other three operations.

In developing the table of acreage, it was assumed that the hydrologic and meteorological conditions reflected a 1 in 5 dry year, or stated differently, the dry conditions that would be expected only 20% of the time.

The maximum annual demand for the interruptible stored water acreage projected for 2010, under a 1 in 5 dry year condition, was 273,000 acre-feet. Using that as the greatest interruptible stored water demand, a set of smaller interruptible stored water supplies were assumed to generate a set of first and second crop acreages expected to be cultivated by the three major operations. These acreages were assumed to be the maximum planting acreage that could be supported by the limited water supplies, both run-of-river and interruptible stored water. The allocation of the available interruptible stored water supplies for irrigation was based on the assumption that the demand for projected first crop acreage for rice (83,700 acres) will be fully met, with any acreage curtailments occurring in second crop.

The acreage level was set for each level of interruptible stored water supply using the following process:

1. The total interruptible stored water supply available was allocated to each of the three major operations according to the percentages given above.
2. The available interruptible stored water for each irrigation operation was used first to meet the needs of first crop rice.
3. The remaining interruptible stored water supply, after first crop, was used for second crop needs. If there was insufficient interruptible stored water supplies, then the maximum allowed second crop acreage was reduced in the same proportion as the ratio of the available to the maximum needed interruptible stored water supplies. For example, if there is only 50% of the interruptible stored water needed to meet the needs of the maximum second crop acreage allowed, the second crop acreage is set to 50% of the maximum second crop.

The table of acreage thus developed for the irrigation operations was used in simulations conducted with the RESPONSE model for this WMP update to define the planning decisions of allocating available interruptible stored water when curtailments were instituted. As noted

before, Pierce Ranch acreage and water demand were treated in the RESPONSE model as percentages of the combined acreage and water demand of the three other irrigation operations.

In addition to the senior water right holders and major irrigation operations, there are additional demands for surface water along the Colorado River. These demands, and their water rights, are junior in time to December 1, 1900 but senior to November 1, 1987. Consistent with LCRA's water rights for Lakes Buchanan and Travis, the WMP provides that LCRA will treat any of these rights junior to the water rights for Lakes Buchanan and Travis in the same manner as the users of interruptible stored water. The maximum amount of interruptible stored water to meet the demand of such junior water rights is about 4,700 acre-feet annually, however these demands are not likely to take place each and every year.

c. Instream Flow and Estuarine Freshwater Inflow Water Demands

As noted in the section on firm water demands, interruptible stored water is used to meet part of the environmental water demands for instream flow and estuarine freshwater inflows. During the critical drought, the average annual demand on interruptible stored water is estimated to be 23,030 acre-feet per year, with 8,600 acre-feet per year of that amount provided for instream flow maintenance.

4. Summary

Projected surface water demands in LCRA's ten-county water district during severe droughts total about 798,300 acre-feet annually in 2010. Firm water demands are projected to be approximately 360,100 acre-feet annually in 2010 (See Table 4-2). Surface water demands for irrigated agriculture under drought conditions are estimated to be 438,200 acre-feet annually. The projected irrigation demands, as well as reported use in 2000, are indicated in Table 4-3.

REFERENCES

Tex. Water Dev. Bd., WATER FOR TEXAS – 2002 VOLUME III (2002) (Region K Plan) (available online at <http://www.twdb.state.tx.us/rwp/k/PDFs/>).

Martin, Q. W. (1990). "Economic Evaluation of Alternative Rice Cropping Decisions," Open File Report, Water and Wastewater Utilities Program, Lower Colorado River Authority, Austin, TX.

D. Projected Water Supplies

1. Water Supply Management Procedure

a. Systems Operation Concept

A fundamental concept of the WMP is that Lakes Buchanan and Travis and the lower Colorado River are operated as a combined water supply system. Unregulated inflows entering the

Colorado River from drainage areas downstream of the Highland Lakes must be used to the maximum extent possible before inflows to the Lakes Buchanan and Travis are passed through or stored and subsequently released to satisfy downstream water needs.

Such a system concept requires a careful and extensive analysis of the interconnection of hydrologic conditions, water demands, and priority of water rights and uses. The WMP uses the following general guidelines for the storage and use of water in the Highland Lakes and the lower Colorado River.

b. Critical Drought Period Concept

A basic assumption in assessing water availability for the DMP/DCP is that all operational procedures must be evaluated as if the worst drought ever recorded for the lower Colorado River were to reoccur. This Drought of Record for the Highland Lakes was the 1947-1957 period, a period that was identified as the most severe occurring during the 105 years since data collection started in February 1898.

c. Procedures For Evaluating Water Availability

LCRA staff developed a computer program for evaluating water availability under a variety of management policies. This program is called "RESPONSE - Lower Colorado River Authority Reservoir System Simulation Computer Program." The evaluation of water availability proceeds on an annual basis. For each year, a three-stage process is executed:

1. water demands are estimated for each user or usage category for the coming year;
2. the daily flows are allocated among users based on legal priority or seniority; and
3. the operation of Lakes Buchanan and Travis is simulated on a monthly basis to reflect the storage of unused inflows, evaporation, and potential spills.

The demands for water in the next year are specified as either fixed annual amounts or demands that vary depending on water in storage. The firm demands are all held constant in each year of simulated hydrologic conditions. The irrigation demands change from year to year depending on: (1) the acres cultivated in each irrigation operation for first and second crop rice; (2) weather conditions (rainfall and evaporation) in that year; and (3) water held in storage in Lakes Buchanan and Travis at the beginning of the year. The water demand for first crop rice occurs only in the months of March through July, while second crop demands are in August through October. All annual water demands are distributed on a daily basis using historical water usage information.

The simulated allocation of inflows into Lakes Buchanan and Travis in the DMP/DCP among downstream senior water rights holders follows the same procedure used in developing the Combined Firm Yield of Lakes Buchanan and Travis for the WMP. It is important to note, however, that these simulated monthly operations do not necessarily reflect the actual day-to-day

operations of the reservoir system, which often requires the exercise of best professional judgment.

2. Supplies for Firm Demands

The annual dependable water supply that can be supplied from Lakes Buchanan and Travis during a repetition of the Drought of Record is referred to as the Combined Firm Yield. Based on the studies available to LCRA, the Combined Firm Yield has been calculated by LCRA to be 445,266 acre-feet per year, exclusive of the amount allocated to O.H. Ivie Reservoir. In addition to this Combined Firm Yield, water supplies are also available from the natural flow of the river downstream of the Highland Lakes to meet a major part of the City of Austin's and the South Texas Project's firm water demands.

Adding the other firm water demands to those of the City of Austin gives a projected drought-condition demand in the year 2010 of approximately 360,100 acre-feet annually, as described in Table 4-2. Portions of the demands of the City of Austin and of STP can be supplied from run-of-river flows under separate water rights, reducing the projected drought-condition demand for stored water in year 2010 to about 184,000 acre-feet annually. The estimate of drought-condition firm demand for stored water in 2005 is about 134,000 acre-feet annually. The firm demands for stored water over the next ten years are low relative to the firm supplies from the Combined Firm Yield. Thus, curtailment of firm demands is not likely in the next decade, even under a recurrence of extreme drought conditions. A large surplus in firm stored water supplies is therefore available to meet interruptible stored water needs without placing at risk the stored water needed for firm water users in the next decade.

3. Supplies for Interruptible Stored Water Demands

As specified by the WMP, the amount of interruptible stored water available for the next irrigation season is projected by LCRA staff in November of each year. The projected supply depends upon the amount expected to be in the combined storage in Lakes Buchanan and Travis on January 1, anticipated inflows for the subsequent months through the irrigation season, and the current demands for firm water.

Several procedures were evaluated to predict the likely supplies available, during a repetition of the Drought of Record, in the next year for interruptible stored water demand. Historical records of streamflow were examined, but were found to be highly variable and hence not accurate in estimating water availability for the next year. The most accurate indicator of water availability is the combined storage in Lakes Buchanan and Travis at the beginning of the year. Thus, for the DMP/DCP, the allocation of stored water supplies to meet interruptible stored water demands is based solely on the combined reservoir storage in Lakes Buchanan and Travis at the beginning of each year, and decisions to curtail interruptible stored water supplies in annual contracts are keyed to particular total January 1 storage levels.

At relatively full storage levels on January 1, the supply of interruptible stored water is sufficient

to meet all projected firm and interruptible stored water demands. However, at or below some storage levels, there are not sufficient supplies and the annual contracts for interruptible stored water must be reduced. At lower and lower January 1 storage levels, less and less interruptible stored water is available for allocation through the annual contracts. At some relatively low storage, there will be a total cutoff of water for interruptible stored water use in the coming year. Provisions will be made to revise the water supply estimates during the year to respond to significant changes in projected streamflow and storage due to rainfall in the basin.

The evaluation of expected hydrologic and water demand conditions during a repetition of the Drought of Record can only be simulated based on projected information. This projected information is subject to some uncertainty. LCRA has determined it prudent to designate some minimum storage level serving as a safety factor to insure that all firm demands are fully met during the critical drought. Under this conceptual operating plan, there would be a storage level which, when reached at any time during the year, would require the total cutoff of all water for interruptible stored water use. That storage level defines a Reserve Storage Pool for the system.

With the increase in projected firm water needs of about 50,000 acre-feet annually from Lakes Buchanan and Travis for 2010, there is less water for interruptible stored water supply from Lakes Buchanan and Travis since firm water needs take priority over interruptible stored water uses. To avoid shortages to firm water users, it is recommended that interruptible stored water supplies from Lakes Buchanan and Travis be reduced during the critical drought years from what is available under the WMP approved in 1999 by revising the annual interruptible stored water supply curtailment policy, as discussed below. This reduction in supplies impacts irrigation primarily since irrigation has the highest priority for use of interruptible stored water.

E. Water Curtailment Policies

1. Triggering Conditions

The DMP/DCP contains distinct triggering levels, as well as several associated cancellation measures, that are associated with the amount of water available in Lakes Buchanan and Travis. These responses range from voluntary conservation by firm water customers to total cutoff of interruptible stored water customers. This DMP/DCP fully meets the critical instream flow needs at all times and meets the target flows during periods of normal or above normal stream flow conditions.

2. Curtailment of Interruptible Stored Water Demands within Irrigation Operations and for Instream and Bay and Estuary Freshwater Inflows

Given the large demand for interruptible stored water for rice production, there will likely be a shortage of interruptible stored water at some time during the next decade. The curtailment policies considered in the DMP/DCP focus primarily on the reduction in interruptible stored water supplies through the annual contracting process. The impact of reducing supplies in the annual contracts is far less than forcing a curtailment or total cutoff during the year after the rice

farmers have made economic commitments based on the assumed availability of the water.

a. Recommendation for Interruptible Stored Water Demand Curtailment for Irrigation and Environmental Needs

To examine possible alternative policies for the 2003 update, LCRA staff reviewed with the Water Management Plan Revision Advisory Committee over thirty options for allocating water supply between irrigation and environmental needs.

In determining available interruptible stored water supplies, it is essential that firm water demands be fully protected during a repetition of the Drought of Record (DOR). This drought is the worst ever recorded on the lower Colorado River and occurred from 1947 through 1956. As noted earlier, projected firm water demands from Lakes Buchanan and Travis over the next ten years (to 2010) are estimated to increase by 50,000 acre-feet annually (24 percent) from the ten-year projections used in the 1999 version of the WMP (to 2005). Meeting those increased demands may only be achieved by decreasing the interruptible stored water supplies presently provided from Lakes Buchanan and Travis. This reduction in supplies impacts irrigation primarily since irrigation has the highest priority for use of interruptible stored water. The second factor affecting interruptible stored water supplies available for irrigation is the allocation of interruptible stored water supplies between irrigation and environmental protection. This allocation is always a delicate balancing between benefits and adverse impacts.

After examining the alternatives, LCRA recommends that interruptible stored water supplies be reduced from present levels and that additional water be provided for estuarine freshwater inflows. As more specifically described below, LCRA recommends that interruptible stored water supplies be reduced from the current levels with the initial storage curtailment threshold raised from the current value of 1.1 to 1.4 million acre-feet. The annual interruptible stored water supplies are determined based on beginning-of-year storage. As storage declines, there is a decline in annual interruptible stored water supplies available. For storage levels less than 1.4 million acre-feet, there would be progressive reductions in annual interruptible stored water supplies.

Further, LCRA recommends that an intermediate release schedule be provided for estuarine freshwater inflows that allows a slightly more gradual reduction of inflows to Matagorda Bay during low flow years. The recommended changes are deemed by LCRA as a balance between a modest incremental decrease in irrigation water supplies during drought conditions and modest increased inflow to Matagorda Bay during non-drought years to help maintain the ecological health of the Bay. Based on a balance of environmental and irrigation impacts, the recommended WMP changes include an increase of stored water released for estuarine freshwater inflow. This increase would be provided in years when the January 1 storage level in Lakes Buchanan and Travis is between 1.1 to 1.7 million acre-feet (55 and 86 percent full).

The recommendations for the current update are as follows:

- 1) Open Supply - If the total January 1 storage in Lakes Travis and Buchanan combined is equal to or greater than 1,400,000 acre-feet, then LCRA will supply all interruptible stored water demands. This assumes 273,000 acre-feet of interruptible storage water is sufficient to irrigate a total of 83,700 acres within the four irrigation operations, with seventy percent (70%) of that acreage being irrigated for a ratoon, or second, crop of rice.
- 2) Curtailment will begin if the total January 1 storage is less than 1,400,000 acre-feet and greater than 325,000 acre-feet. The available interruptible stored water supply when combined storage on January 1 is less than 1,400,000 acre-feet is shown in Figure 4-1. If combined storage on January 1 is between 1.4 million acre-feet and 1.15 million acre-feet, the interruptible stored water supply available will vary beginning at 273,000 acre-feet available at 1.4 million acre-feet of storage and decreasing at a rate of approximately 31,200 acre-feet for each 100,000 acre-foot decrease in combined storage until a value of 195,000 acre-feet available at a combined storage of 1.15 million acre-feet. When the combined storage in Lakes Buchanan and Travis on January 1 is less than 1,150,000 acre-feet, the interruptible stored water supply available will vary beginning at 195,000 acre-feet available at 1.15 million acre-feet of storage and decreasing at a rate of approximately 4,250 acre-feet for each 100,000 acre-foot decrease in combined storage until a value of 160,000 acre-feet available at a combined storage of 325,000 acre-feet.
- 3) Cutoff of the interruptible stored water supply for the coming year will occur when the combined storage in Lakes Buchanan and Travis on January 1 is less than or equal to 325,000 acre-feet.
- 4) Reserve Storage Pool - If at any time during the year the total storage in Lakes Buchanan and Travis, combined, is less than or equal to 200,000 acre-feet then all use of interruptible stored water will be stopped.
- 5) During periods of curtailment or cutoff instituted on January 1, LCRA will cancel the curtailment of interruptible stored water for the irrigation operations at any time during the year prior to July 31, if the combined storage in Lakes Buchanan and Travis is projected to be equal to or greater than 1.4 million acre-feet anytime in July. Further, the remaining available interruptible stored water supplies for the year may be reallocated, at this time, between irrigation operations if such allocations do not adversely affect any irrigation operation.
- 6) During periods of curtailments, LCRA will allow each irrigation operation the option of either: (1) using up to a maximum authorized volume of interruptible stored water allocated to that operation, or (2) using sufficient water to cultivate a level of acreage agreed upon among the customers within each particular irrigation operation and LCRA.

Since the curtailment begins at a storage level more than one half full, curtailment of irrigation water supplies may occur during some relatively mild droughts, however such curtailment would be limited in scope and duration. Further, it is likely that the rice producers will only be

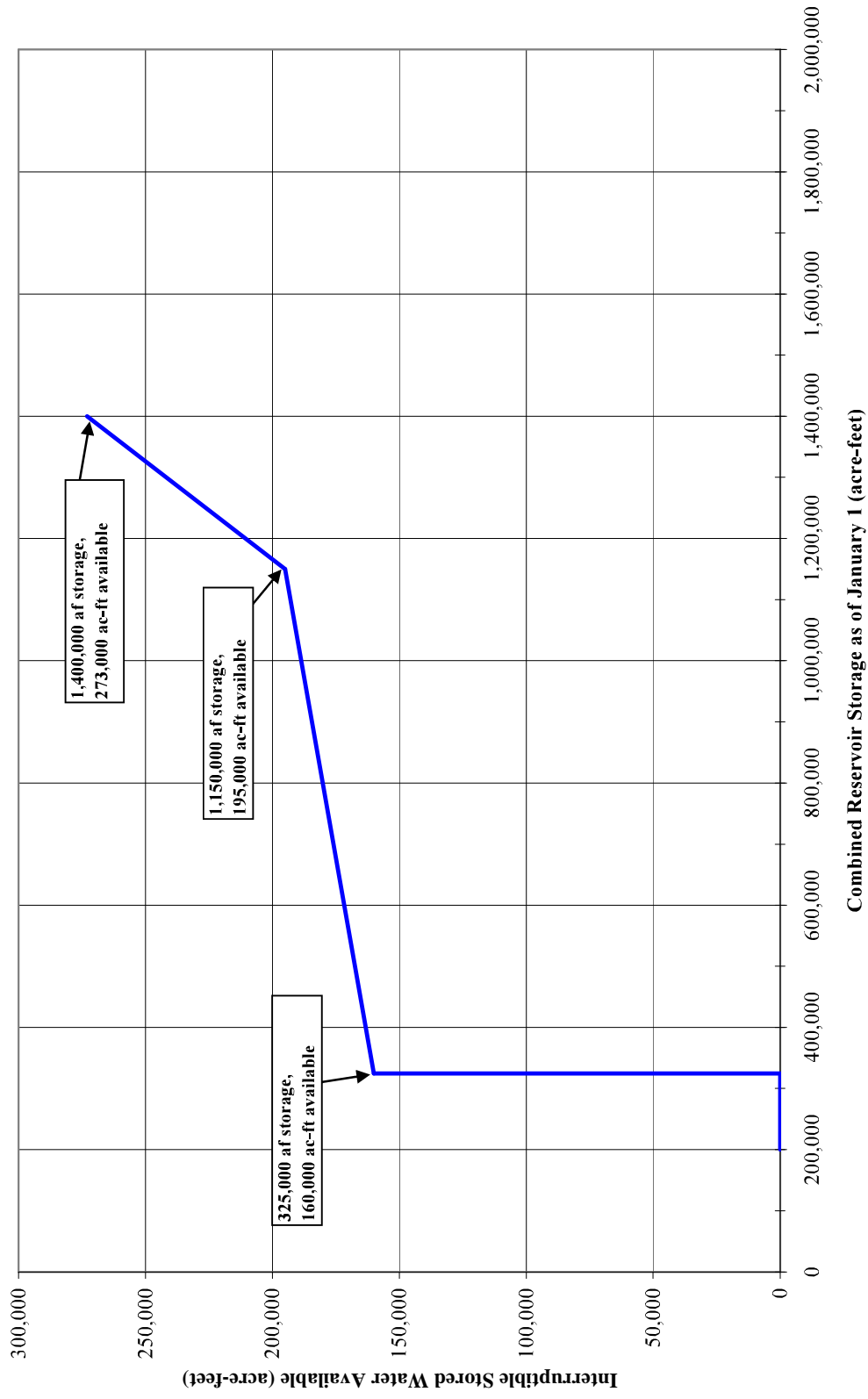
tentatively required to curtail second crop rice, which is cultivated after first crop rice is harvested in July and August. Thus, the curtailment plan has the added advantage that spring rains and runoff may increase water supplies and reduce demand and thereby allow an increase in the estimate of interruptible stored water available for second crop rice. Rice producers could relatively easily increase their second crop acres if they were aware of any increased water supply by June 15.

To achieve the estimated benefits of the management policy, it is necessary for the irrigation operations to reduce their water demands to correspond to reductions in the estimated interruptible stored water supplies, in accordance with the procedures in this WMP or the terms and conditions of contracts between LCRA and stored water users. Close coordination between LCRA and the operations will be needed. Should an operation choose not to reduce the acreage cultivated in response to the projected shortage of interruptible stored water supply, LCRA will only supply that operation with its estimated portion of the reduced interruptible stored water supply. No additional interruptible stored water will be released in that year for that irrigation operation once the diversion limit has been reached.

In addition to the above features, and consistent with state law, LCRA's customers must prepare and adopt a legally enforceable local drought contingency plan, which should include specifics concerning the actions to be taken to comply with LCRA's DMP/DCP regarding the curtailment of interruptible stored water supplies. LCRA staff is available to provide technical assistance with the preparation of required local plans.

FIGURE 4-1

**Interruptible Stored Water Available During Curtailment
Based On January 1 Combined Storage in Lakes Buchanan and Travis**



b.Irrigation Allocation Among the Irrigation Operations

As provided in Finding 25 of the September 7, 1989 Order of the Texas Water Commission approving LCRA's WMP, "the priority allocation and terms governing the interruption of supply of stored water for Garwood are based upon a contract between Garwood and LCRA."

LCRA has negotiated a contract with Pierce Ranch governing the interruption of the supply of stored water to Pierce Ranch. Interruption of the supply of stored water for other commitments similarly would be governed by contract or LCRA Board resolution.

There are many ways in which interruptible stored water demands may be curtailed through the annual contracts. The two most likely are a gradual curtailment with reductions indexed against beginning of year storage in Lakes Buchanan and Travis; or an abrupt total cutoff policy where the full demands are supplied if the beginning of year storage level in Lakes Buchanan and Travis was above a specific level, otherwise totally stop interruptible stored water sales for the next year.

The largest use for interruptible stored water is rice production. Rice producers must plan their crops for the next season based upon the projected interruptible stored water supply, even though more supply may actually be available in future months. The advantages of the gradual approach of curtailment are that the rice industry could use the water allocated to achieve the greatest benefit. Water could be used in first crop on the hope that conditions in the spring would refill the river and lakes. The disadvantage is that some curtailment would occur when it was not really necessary in years when the critical drought was not repeated. Lakes Buchanan and Travis would refill and spill because the drought ends before conditions become as severe as the critical Drought of Record.

The advantages of the "all or nothing" approach are that there would be more years when the full demands would be met and minor droughts would not affect available supplies. Disadvantages would be that in some years there would be no interruptible stored water and most rice producers would risk substantial or total loss of their crops if sufficient run-of-river water was not available throughout the growing season.

In years when there is not sufficient projected interruptible stored water available to meet all irrigation needs, the interruptible stored water will be allocated to the irrigation operations so that all operations have the same percentage shortage in their total interruptible stored water demand. The calculation of the annual demand of interruptible stored water will be based on a projection of relatively dry weather and low streamflow conditions in the next year.

The allocation of interruptible stored water supply to the individual irrigation operations is discussed above in Section C.3.b. Briefly, allocation of interruptible stored water supply to the individual irrigation operations for the 2003 update of the WMP is according to the following formula:

Interruptible Stored Water Supply = $0.5 \times \text{Average annual interruptible stored water usage over past 10 years} + 0.5 \times \text{Highest year of interruptible stored water usage within past 10 years}$.

Using the last ten years of interruptible stored water usage, each irrigation operation was determined to be entitled to the following percentages of interruptible stored water supplies available:

Gulf Coast	.425
Lakeside	.425
Garwood	.063
Pierce Ranch	.088

Based on this allocation, a table of acreage was developed for the three major irrigation operations showing the likely allocation of various amounts of interruptible stored water between first and second rice crop. Pierce Ranch was not included in the table since there is not a reasonably accurate predictive equation for water use at Pierce Ranch. To represent Pierce Ranch's needs, water use and acreage were assumed at 9 and 6 %, respectively, of the combined water use and acreage, respectively, of the other three operations.

c. Irrigation Allocation Within the Irrigation Operations

Because Pierce Ranch has entered into a long-term interruptible stored water contract with LCRA, Pierce Ranch will determine how water will be allocated within its own operation. Within each LCRA irrigation operation, LCRA and its customers, through the advisory committees, will mutually determine which of the following allocation methods to follow:

Volumetric method – The total volume of water available to each operation will be divided by the operation's total recent base history to establish an amount available per acre, not to exceed 5.25 acre-feet. Each customer's actual first crop per acre usage for each landmass will then be subtracted from the per acre farm level availability and the balance, if any, will be made available to the customer for second crop production. Additional water made available due to any customers choosing not to irrigate either first or second crop will be equitably distributed to customers who irrigate other crops within the operation.

Acreage Method – The irrigation operation choosing this method would irrigate first crop acreage, but prior to the initial contracting process, would determine the maximum first crop acreage that could be irrigated with allocated water supplies. The first crop acreage for the particular irrigation operation would be determined by dividing the total water available to the particular irrigation operation by a first crop acre-foot per acre water use duty as agreed upon

between LCRA and the respective advisory committee. Contracted first crop acreage would be limited to this amount and would be made available to individual customers pro rata, based on their recent irrigation history as described below. For irrigation operations using volumetric measurement, any use of water in excess of the first crop acre-feet per acre duty would be subject to a surcharge. Prior to contracting for second crop water, the acreage available for second crop would be determined and contracted for on a pro rata basis, in a manner similar to that used for first crop, including a duty and surcharge. During a curtailment, water would be available for rice only, except at the Gulf Coast irrigation operation, where water would also be available for turf grass. Other supplemental agricultural interruptible demands within an operation would also be considered on a limited basis and only to the extent that water is available within the canal system which is not needed for rice irrigation.

Each customer's average base acreage history is to be determined based upon an averaging period agreed to by the farmer advisory committees. The averaging periods are as follows: Garwood – five (5) years; Gulf Coast – two (2) years; and Lakeside – six (6) years.

At the Lakeside and Garwood irrigation operations, the base acreage history shall be based upon the lands irrigated such that a customer shall not be entitled to irrigate lands in a curtailment year that were not previously irrigated by that customer, unless the current landowner of the land that contributed to the base acreage history grants express written consent, and such consent is provided to LCRA with customer's application. In the event that a customer no longer farms land which has a history of being farmed, that history shall be credited to the current landowner or a successor tenant farmer unless the landowner has granted consent for such base acreage to follow the customer to additional lands as described above.

At the Gulf Coast irrigation operation, the base acreage history shall follow the LCRA customer, and not be restricted to a particular landmass.

Allocation of curtailed interruptible stored water to the various users within the irrigation operation will be based on the amount of irrigated acreage on each landmass. This water use will be determined by accounting for established crop rotations during the defined averaging period and will include only those years during that same period that water was used on the landmass. Irrigation operations personnel will maintain this information for each irrigated landmass. Separate base acreage histories will be maintained for rice and turf grass. During periods of curtailment, irrigation customer contracts will be limited to the base acreage as determined by the method described above and any reductions necessary will be made from this base acreage.

d. Drought More Severe Than Drought of Record

In the event that the LCRA Board of Directors declares a drought to be more severe than the Drought of Record, limits would be placed on first crop production. If that occurred, the

following key elements of limiting first crop would stand:

- On Jan. 1 of each consecutive critical drought year, the projected run-of-river flow and interruptible stored water would be calculated and the water volume available to each operation would be projected.
- Each irrigation operation would decide with LCRA which allocation method to use, either the maximum acreage plan or the maximum volume plan.
- The application and contracting process would have a final deadline of February 15th of each year of the drought period that is more critical than the Drought of Record.

e. Termination of Water Allocation Policy

The water allocation model and water allocation plan for agricultural irrigation will terminate when the combined stored volume of Lakes Buchanan and Travis exceeds 1.4 million acre-feet.

The first crop water allocation process described here would terminate when LCRA reallocates interruptible stored water to the irrigation operations after the Board declares the drought worse than the Drought of Record to be over.

f. Procedures for Water Use Accounting

LCRA will employ its ordinary and standard water measurement procedures to account for water used during curtailment periods. During the implementation of the water allocation policies, LCRA will notify each customer of the amount of acreage for which LCRA will provide water. LCRA staff will perform actual field surveys to verify that each customer was not planting more than the allocated acreage. Customers planting excess acreage will be required to prevent irrigation waters from entering excess acreage through construction of appropriate outside levees enclosing only permitted acreage.

g. Transfer of Water Among Individual Users

Water allocation among individual users within individual operations is not a property right and there are no procedures or policies for individual users to obtain that right. All waters available during the critical drought would be allocated on a pro-rata basis to the landmasses contracted to irrigate during that critical drought year and either the maximum volume or maximum acreage for that irrigation operation would be consistent with that plan.

h. Variances

Within each LCRA irrigation operation, the LCRA General Manager or his designee is authorized, after consultation with the operation's advisory committee, to move and adjust the

averaging period for base acreages within farm service agency farms units to account for established field rotations and contemporary changes in management practices so long as such adjustments do not result in a net increase in acreage history.

i. Enforcement

All LCRA interruptible stored water contracts include a provision requiring that, in cases of a shortage of water resulting from drought, the water be distributed in accordance with LCRA's WMP and Texas Water Code section 11.039.

Interruptible stored water customers within the irrigation operations failing to comply with the pro-rata allocation requirements (curtailment plan) shall be subject to a civil action to enjoin the non-compliant customers for breach of contract. Additionally, the use of water in excess of the customer's per acre duty as described in section C.3.c above is subject to a surcharge.

3. Curtailment of Interruptible Stored Water Demands for Other than Irrigation Operations

LCRA will limit additional sales or commitments of interruptible stored water, other than for the four irrigation operations' Conservation Base acreage or other priority allocation, based on the combined volume of water in Lakes Buchanan and Travis at certain times of the year.

The supply of interruptible stored water made available outside the irrigation operations for the January through June period will be based on the January 1 storage levels in Lakes Buchanan and Travis taken separately. The supply for the July through December period for such sales will be based on the minimum of the maximum storage levels in April, May, and June in Lakes Buchanan and Travis, taken separately. No such sales will be allowed if either lake is less than 94% of its maximum conservation capacity. If both lakes are at their maximum conservation capacity as calculated above for either six-month period, then such interruptible stored water sales will be limited to a total of 30,000 acre-feet for that year. For projected lake volumes between 94% and 100% of conservation capacity, such interruptible stored water sales would be limited proportionately, based on the storage reservoir with the lowest percentage of capacity as calculated above.

4. Curtailment of Firm Water Demands

LCRA is required by TCEQ and the Texas Water Code to follow water supply allocation procedures to insure that there is no shortage or deficiency of stored water to meet firm demands during a repeat of the Drought of Record. Given the relatively small demand on firm water supplies at present, the possibility of a firm water shortage occurring is remote for the foreseeable future.

LCRA cannot determine with absolute certainty whether a particular drought event will be more or less severe than the Drought of Record. Therefore, LCRA will engage its customers in a public education campaign and seek voluntary reduction of firm demands from its firm

customers in the early stages of a drought, as more specifically described below.

LCRA cannot invoke mandatory curtailments of firm water demand unless a particular drought event is determined to be more severe than the Drought of Record or some other water emergency that drastically reduces the available firm water supply. LCRA Water Supply Planning staff has developed a simplified “drought monitoring procedure” for identifying a drought worse than the Drought of Record for the Highland Lakes watershed. Historical inflow data for the contributing watershed of the Highland Lakes were used in the development of this procedure.

a. Policy Recommendation for Firm Water Demand Curtailment

- 1) Recommendation 1: LCRA encourages its firm water customers to implement long-term water conservation measures year-round to meet the goals included in their water conservation plans. LCRA will implement a public awareness campaign on water use and conservation.
- 2) Recommendation 2: Whenever total storage in Lakes Buchanan and Travis is at or below 1.4 million acre-feet, LCRA requests its firm water customers implement the voluntary drought restrictions contained in their drought contingency plans, with a target reduction goal of 5 percent (5%).
- 3) Recommendation 3: Whenever the total storage in Lakes Buchanan and Travis is at or below 900,000 acre-feet, LCRA will ask all its firm water customers to implement mandatory water use reduction measures in their Drought Contingency Plans, with a target reduction goal of ten to twenty percent (10 – 20%). LCRA will also begin discussions with firm water customers to develop a specific stored water curtailment plan, to be approved by the LCRA Board and TCEQ.
- 4) Recommendation 4: A mandatory pro rata curtailment of a minimum of twenty percent (20%) of LCRA’s firm water customers’ demands pursuant to Texas Water Code §11.039 will be implemented when the LCRA Board determines that the river system is experiencing a drought more severe than the Drought of Record. If lake levels continue to drop below 600,000 acre-feet, the mandatory pro rata curtailment percentage may be increased as determined by the LCRA Board. LCRA will curtail and distribute the available supply of firm water among all of its firm water supply customers on a pro rata basis according to the amount of firm water to which they are legally entitled under the terms of their contract and consistent with the curtailment plan approved by the LCRA Board and TCEQ. All uses of interruptible stored water will be totally cutoff prior to and during any mandatory pro rata curtailment of firm stored water supplies.

In addition to the above features, this curtailment policy for firm water demands, LCRA will require each of its firm water customers to prepare and adopt a legally enforceable local drought contingency plan that specifies the actions to be taken to comply with this DMP/DCP regarding

the curtailment of firm supplies. Such plans should be developed pursuant to LCRA guidelines and submitted for LCRA review and acceptance within a reasonable time.

b. Monitoring and Enforcement

LCRA will monitor customers' compliance with the required demand reduction goals and will take enforcement action as necessary against noncompliant customers. Monitoring and enforcement of water-use restrictions at the end-user level generally will be the customers' responsibility.

c. Variances

LCRA's General Manager or his designee may, in writing, grant a temporary variance to the pro rata water allocation requirement of this DMP/DCP if it is determined that failure to grant such a variance would cause an emergency condition adversely affecting the public health, welfare or safety and if one or more of the following conditions are met:

- Compliance with the plan cannot be technically accomplished during the duration of the water supply shortage or other condition for which the plan is in effect.
- Alternative methods can be implemented that will achieve the same level of reduction in water use.

Persons requesting an exemption from the provisions of the DMP/DCP shall file a petition for variance with the LCRA General Manager or his designee within five (5) days after pro rata allocation has been invoked. All petitions for variances shall be reviewed by the LCRA Board of Directors and shall include the following:

- Name and address of the petitioner(s).
- Detailed statement with supporting data and information as to how the pro rata allocation of water under the policies and procedures established in the LCRA DMP/DCP adversely affects the petitioner or what damage or harm will occur to the petitioner or others if the petitioner complies with the pro rata reduction requirements of the plan.
- Description of the relief requested.
- Period of time for which the variance is sought.
- Alternative measures the petitioner is taking or proposes to take to meet the intent of the plan and the compliance date.

- Other pertinent information.

Variances granted by the LCRA Board of Directors shall be subject to the following conditions, unless waived or modified by the LCRA Board of Directors:

- Variances shall include a timetable for compliance.
- Variances granted shall expire when pro-rata reduction requirements are no longer in effect, unless the petitioner has failed to meet specified requirements.

No variance shall be retroactive or otherwise justify any violation of the LCRA DMP/DCP occurring prior to the issuance of the variance(s).

d. Notification of TCEQ Executive Director

The LCRA General Manager or his designee will notify the TCEQ Executive Director within five (5) business days of implementation of any mandatory provisions in the DMP/DCP.

5. Declaration and Cancellation of a Drought More Severe Than the Drought of Record

The LCRA Board of Directors will declare a drought worse than the drought of record when the following three conditions are simultaneously met: (a) drought at least 24 consecutive months (24 months since both Lakes Buchanan and Travis were at their maximum allowable water conservation storage levels); and (b) the cumulative inflow deficit since the beginning of the drought exceeds the envelope curve for cumulative inflow deficits by at least 5% for six consecutive months; and (c) the combined storage in Lakes Buchanan and Travis is less than 600,000 acre-feet.

Curtailments of interruptible stored water due solely to the declaration of a drought worse than the drought of record of duration less than 36 months is only effective on the following January 1 or July 31, whichever occurs first following the declaration by the LCRA Board of Directors. Droughts more than 36 months in length have no restrictions as to when supply reductions can be implemented.

The LCRA Board of Directors will cancel such a declaration if any of the following conditions are met: (a) the cumulative inflow deficit since the beginning of the drought is less than the envelope curve for cumulative inflow deficits by at least 5% for six consecutive months; or (b) the combined storage in Lakes Buchanan and Travis is greater than 1.4 million acre-feet of water, which is simply the recommended threshold for curtailment of interruptible stored water during a repetition of the drought of record. Prior to declaring a drought worse than the drought of record, LCRA will re-evaluate this threshold level to determine if a more accurate conservation storage level in lieu of 1.4 million acre-feet can be determined.

6. Public Notice

LCRA will carry out a public information campaign that is appropriate to the particular curtailment contemplated. This could include some or all of the following efforts: (1) news releases, (2) news updates to area media, (3) interviews with local radio and television stations, (4) responses to requests for information, (5) distribution of water conservation education materials, (6) advertisements in local newspapers to inform the public about current water supply and usage and our water management planning strategies, (7) improvements to LCRA's automated telephone message system to provide information on lake levels, and (8) public service announcements on local radio stations.

7. Impacts of the Recommended Management Policy

a. Firm Water Demands and Supplies

All projected year 2010 demands for firm water are fully satisfied under these simulated critical drought conditions. The largest firm water demand is for the City of Austin. The majority of Austin's projected annual demand of 201,400 acre-feet is met from run-of-river flows diverted under its senior water rights.

Approximately 65% of the demand during the 1947-1956 critical drought years is estimated to be supplied by these flows with the remainder supplied by firm stored water.

b. Interruptible Stored Water Demands and Supplies

With the increase in projected firm water needs for 2010, there is less water for interruptible stored water supply from Lakes Buchanan and Travis since firm water needs take priority over interruptible stored water uses. To avoid shortages to firm water users, it is recommended that interruptible stored water supplies from Lakes Buchanan and Travis be reduced during the critical drought years from what is available under the WMP approved in 1999. This reduction in supplies primarily impacts irrigation.

Under the recommended management policy, all interruptible stored water available during a repetition of the Drought of Record is used by the four downstream irrigation operations, except for that portion committed to maintaining instream flows and estuarine freshwater inflows.

With the curtailment threshold raised from the current value of 1.1 to 1.4 million acre-feet, the projected first crop demand of 83,700 acres will be fully met under the proposed changes, as it is under the WMP approved in 1999. However, there will be a substantial reduction in the irrigation acreage supplied for second crop under the proposed curtailment policy. The WMP approved in 1999 provides sufficient water to irrigate an average of 56,500 acres of second crop each year during a repetition of the Drought of Record. The proposed plan would provide water only for an average of 32,700 acres of second crop under the same drought conditions. Approximately 92 percent (21,800 acres) of this decrease in acreage is due to the increased

projected municipal demands, with the remainder (2,000 acres) due to the proposed change in environmental releases for estuarine inflows. In spite of this reduction, irrigators would use, during a repeat of the Drought of Record, an average of 168,400 acre-feet annually, or 75 percent of all interruptible stored water used for irrigation and environmental protection.

The simulated acreage cultivated in first and second crops are given for all four operations combined and individually in Figures 4-2 thru 4-6, at the end of this Chapter. As noted previously, however, the actual interruptible stored water curtailments may differ from the values reflected by the cultivated acreage as shown in this simulation, depending on the facts as they then exist and the terms and conditions of the contracts between LCRA and users.

The recommendation concerning instream flows reflects the philosophy adopted in the initial WMP and continuation in the amendments to the WMP that instream flows be curtailed whenever there is a curtailment of interruptible stored water to the four major irrigation operations. Since the curtailment threshold for irrigation supplies is recommended to rise from 1.1 to 1.4 million acre-feet, LCRA has proposed that the curtailment storage threshold for instream flows also be revised upwards the same amount. By synchronizing these curtailment trigger points, the WMP reflects reduced supplies available to maintain instream flows, including both supplies released for irrigation that simultaneously benefit instream flows as well supplies dedicated to maintain streamflows for ecological benefit.

The recommended intermediate estuarine inflow policy would provide for releases of stored water from Lakes Buchanan and Travis of up to 256,700 acre-feet (150 percent of Critical FIN) annually to Matagorda Bay in years whenever the combined storage in Lakes Buchanan and Travis on January 1 is between 1.1 and 1.7 million acre-feet. By increasing the releases of stored water from Lakes Buchanan and Travis in years when the January 1 storage is within this given range, the estuarine ecosystem receives more freshwater inflows during moderate droughts than it would be under the present WMP.

The WMP, with the proposed revisions herein, will have essentially the same total stored water commitments for environmental purposes as currently provided in the present WMP. During a repetition of the DOR, the present WMP would provide an annual average of 56,000 acre-feet for both instream flows and estuarine inflows. With the proposed changes, the WMP would provide about 56,500 acre-feet annually during the same period and for the same purposes.

The proposed increase in the firm water allocated for environmental purposes from about 16,000 to 33,400 acre-feet is required to properly account for the stored water dedicated for environmental purposes. Whenever irrigation interruptible stored water supplies are curtailed, stored water used for environmental protection has be accounted as firm water since irrigation has priority use of available interruptible stored water supplies. Since the proposed storage threshold for curtailment of irrigation supplies is significantly greater than the present threshold, there will be more years in the DOR when irrigation supplies are curtailed, hence increasing the environmental flows that have to be assigned to firm water supplies.

The proposed additional 17,400 acre-feet firm water commitment for environmental purposes would be provided from the presently uncommitted firm yield of 60,952 acre-feet. The remaining firm yield available after this allocation would be 43,462 acre-feet. This amount is in addition to 50,000 acre-feet reserved by the Board for future uses. The total proposed firm water allocation of 33,400 acre-feet for environmental purposes represents 8 percent of the total firm supply from Lakes Buchanan and Travis.

c. Lake Storage Levels

For the simulated repetition of the Drought of Record, the total combined storage of Lakes Buchanan and Travis was reduced to very low levels in the worst drought years (Figure 4-8), even with the partial curtailment of interruptible stored water supplies. Approximately 200,000 acre-feet of stored water remains in Lakes Travis and Buchanan combined at the lowest storage content. The simulated lake water surface elevations and storage levels are given in Figures 4-9 and 4-10, for Lakes Buchanan and Travis, respectively. The minimum lake water surface levels during the simulation period are about 960 feet msl on Lake Buchanan and 578 feet msl on Lake Travis. The average lake water surface elevations (for the repetition of the 1941-1965 period hydrology) are projected to be 1005 feet msl on Lake Buchanan, and 657 feet msl on Lake Travis.

The simulated minimum water levels in Lakes Travis and Buchanan are lower than the historical low levels of 614 feet and 983 feet, respectively. The greater drawdown on the lakes in the simulated operation is largely because of greater water demands and lower storable inflows than occurred historically. The projected year 2010 water demands are significantly greater than those that occurred historically in the 1941-1965 period. Firm water demands during the actual drought of record were only a small fraction of those projected by year 2010. Additionally, the rice producers only cultivated one crop of rice prior to about 1963. The current practice of producing two crops each year has increased the water demands of irrigation over those of the 1947-1956 critical drought period.

The second factor causing the simulated storage levels to be lower than historical levels is a difference in the storable inflows. The simulated operation uses historical inflows adjusted for any flow reductions caused by water diverted for upstream water rights, particularly major reservoirs including O. H. Ivie Reservoir. Most of the large reservoirs upstream of the Highland Lakes were not in operation during the critical drought period. During any repetition of the Drought of Record, these upstream reservoirs would likely significantly reduce storable inflows.

d. Flows in the Colorado River

For a repetition of the hydrologic conditions in the 1947-1956 critical drought years, the estimated average flow of the Colorado River at Bay City is about 471,000 acre-feet annually with the projected 2010 demands. For a repetition of the 1941-1965 period, the simulated annual flow at Bay City averages 1.22 million acre-feet. Of this total, a portion of the flow consists of dedicated releases of stored water from Lakes Buchanan and Travis to meet the Target and

Critical freshwater inflow needs and a portion consists of stored water released to meet critical instream flow needs at several upstream locations.

The dedicated firm and interruptible stored water releases for the 1947-1956 critical period amount to an average of 56,500 acre-feet per year of which 36,000 acre-feet is for maintaining instream flows.

F. Annual Implementation of Drought Management and Drought Contingency Plans

1. Annual Review and Revisions

As part of the WMP, the DMP/DCP is subject to review each year. The DMP/DCP may be revised at any time subject to approval by the LCRA Board and the TCEQ. Changing water supply and demand conditions on the lower Colorado River will be reflected as necessary in future amendments to the WMP.

2. Administration

The curtailment of interruptible stored water supply will occur through the annual contracting process in November through January of each year. The curtailment of firm water will depend on storage levels and will be monitored continuously. Curtailment of interruptible stored water supply for Garwood and other entities supplied pursuant to long-term contracts will be accomplished pursuant to the terms of those contracts.

LCRA will monitor customer compliance with the required demand reduction goals and take enforcement action as necessary against noncompliant customers. Monitoring and enforcement of water use restrictions at the end-user level generally will be the customer's responsibility. At present, LCRA's ability to enforce curtailments of firm water demands is uncertain and may be limited to taking civil action to enjoin a non-compliant customer for breach of contract.

Figure 4-2: Simulated Irrigated Acreage - 4 Irrigation Operations Combined

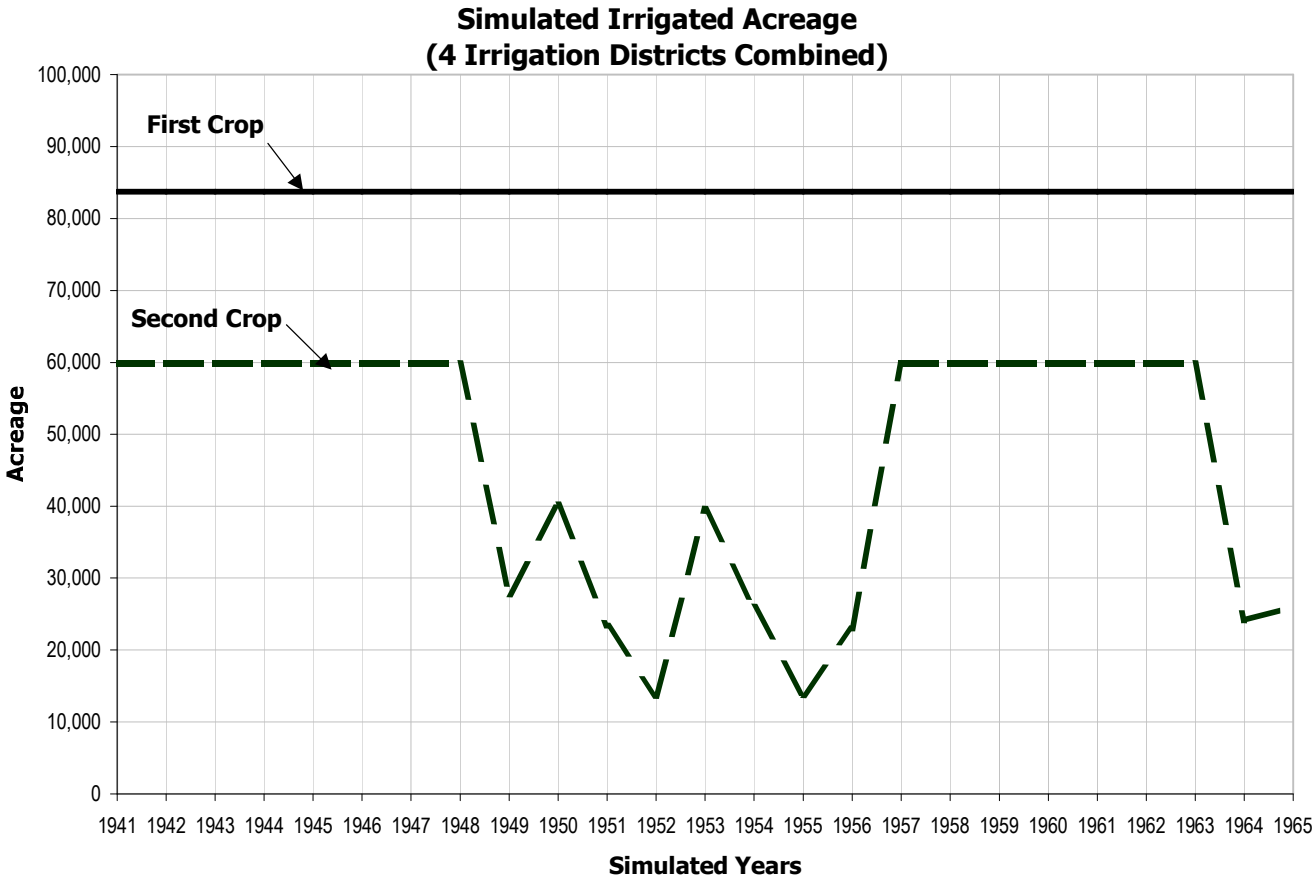


Figure 4-3: Simulated Irrigated Acreage - Gulf Coast

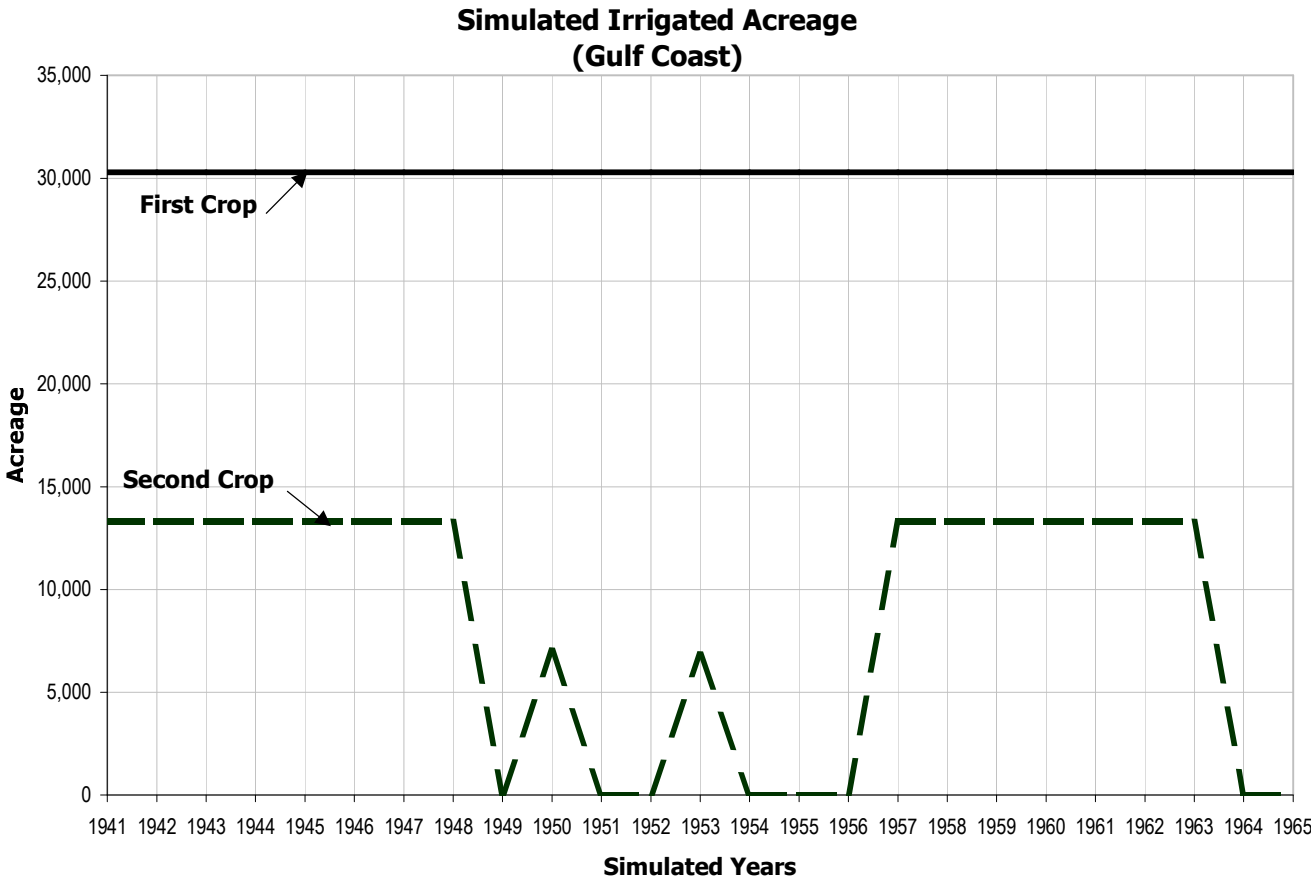


Figure 4-4: Simulated Irrigated Acreage - Lakeside

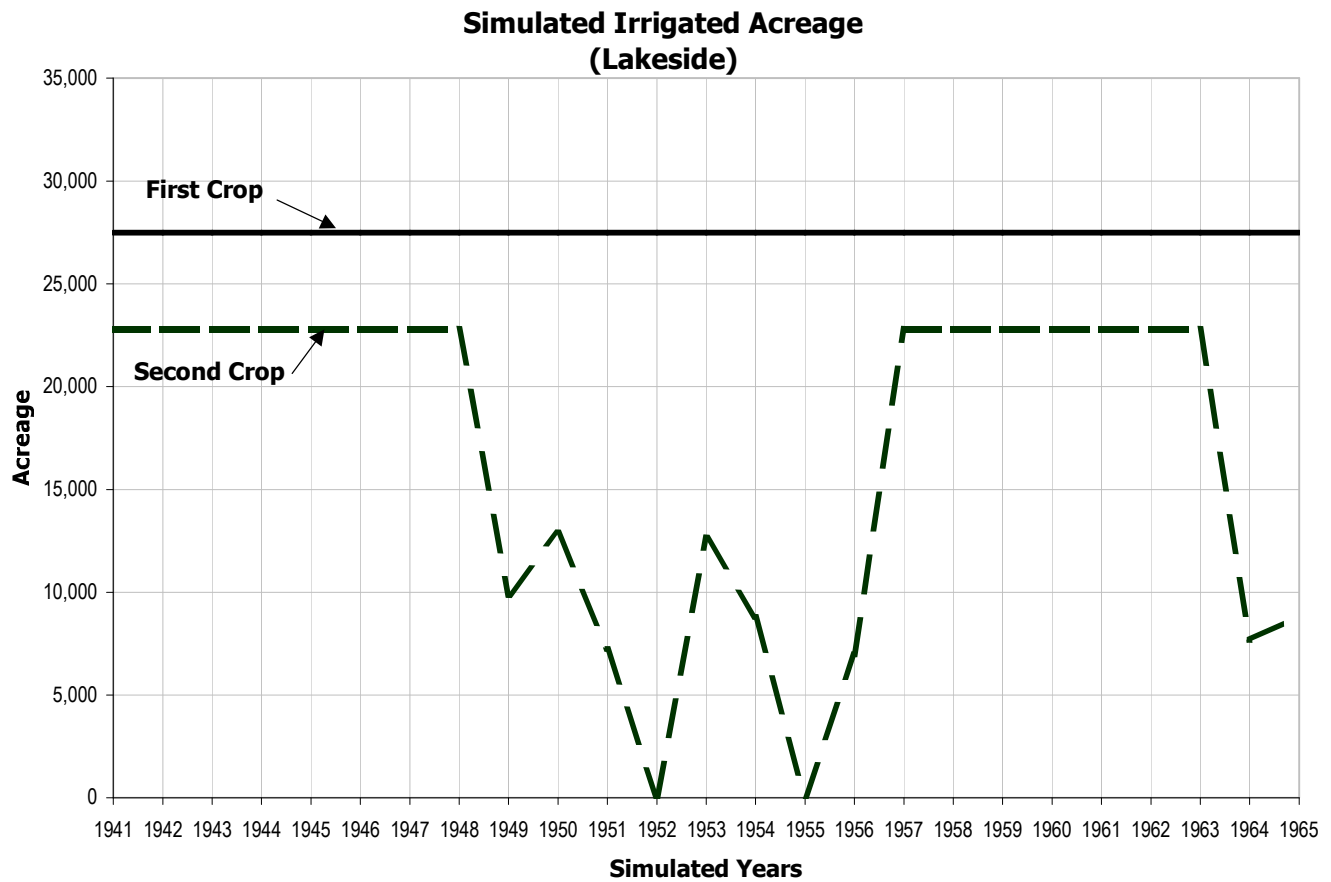


Figure 4-5: Simulated Irrigated Acreage - Garwood

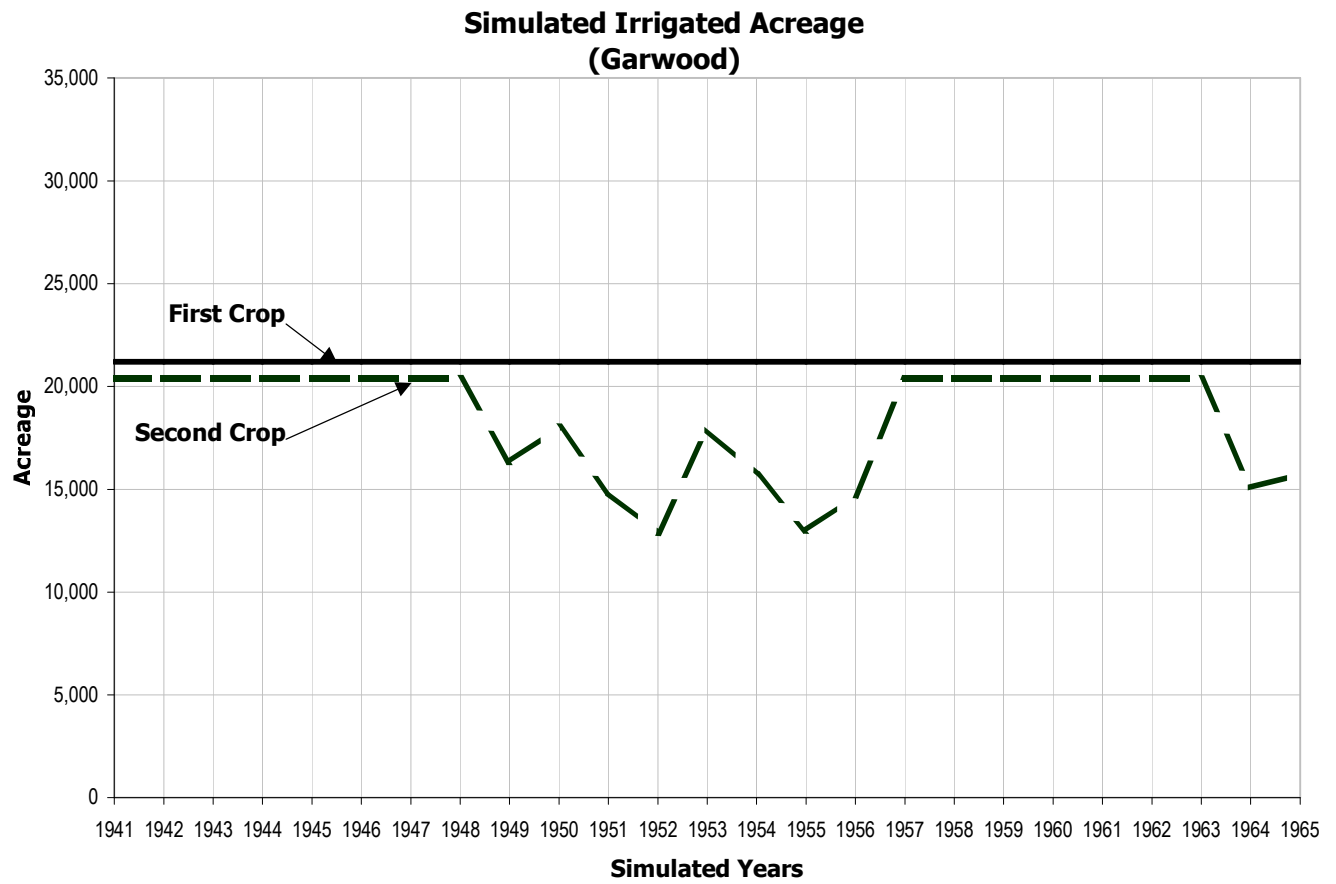


Figure 4-6: Simulated Irrigated Acreage - Pierce Ranch

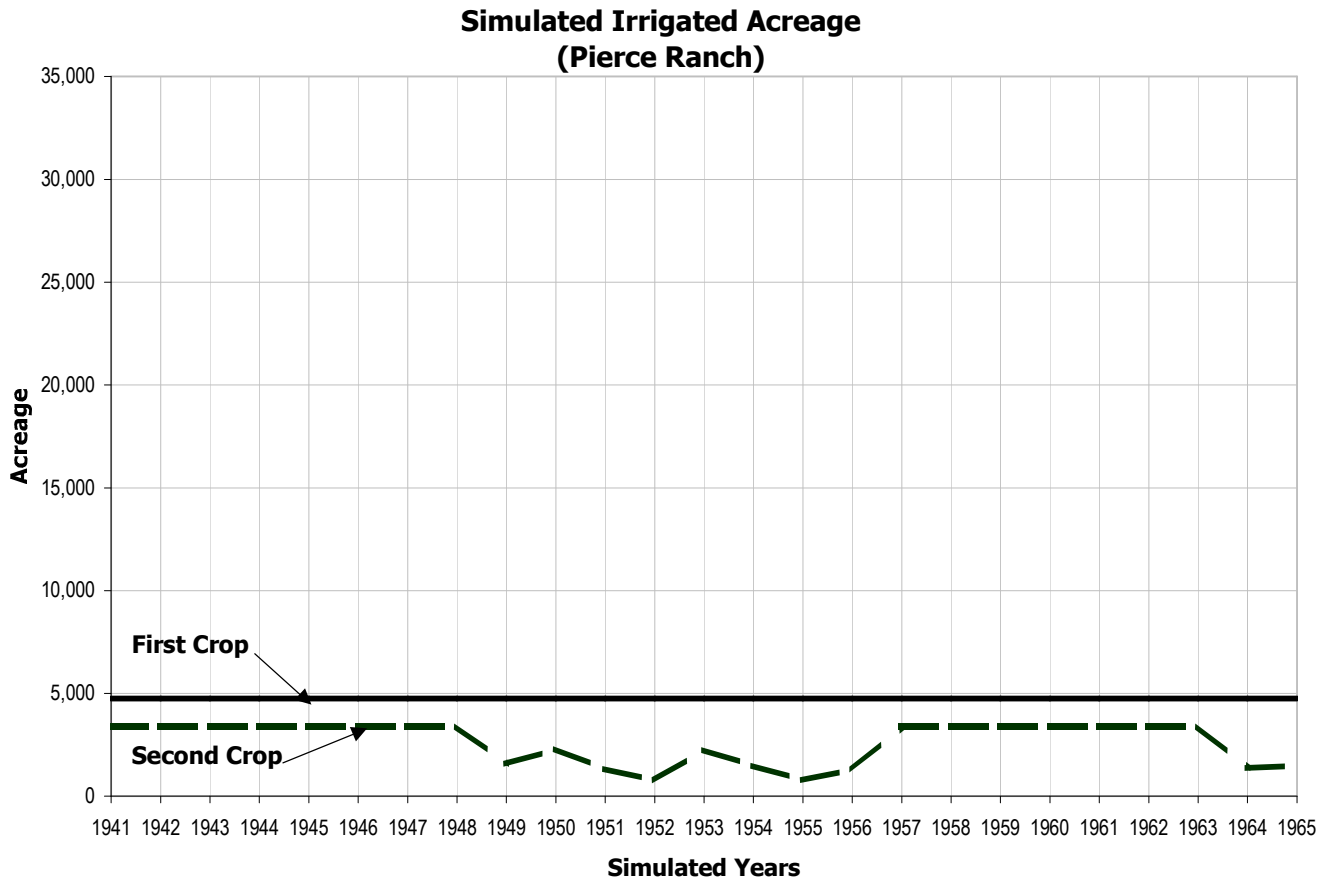


Figure 4-7: Simulated Travis and Buchanan Storage Condition

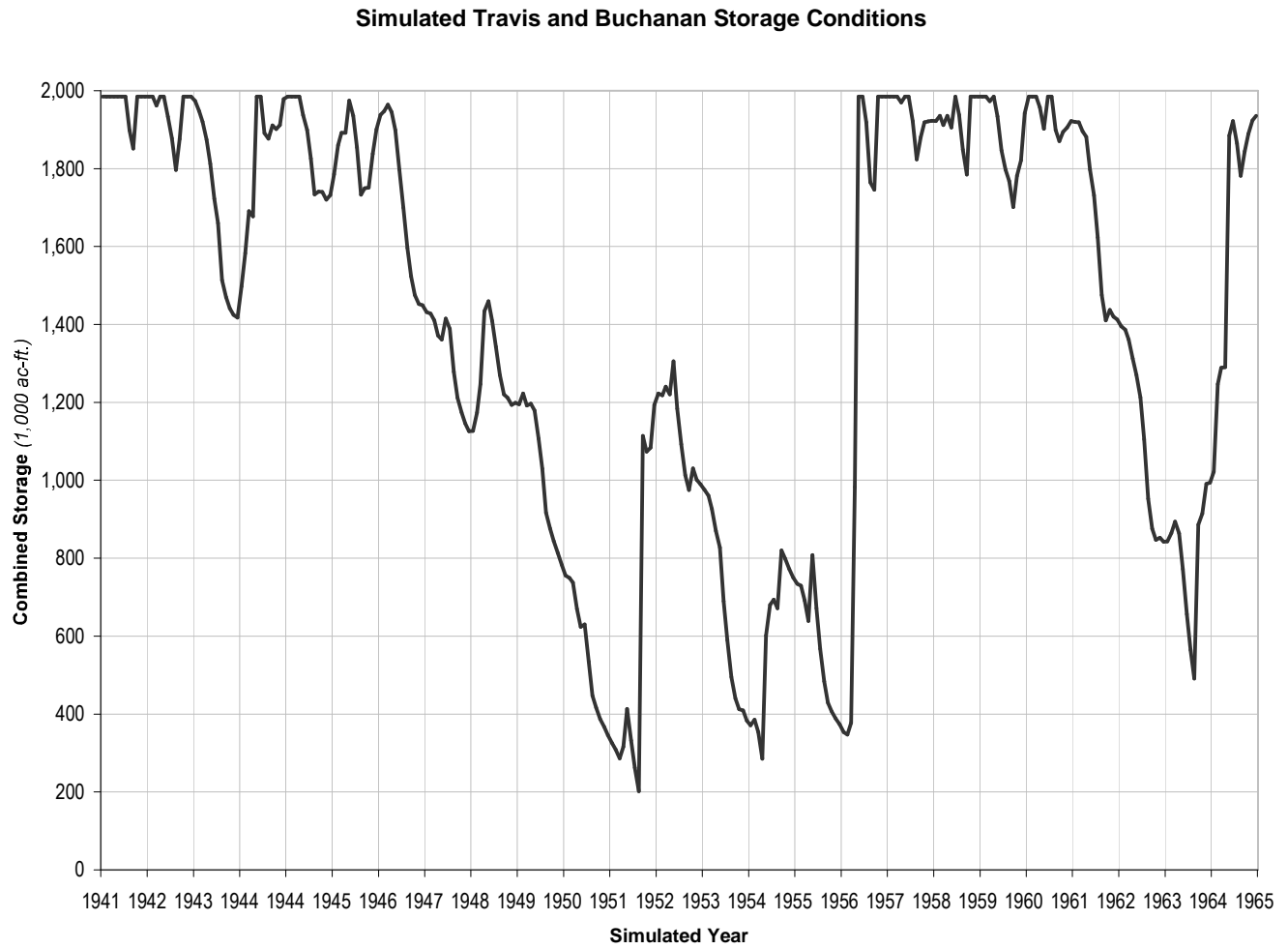


Figure 4-8: Lake Buchanan Simulated Elevation and Storage

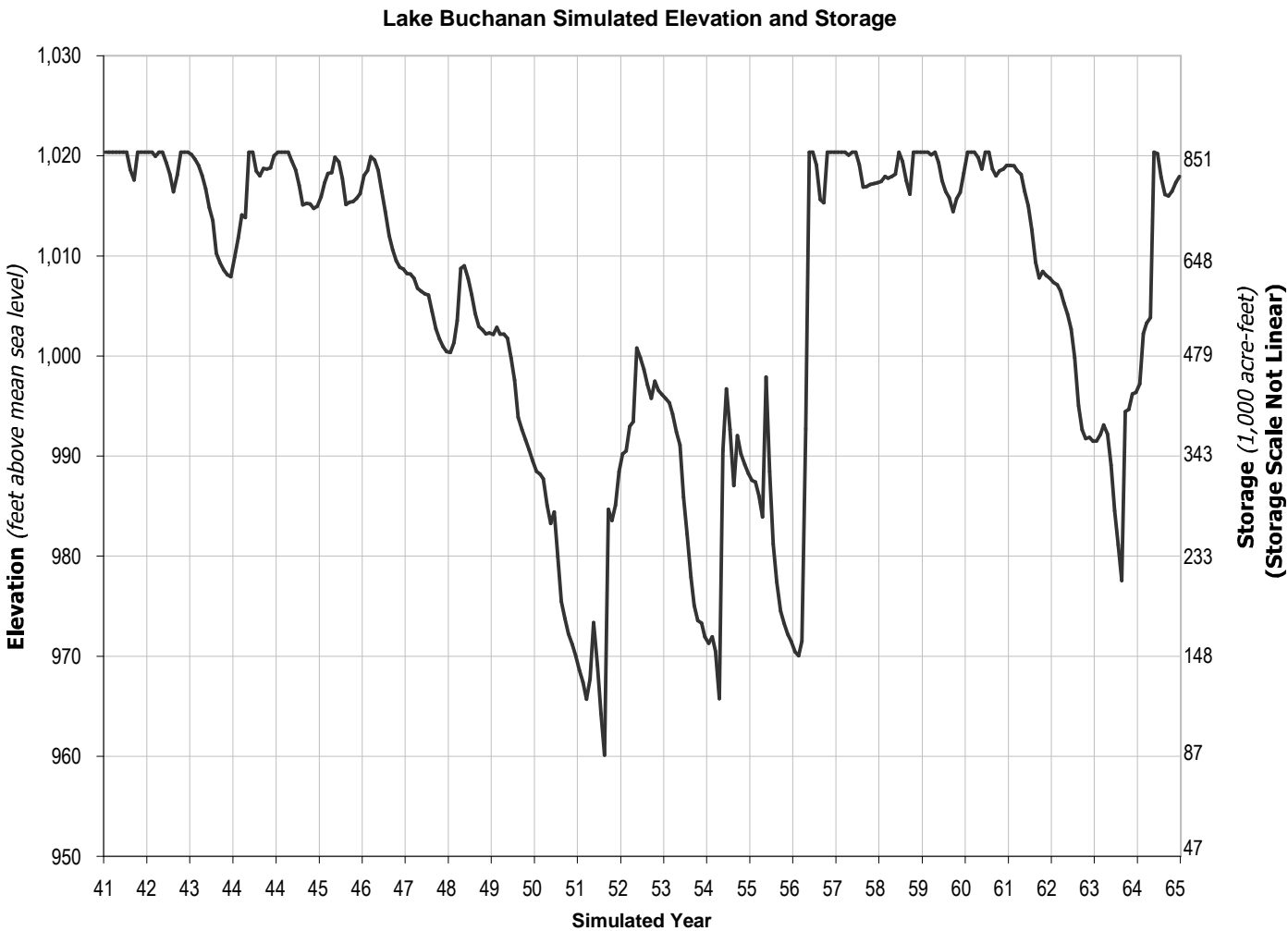
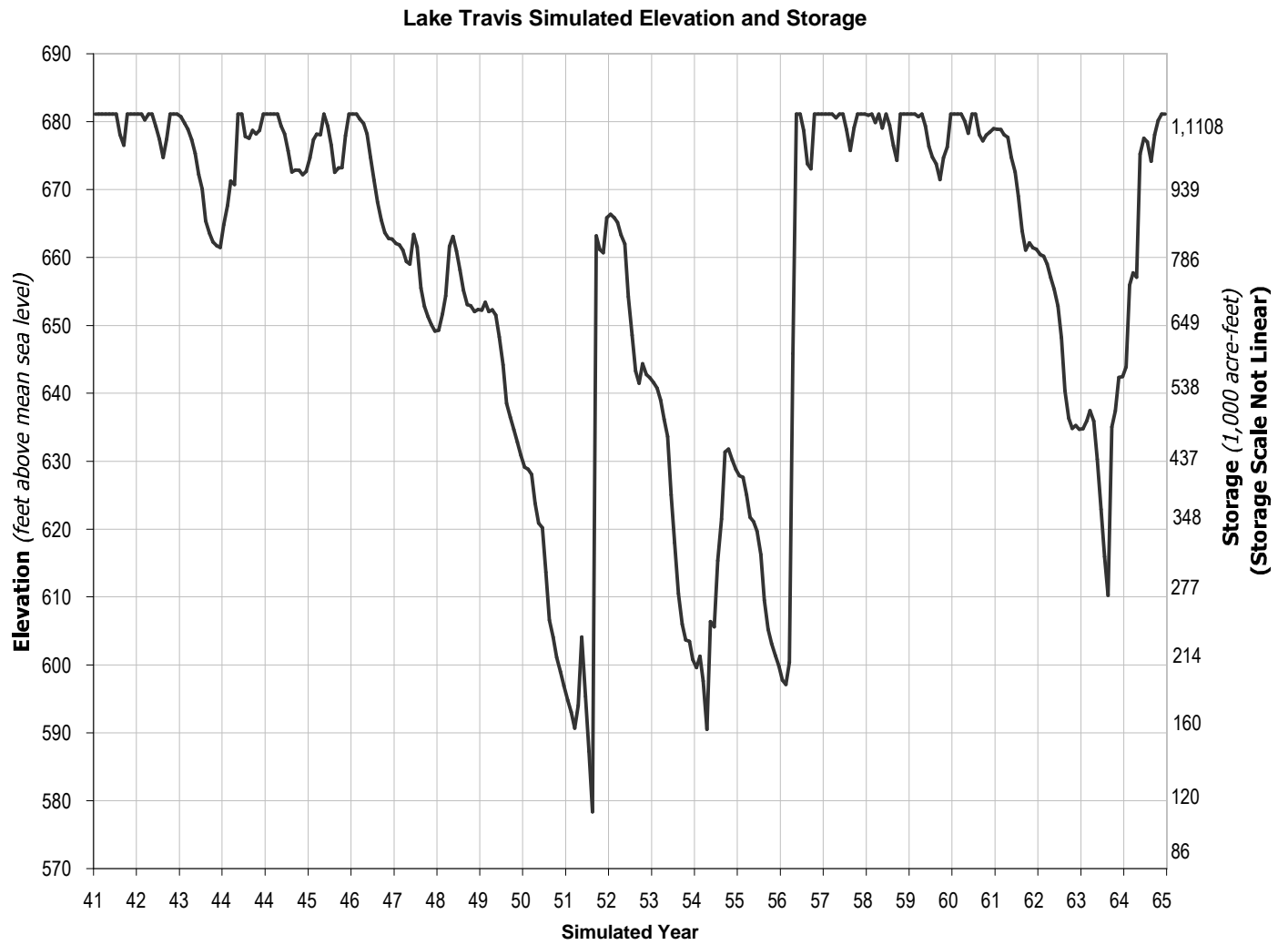


Figure 4-9: Lake Travis Simulated Elevation and Storage



TEXAS WATER COMMISSION



IN RE: CONSIDERATION OF §
THE LOWER COLORADO RIVER § BEFORE THE
AUTHORITY'S WATER MANAGEMENT §
PLAN AND AMENDMENTS TO § TEXAS WATER COMMISSION
CERTIFICATES OF ADJUDICATION §
NOS. 14-5478 AND 14-5482 §

ORDER APPROVING LOWER COLORADO RIVER AUTHORITY'S WATER MANAGEMENT PLAN AND AMENDING CERTIFICATES OF ADJUDICATION NOS. 14-5478 AND 14-5482

On the 7th day of September, 1989, the Texas Water Commission ("Commission") held a public hearing to consider the Lower Colorado River Authority's Water Management Plan and applications to amend Certificates of Adjudication Nos. 14-5478 and 14-5482. At the hearing, the following were named as parties: the Lower Colorado River Authority; the Texas Parks and Wildlife Department; the City of Austin; the Garwood Irrigation Company; the Sierra Club, Lone Star Chapter; the Texas Farm Bureau; the Matagorda County Water Council; Houston Lighting and Power Company as Project Manager for the South Texas Project; Clear, Clean Colorado River Association; Pierce Ranch; the Village of Lakeway; the Executive Director of the Texas Water Commission; and the Public Interest Counsel of the Texas Water Commission. Having considered the evidence and arguments presented, the Commission makes the following Findings of Fact and Conclusions of Law:

FINDINGS OF FACT

1. Notice of the adjudicative public hearing was published on July 26, 1989, in the Blanco County News, Austin American-Statesman and the Colorado County Citizen, newspapers regularly published and generally circulated in Blanco, Travis and Colorado Counties, Texas, respectively; on July 27, 1989, in the San Saba News and Star, Llano News, Highlander and the Bay City Daily, newspapers regularly published and generally circulated in San Saba, Llano, Burnet, and Matagorda Counties, Texas, respectively; on July 28, 1989, in the Fayette County Record, a newspaper regularly published and generally circulated in Fayette County, Texas; on July 29, 1989, in the Wharton Journal-Spectator, a newspaper regularly published and generally circulated in Wharton County, Texas, and on July 31, 1989 in the Bastrop Advisor, a newspaper regularly published and generally circulated in Bastrop County, Texas, the only counties in which persons reside who may be affected by action taken as a result of the hearing. Said notice was published not less than thirty days before the date of the hearing.

2. On July 26, 1989, notice of the public hearing was sent by first-class mail to persons who may be affected by action taken as a result of the hearing and to each person as required by law.
3. The Lower Colorado River Authority (LCRA) is requesting approval of its Water Management Plan for the Lower Colorado River, Colorado River Basin in accordance with the Court's Final Judgment and Decree entered in Cause No. 115,414 A-1, 264th Judicial District, In Re: The Exceptions of the Lower Colorado River Authority and the City of Austin to the Adjudication of Water Rights in the Lower Colorado River Segment of the Colorado River Basin, and is further requesting approval of amendments to Certificates of Adjudication Nos. 14-5478 and 14-5482 to authorize LCRA to divert, release and use the water in Lakes Buchanan and Travis for additional beneficial uses including domestic, recreation, instream flow and bays/estuary purposes.
4. LCRA's Water Management Plan consists of two volumes. Volume I, Policies and Operations, describes the issues and conflicts in the demands on the Colorado River system and lays out the policies and management actions LCRA will use to accommodate the variety of demands on the system. Volume II, Technical Report, describes the models and data sources and the process used for the determination of the Combined Firm Yield and the Annual Rule Curve methodology. Volume II includes a set of Appendices consisting of the Court's Final Judgment and Decree, and the detailed data used to support the recommendations and conclusions discussed in Volumes I and II.
5. The Highland Lakes Reservoirs are operated by LCRA as a system for flood control and water supply. Mansfield Dam is the only structure with a dedicated flood pool and is operated during flooding according to flood-control regulations as published in the Code of Federal Regulations and under the supervision of the U.S. Corps of Engineers.
6. LCRA has a remote data acquisition system referred to as "Hydromet." The Hydromet allows for remote interrogation of a networked system of twenty-one self-reporting rainfall gages, twenty-two remotely monitored streamflow gages and six reservoir elevation gages. Twenty of the streamflow gages also gather rainfall information, giving a total of forty-one rainfall sites. The network is polled each hour, and all data is verified and stored in a real-time data base on a central computer system. Communications are a combination of microwave and UHF radio. The relational data provided by the Hydromet monitors flows above and below the lakes.
7. LCRA has a central computer system that is composed of two Digital Equipment Corporation MicroVAX II mini computers, one

of which is designated as an operations system located at the LCRA System Operations Control Center, and the other designated as a development system located at the Water Resources office. Real time data is logged and maintained on an on-line historical data base for one year. This is available for access by operations models, historical analyses, or other needs.

8. LCRA has developed several hydrologic models that are models used for routine operations of the system. Each model was developed to meet specific operational needs. The Daily Operations Model, analyzes the downstream inflow and demands by accessing streamflow data, totalling demands, and making multiple computer runs of the Model. The Flood Management Model is a user oriented operation tool which accesses real-time data and routes flood flows through the Highland Lakes. The Storage Projection Model uses historical inflow data to estimate the reliability of reservoir system storage subject to storage conditions and water demands.
9. The Daily Allocation Model will determine the extent to which releases from storage are diverted. It will perform a water balance every twenty-four hours at each river gage below Tom Miller Dam, and will allocate the natural flow of the river (whether or not it originated upstream or downstream of the lakes) to major water rights holders to the extent it is available. The remaining portion, if any, of each diversion is assumed to have been from water released from storage. Each amount is then totaled for the week, month and year to determine the total demand on storage.
10. Daily Operations are a joint effort between the System Operations Control Center (SOCC), Hydro Operations personnel located at the dams, and Water Operations personnel located at the Central Office complex. Water Operations personnel determine the required release by contacting downstream customers, operating the Daily Operations Model, and posting the daily release schedule. The SOCC then determines the optimum time and during the day to release the water based on the daily power peak demand, and orders the hydro generation units to begin and end at the necessary times. Hydro Operations personnel at each dam determine which unit to run at each dam.
11. The standard operating levels for the Highland Lakes are: Lake Buchanan, 1020.35 feet; Inks Lake, 887.30 +/- 0.4; Lake LBJ, 824.70 +/- 0.3; Lake Marble Falls, 736.60 +/- 0.4; Lake Travis, 681.00; and Lake Austin, 492.30 +/- 0.5. All levels are referenced to mean sea level.
12. The U. S. Corps of Engineers is evaluating potential flood damages to areas both upstream and downstream of Mansfield

Dam. LCRA is cooperating in this study. The Corps is also performing a reconnaissance study of possible additional flood control and water supply reservoirs. LCRA is cooperating in this study as well.

13. The Highland Lakes System consists of Lakes Buchanan, Inks, LBJ, Marble Falls, Travis and Austin.
14. LCRA's water rights for Lakes Buchanan, Inks, LBJ, Marble Falls and Travis are set forth in Certificates of Adjudication Nos. 14-5478, 14-5479, 14-5480, 14-5481 and 14-5482. LCRA operates Tom Miller Dam (the dam creating Lake Austin) pursuant to agreement with the City of Austin. Austin's water rights for Lake Austin are set forth in Certificate No. 14-5471.
15. LCRA's water rights on the Colorado River below the City of Austin are set forth in Certificates of Adjudication Nos. 14-5437, 14-5473, 14-5474, 14-5475, and 14-5476.
16. LCRA's right to use the waters of the Highland Lakes is subject to the terms and conditions as set out in the final judgment and decree dated April 20, 1988, in Cause No. 115, 414-A-1.
17. LCRA is committed to following the terms and conditions of the final judgment and decree dated April 20, 1988 in Cause No. 115, 414-A-1.
18. LCRA's first step in development of its Water Management Plan was a comprehensive review of LCRA's Board policies and existing programs that guide and shape the way LCRA manages the river system. The LCRA Board of Directors held a series of monthly public meetings and received testimony from LCRA staff, outside experts, and numerous representatives of diversified constituencies including state agencies, environmental groups, business, industry, agricultural interests, and wholesale electric customers. Based upon the evidence the Board received new comprehensive water policies were adopted by the LCRA Board. These policies form the foundation of the Plan.
19. LCRA's next step was the formulation of a Public Task Force. The LCRA staff and public task force met and worked together over a 6 month period.
20. A draft of the Technical Report (Volume II) of the Water Management Plan was transmitted to the Commission on December 30, 1988. A draft of both Volumes I and II of the Plan was submitted to the Commission's staff and distributed to the public in February 1989 for public comment, LCRA held public workshops followed by local meetings in Bay City, Eagle Lake

and at Buchanan Dam. Additionally, public discussions during LCRA Board meetings were held in March, April and May 1989. LCRA formally adopted the Plan in May 1989.

21. LCRA's proposed Water Management Plan was filed with the Commission on July 7, 1989. The Commission acknowledged receipt of LCRA's proposed Plan on July 18, 1989.
22. LCRA's Water Management Plan has essentially four criteria. One is that the Highland Lakes and the Colorado River downstream will be managed together as a single system for downstream water supply purposes. The second is that the beneficial use of the water derived from inflows below the Highland Lakes will be maximized. The third is that LCRA will stretch and conserve the waters stored in the Highland Lakes and advance water quality. The fourth is that adequate flows will be provided to maintain, and where reasonably possible, improve, fish, wildlife, and recreation resources in the Lower Colorado River and to maintain a proper ecological environment and health of related living marine resources in the Lavaca-Tres Palacios Estuary, to the extent it is affected by the lower Colorado River watershed.
23. LCRA will follow five guidelines in implementing its Water Management Plan including:
 - a. All demands for water from the Colorado River downstream of the Highland Lakes will be satisfied to the extent possible by run-of-river flows of the Colorado River;
 - b. Inflows will be passed through the Highland Lakes to honor downstream senior water rights only when those rights cannot be satisfied by the flow in the river below the Highland Lakes;
 - c. The firm, uninterruptible commitments of water from Lakes Travis and Buchanan will not exceed the Combined Firm Yield;
 - d. Water from Lakes Travis and Buchanan will be available on an interruptible basis only as long as LCRA's ability to meet the demand for uninterruptible water is not impaired;
 - e. Water shall not be released through any dam solely for hydroelectric generation, except during emergency shortages of electricity, and during other times that such releases will be needed for another beneficial purpose.
24. LCRA has the ability to constantly monitor the amount of water in the river available to meet demands through the Hydromet

System which should allow full utilization of the flows originating below Lake Travis prior to making any releases from storage or passing inflows through the reservoirs.

25. Under the Water Management Plan the four downstream irrigation operations (Gulf Coast, Lakeside, Garwood, and Pierce Ranch) will have first priority for the interruptible water in the annual allocation process. This priority will be set by establishing a Conservation Base for LCRA's two irrigation districts. LCRA intends to negotiate a contract which will include a Conservation Base acreage with Pierce Ranch. The Conservation Base acreage for Gulf Coast, Lakeside and Pierce Ranch was determined on the basis of a ten-year (1976-1985) historical average of actual production acreage. The allocation of water for these three users is based on a duty of 5.25 acre-feet of water per acre irrigated. The priority allocation and terms governing the interruption of supply of stored water for Garwood are based upon a contract between Garwood and LCRA. The 5.25 acre-foot-per-acre duty also applies to Garwood irrigated acreage. In the annual allocation process Lakeside has a priority to interruptible stored water in an amount necessary to firm up run-of-river rights to 136,500 acre-feet per year; Gulf Coast an amount necessary to firm up run-of-river rights to 194,250 acre-feet per year and Garwood an amount necessary to firm up run-of-river rights to 168,000 acre-feet per year.
26. When the federal allocation for the number of acres of rice that can be grown exceeds the Conservation Base acreage of Lakeside and Gulf Coast, then in that year LCRA will provide back up stored water for up to 28,300 acres at Lakeside and 42,800 acres at Gulf Coast. These limits represent the maximum number of acres served by each of the two divisions during the 10 year historic period that was used to establish the Conservation Base. For the Lakeside Division, any acreage over 25,000 and up to 28,300 can be served from an alternate source.
27. Lake levels follow an annual cycle--that of filling the conservation storage space in the winter and spring months of the year to be drawn down by larger water uses during the summer months.
28. Because these multiple purpose reservoirs were not constructed for recreational use, the demands for stability in the reservoir levels by recreation interests present conflicts which are extremely difficult to accommodate. If limits are to be placed on how far down the reservoirs' water levels are allowed to decline, a corresponding limitation on the amount of water that is available to supply the other demands on the reservoir system must also be agreed to.

29. To the extent that the annual analysis of the amount of water in storage reveals that there are interruptible water supplies available after meeting the demands of the irrigation operations, interruptible water may be held in the reservoirs to better ensure the security of supply or to maintain lake levels.
30. If additional sales of interruptible water exceed the Conservation Base amounts and the priority allocation for Garwood would draw the lakes below these minimum levels the LCRA Board will not declare any additional interruptible water available for sale in that year. Those levels are 660 feet msl for Lake Travis and 1012 feet msl for Lake Buchanan. LCRA is not guaranteeing minimum lake levels.
31. Another item to help keep the levels of Lakes Buchanan and Travis as high as possible is the agreement that no maintenance, except for emergencies, which would require the lowering of Lakes LBJ, Marble Falls, and Inks will be permitted if the refilling of those lakes would draw the levels of Lakes Travis and Buchanan below the minimum levels. Periodic lowering and refilling of Lake Austin will be done pursuant to the Settlement Agreement (December 10, 1988) between LCRA and the City of Austin.
32. Downstream recreation interests may be enhanced by LCRA's commitment to maintain minimum instream flows. LCRA will develop additional boat launches and recreation areas on the river through LCRA's 10-county district in order to give the public better access to the Colorado River.
33. Hydroelectric power plants located in each of the dams owned and operated by LCRA total 242 megawatts of capacity. Hydropower generally has been subordinated to be a by-product of the release of water for other purposes. LCRA retains the right to make releases solely for hydropower production in times of emergency as part of the Water Management Plan operating policies.
34. LCRA and Texas Parks and Wildlife Department (TPWD) have entered into a Memorandum of Understanding (MOU), wherein the LCRA and TPWD have agreed that LCRA's Water Management Plan would have a goal of maintaining, and where reasonably possible, improving fish, wildlife, and recreation resources in the Lower Colorado Watershed and of maintaining a proper ecological environment and health of related living marine resources in the Lavaca-Tres Palacios Estuary, to the extent that it is affected by that watershed. Some of the provisions addressed in the MOU have been included in LCRA's Water Management Plan.

35. LCRA and TPWD currently are studying the instream flow issue. These studies are scheduled for completion in March 1991.
36. Until the instream flow studies are complete, LCRA will commit to maintaining a minimum monthly mean flow of 200 cfs throughout the lower basin. This flow may, at times, be satisfied from inflows into the river channel and releases made by LCRA to satisfy the demands of downstream users. To assure that sufficient water will be available to satisfy this instream flow demand, LCRA has allocated 25,000 acre-feet of firm water supply to back up this demand on the system and the demand for inflows into the bays and estuaries.
37. Fresh water inflows are essential to maintenance of the productivity of the bays and estuaries. Preliminary data indicate that the amount of inflows needed for the Lavaca-Tres Palacios Estuary may represent the largest single demand on the system. TPWD and the Texas Water Development Board (TWDB) are currently studying the issue of how much fresh water is necessary to maintain the productivity of the bays and estuaries. The study is scheduled for completion by the end of 1989 with public review scheduled during 1990.
38. Until the bays and estuaries study is completed, LCRA has committed to a minimum monthly mean flow of 200 cfs, a minimum seasonal mean flow of 375 cfs, and a minimum annual flow of 272,121 acre-feet for the bays and estuaries. Measurements are to be made at the USGS gage at Bay City. This flow may at times be satisfied from inflows into the river channel, releases of stored water by LCRA for downstream uses and runoff or tailwaters from the rice irrigation operations. These flows will be backed up with 25,000 acre-feet of firm supply water which is also available for instream flow demands.
39. The Texas Water Development Board (TWDB) and the U.T. Bureau of Economic Geology are currently studying the Carrizo-Wilcox and Gulf Coast Aquifers. LCRA is studying the feasibility of the use of groundwater resources in conjunction with interruptible surface water supplies including the evaluation of artificial recharge of depleted aquifer storage space.
40. Under the existing LCRA Water Pricing Policy the rates for purchasing water must recover the costs associated with the Water Management Plan including necessary funds for water quality and conservation activities.
41. The water to be captured by the Stacy Reservoir are waters that otherwise would have flowed into Lake Buchanan. LCRA determined that the appropriate approach at this time was to calculate the firm yield of the Stacy reservoir separately

from the Highland Lakes, then add it back in, to give the total combined firm yield for Lakes Buchanan and Travis.

42. LCRA used a standard single reservoir operation model to determine the firm yield of the Stacy Reservoir. Inputs to the model included: inflow, net evaporation, monthly water demand distribution, and area/capacity curve for the reservoir.
43. LCRA used a multiple reservoir operations model to determine the combined firm yield of Lakes Buchanan and Travis. User defined local water demands were assumed at each of the reservoirs. Inputs to the model included: inflows, net evaporation, local water demands, monthly water demand distribution, minimum and maximum allowable contents, and area/capacity curves for each reservoir.
44. The period of 1941-1965 was used in the determination of the combined firm yield which includes the worst drought of record encountered.
45. Hydrologic data was related to reservoir inflow. The inflow that actually occurred in the record drought was adjusted to simulate a future time period. The monthly values of inflow to Lakes Buchanan and Travis for the period of January 1940 through December 31, 1972 provided to LCRA by TWC water availability model were adjusted. Under the approach used at this time by LCRA to determine the combined firm yield, the simulated operations of Stacy Reservoir did not pass flow to fulfill downstream senior run-of-the-river water rights.
46. LCRA determined how much water was necessary to satisfy daily water demands at a specific location to the extent that flow is available in the river at that point on that specific day. LCRA found that the average annual unsatisfied demand was 520,657 acre-feet; the maximum annual unsatisfied demand was 674,095 acre-feet; and minimum annual unsatisfied demand was 340,500 acre-feet.
47. LCRA determined that the firm yield of the Stacy Reservoir is 90,546 acre-feet. The combined firm yield of Lakes Buchanan and Travis without inflow from upstream of Stacy Reservoir is 445,266 acre-feet/year. Adding the firm yield of Stacy Reservoir results in the combined firm yield for Lakes Buchanan and Travis of 535,812 acre-feet/year which represents the maximum average annual demand that can be met by these two lakes during a repetition of the most critical drought of record on the lower Colorado River. The combined firm yield may also be expressed as a total of 2,679,060 acre-feet over any five consecutive calendar-year period.

48. LCRA developed a rule curve which defines the ability of Lakes Buchanan and Travis to meet annual demands in excess of the combined firm yield, while reserving an adequate supply to meet firm demands.
49. Starting with the reservoirs full, various demands ranging from .781 million acre-feet to 1.5 million acre-feet were placed on the system for the period. It was found that even at a demand of 1.5 million acre-feet per year 100% of the demand was met in 46% of the years; 75% of the demand was met in 63% of the years; and the amount of .781 million acre-feet was met in 80% of the years.
50. This annual rule curve is considered conservative to the degree that the effect of a critical short-term drought equal to or less severe than historical will be negligible only if total firm demands are less than the combined firm yield.
51. The annual operations rule curve will analyze projected annual demands and based on October 1 lake levels will guarantee the supply of water for firm demands and identify an annual amount of water which may be used for non-firm purposes. It will be modified as firm demands increase, and as hydrologic conditions change in the Colorado River Basin.
52. The operational rule curve will be applied to the system on a monthly basis to determine how the system is responding to current conditions as compared to historical operations. This will allow LCRA to optimize reservoir operations on a real time basis and to determine if adjustments to the amount of interruptible water are necessary. This monthly analysis will help LCRA detect early signs of drought and allow LCRA to timely develop and implement drought contingency measures.
53. The amount of water required to meet the firm demand within the system for the preceding year will be calculated in early October. This amount will be compared to the projections for that year, and any variations will be noted and documented. LCRA will solicit information and projections of use from all of its firm supply contract holders and other firm uses provided for by resolution of the LCRA Board. This information will be used to develop a projection of firm demands for the coming year.
54. LCRA will assess the contents of Lakes Travis and Buchanan as of October 1 to project the storage levels for January 1 of the next year. Inflows into Lakes Travis and Buchanan from the upstream tributaries will be added to this preliminary storage level based on the minimum annual inflow from the period of drought. This process will allow LCRA to reserve sufficient water in the system to meet all firm demands for one year beyond the year being considered for allocations.

Estimates for firm demand commitments for the next year will be subtracted from the total water supply available. The amount of water remaining will then be available for interruptible allocation for that year.

55. In October, LCRA will publish the results of the allocation process, notify the LCRA Board, firm contract holders, the Texas Parks & Wildlife Department and any existing or potential interruptible contract holders. During the October LCRA Board meeting information will be presented to the Board and discussed.
56. The recommended annual allocation plan will be published and LCRA will consider public comments and will take into account any significant water events that may have occurred up to the date of publication. The annual allocation plan will be submitted as a recommendation for LCRA Board approval in November of each year.
57. The portion of the combined firm yield that is not yet committed and the firm uninterruptible water that is committed but not yet being used increases the interruptible water that is available each year. The water that is captured and stored from flood flows also adds to the amount of interruptible water that is available. Over time, as the current contracts draw fully on their commitments and the remainder of the firm yield is contracted for, there will be less interruptible water available on an annual basis.
58. LCRA has committed the following amounts out of the combined firm yield amount:
 - a. Stacy Reservoir - the maximum impact of Stacy Reservoir on the firm yield of Lakes Travis and Buchanan is an average of 90,546 acre-feet per year.
 - b. City of Austin - LCRA has agreed to firm up or supplement Austin's independent water rights to the extent of 290,156 acre-feet per year. A commitment of an average of 148,300 acre-feet per year of stored water is necessary to meet this demand.
 - c. Highland Lakes Water Sale Contracts - municipal and industrial contracts total 104,754 acre-feet per year.
 - d. Cooling Water for LCRA Power Plants - LCRA Board Resolution of January 22, 1987 committed 15,000 acre-feet for Ferguson; 10,750 acre-feet for Sim Gideon and 38,101 acre-feet for Fayette Power Project for a total of 63,851 acre-feet per year.

- e. South Texas Project (STP) - LCRA has a contract to supply industrial water to STP in an amount up to 102,000 acre-feet per year. The commitment is met first by run-of-river water, firmed-up by stored water from Lakes Buchanan and Travis. Simulated operations through the drought of record showed a demand for stored water in one year of 51,700 acre-feet. A commitment of an average of 5,680 acre-feet per year of stored water is necessary to meet this demand.
 - f. Instream Flows and Bay/Estuary Needs - LCRA is also committing (reserving) 25,000 acre-feet out of the combined firm yield to meet instream flows and bay and estuaries' needs.
- 59. LCRA is reserving 50,000 acre-feet of the remaining combined firm yield for future uses under LCRA's certificates of adjudication. This reservation will be until water supply and demand assessments for LCRA's 10-county district are completed or within three years whichever is sooner.
 - 60. The uncommitted balance of the combined firm yield of Lakes Buchanan and Travis is 47,681 acre-feet per year.
 - 61. LCRA is in the process of developing a drought management plan and will be submitting the plan to the Commission in 1990.
 - 62. LCRA is conducting county-by-county assessments of alternative water supply sources. This data will be useful in the development of local drought management plans.
 - 63. The goal of LCRA's conservation programs is to promote the development and application of practices and technologies that will improve water use efficiency, increase the beneficial re-use of water, and minimize the waste of water.
 - 64. LCRA's water conservation programs are directed at the two largest users of water, irrigated agriculture and municipal.
 - 65. LCRA's goal for conservation of water used by irrigated agriculture is to reduce agricultural demands for stored water from the Highland Lakes and reduce costs associated with the operation of LCRA-owned irrigation water delivery systems in Colorado, Wharton and Matagorda Counties.
 - 66. LCRA's current irrigated agriculture conservation programs consist of activities aimed at improving the operating efficiency of irrigation water delivery systems and improving on-farm water use efficiency.
 - 67. The major elements of the irrigation canal rehabilitation program include: improved operational control and management

of the system; vegetation removal and control; improved hydraulics characteristics of canals; installation of water control and measurement structures; and automation of water diversion facilities.

68. The irrigated canal rehabilitation program is expected to reduce water use by 30 percent within the Gulf Coast canal system. Preventive maintenance at Lakeside is expected to maintain canal efficiency.
69. The major elements of the on-farm water conservation program include: Direct support through funding and staff for the Cooperative Rice Water Management Research Program; assistance with the transfer of information from the research arena to the rice producer; conservation demonstrations such as the development and testing of an automated levee gate; and the inclusion of water conservation stipulations in LCRA's standard irrigation water sale contract.
70. Preliminary results indicate that on-farm water use can be reduced by 25 to 30 percent.
71. LCRA's municipal water conservation programs are directed towards implementation of urban water conservation and water re-use. Focus is towards encouraging and supporting local level initiatives by more than 300 public water utility systems within LCRA's statutory district.
72. The five major elements of LCRA's municipal water conservation programs are:
 - a. Direct technical assistance with the development and implementation of local water conservation programs including public awareness and education; water efficiency standards and guidelines for new construction (e.g., plumbing fixture efficiency standards); retrofit programs to improve water efficiency in existing developments; conservation-oriented water rates and other economic incentives; low-water-use landscaping (i.e., Xeriscape); and water re-use and recycling.
 - b. Distribution system audit and leak detection services for local water utilities serving fewer than 10,000 connections.
 - c. Integration of water conservation and re-use measures, as appropriate, with other LCRA programs and projects including LCRA water sale contracts; water resource planning and demand forecasting; water and wastewater utility service studies, projects, and service agreements; water rate design; environmental programs; and energy conservation programs.

- d. Public awareness and education on the water conservation opportunities, benefits, and measures. On-going activities include distribution of brochures, fact sheets, and videos on water conservation; media promotion (e.g., news articles, public service announcements, talk shows, etc.); presentations to civic and service organizations; and workshops, seminars, and special events.
 - e. Demonstrations of advanced water conservation and re-use technologies and low-water-use landscaping techniques.
- 73. LCRA will no later than December 31, 1991 reference and summarize existing information on point and nonpoint pollution sources and loading on the Colorado River including inputs of nutrients, metals, pesticides, oxygen demanding substances and other contaminants that may affect water quality, fish wildlife and recreation resources in accordance with the MOU with TPWD.
 - 74. LCRA will no later than December 31, 1991 identify new data needed to determine the effect of water quality on revision of minimum flow schedule and as soon as reasonably possible will modify its existing monitoring programs or new programs to collect such new data.
 - 75. LCRA is evaluating the potential problems associated with anoxic hypolimnetic releases from reservoirs and the potential for related fish kills due to resulting low dissolved oxygen levels downstream. LCRA will no later than December 31, 1991 reference and summarize this evaluation.
 - 76. LCRA has also applied to the Commission for an amendment to the Certificates of Adjudication Nos. 14-5478 and 14-5482 relating to Lakes Buchanan and Travis.
 - 77. Certificates of Adjudication Nos. 14-5478 (Lake Buchanan) and 14-5482 (Lake Travis) authorize LCRA to divert and use water from Lakes Buchanan and Travis for municipal, industrial, irrigation and mining purposes. LCRA is authorized to use the water impounded in Lakes Buchanan and Travis for recreation purposes with no right of diversion or release. LCRA is authorized to use the bed and banks of the Colorado River, below Lakes Buchanan and Travis to convey water released from Lakes Buchanan and Travis for use by LCRA or others entitled to use such water in the amounts and for the purposes authorized in the Certificates. LCRA is also authorized to divert and use water through Buchanan Dam and Mansfield Dam for the purpose of hydroelectric power generation.
 - 78. The Water Management Plan submitted by LCRA to the Commission for its consideration includes proposed reservoir operating

procedures whereby LCRA will divert or release waters stored in Lakes Buchanan and Travis for several additional purposes of use including domestic, recreation, instream flow and bays/estuary purposes.

79. In order to manage Lakes Buchanan and Travis as proposed in the Water Management Plan, LCRA's Certificates of Adjudication Nos. 14-5478 and 14-5482 need to be amended to authorize LCRA to divert, release and use the water in Lakes Buchanan and Travis for additional beneficial uses including domestic, recreation, instream flow and bay/estuary purposes.
80. As part of these amendments, LCRA is not requesting an additional amount of water. The proposed amendments will not result in an additional consumptive use of state water.
81. A "firm" demand is a contractual obligation or other commitment of LCRA's which must be met 100% of the time through the drought of record. Total firm demands will need to be less than or equal to the combined firm yield to be protected throughout recurrence of the drought of record.
82. Interruptible or "nonfirm" demands are LCRA's contractual obligations or other commitments for stored water which contractually do not have to be met 100% of the time. They will be met to the extent additional water is available each year after firm demands are satisfied.
83. LCRA has formally adopted standard water sale contract forms, and procedures and rules for administering water sale contracts. Existing contracts are written for firm supply of water, subject only to the general laws of availability. A second standard form contract for interruptible supply is presently being developed.
84. LCRA currently has no contracts upstream from the Highland Lakes, except those with upstream reservoirs with junior rights to the Highland Lakes which are more or less operation agreements.
85. Existing upstream operating agreements should be considered firm contracts, and their effect on the combined firm yield should be quantified as was Stacy Reservoir's effect.
86. Junior rights senior to November 1, 1987, will be honored as required by the Court's Judgment and Decree with interruptible supplies. Their diversions will be allocated similar to downstream senior rights.
87. A report which documents LCRA's compliance with the Water Management Plan during the previous year will contain information regarding the adequacy of the hydrologic and

hydraulic data monitoring system as to intensity and accuracy; accuracy of reported or monitored activities; adequacy of the operating rule curve and the adequacy of the daily allocation model and any additional information the Executive Director may request.

88. Under the approach used by LCRA at this time, the combined firm yield of Lakes Buchanan & Travis is 535,812 acre-feet/year. This amount may also be expressed as an average of a total of 2,679,060 acre-feet per year over any five consecutive calendar-year period.
89. LCRA's proposed Water Management Plan does not presently propose any new projects taking, storing or diverting water in excess of 5,000 acre-feet per year.
90. The use of an operational rule curve, as developed by LCRA, is an acceptable approach to insure utilization of the lakes' storage while at the same time guaranteeing that firm demands will be met dependably year after year.
91. LCRA's procedures and guidelines for the allocation of firm water and interruptible water supplies are acceptable, with the understanding that the allocation procedures may be amended at a later time to reflect the results of the instream flow and bay/estuary studies; provided, however, that the Commission shall retain jurisdiction to resolve all disputes regarding allocation of stored water that may arise in the future.
92. LCRA's initiatives regarding point and non-point sources of pollution are commendable.
93. The priorities in LCRA's Water Management Plan for interruptible water are subject to changes after the completion of the studies on the instream flows and bays/estuaries.
94. LCRA's proposed system operations under LCRA's Water Management Plan are consistent with the special conditions set forth in the Court's Final Judgment and Decree regarding LCRA's rights to use the waters of Lakes Buchanan and Travis.

CONCLUSIONS OF LAW

1. The public hearing was held under the authority and in accordance with Chapter 11 of the Texas Water Code, as amended and the Texas Water Commission Permanent Rules.
2. The Texas Water Commission has jurisdiction to consider LCRA's proposed Water Management Plan and applications to amend its Certificates of Adjudication.

3. LCRA's proposed Water Management Plan recognizes the necessity of beneficial inflows from the Colorado River into the Lavaca-Tres Palacios Estuary consistent with Section 11.147 of the Texas Water Code.
4. LCRA's proposed Water Management Plan recognizes the necessity of providing for the protection of fish and wildlife habitats and the water quality of the river as required by Section 11.147 of the Texas Water Code.
5. LCRA's proposed Water Management Plan recognizes the Commission's statutory authority to require water conservation and provides for water conservation consistent with Section 11.134(b)(4) of the Texas Water Code.
6. LCRA's applications to amend its Certificates of Adjudication Nos. 14-5478 and 14-5482 authorizing LCRA to use the waters of Lakes Buchanan and Travis for additional beneficial purposes do not contemplate an additional consumptive use of state water or an increased rate or period of diversion.
7. In order to effectuate the policies of this State relating to the conservation and best utilization of the water resources of this State as set forth in Chapter 11 of the Texas Water Code, LCRA's proposed Water Management Plan should be approved and LCRA's applications to amend Certificates of Adjudication Nos. 14-5478 and 14-5482 should be granted.

NOW, THEREFORE, BE IT ORDERED BY THE TEXAS WATER COMMISSION
THAT:

1. LCRA's proposed Water Management Plan is approved with the following conditions:
 - a. The Water Management Plan shall be subject to the continuing right of supervision of the Commission, and the Commission, on its own motion, may reconsider any element of the plan at any time in the future.
 - b. LCRA's responsibility and authority under the Water Management Plan is limited to operational control of the Highland Lakes and LCRA's facilities downstream, and is limited by the terms of this Order.
 - c. LCRA's responsibility and authority under the Water Management Plan is subject to and shall not conflict with the authority of any watermaster operation the Commission may establish on the Colorado River.
 - d. LCRA shall make available to the Commission all real-time, historical or allocated streamflow data collected by LCRA.

- e. LCRA shall supply interruptible water, in accordance with the provisions and conditions specified in the Final Judgement and Decree, to any downstream water right with a priority date junior to December 1, 1900 and senior to November 1, 1987 that authorizes the diversion of not more than 3000 acre-feet of water per year. Priority shall be given to these water rights in the same manner that LCRA allocates water to the major irrigation operations downstream (Lakeside, Gulf Coast, Garwood and Pierce Ranch).
- f. All sales, agreements or LCRA Board commitments for the use of water in or from the Highland Lakes shall be submitted to the Commission within 45 days of the effective date of the document.
- g. LCRA shall submit a drought contingency plan within one year from the date the Commission signs this order approving the Water Management Plan. Such plan shall be subject to the review and approval of the Commission.
- h. LCRA shall allocate 25,000 acre-feet per annum of its firm water supply to supplement and maintain a minimum monthly mean flow of 200 cfs throughout the lower Colorado River measured at the USGS gage at Bastrop for instream flow purposes and a minimum monthly mean flow of 200 cfs, a minimum seasonal mean flow of 375 cfs and a minimum annual flow of 272,121 acre-feet measured at the USGS gage at Bay City for freshwater inflow to the Lavaca-Tres Palacios estuarine system.
- i. Prior to any diversion of surface water for recharge purposes, LCRA shall obtain the necessary authorizations from the Commission.
- j. LCRA shall prepare and submit to the Commission, on or before March 1 of each year beginning with March 1, 1990, a report which documents compliance with the approved Water Management Plan and any special conditions thereto during the previous year. Such report shall be in a form approved by the Executive Director.
- k. After the instream study by LCRA and TPWD is completed, but in any event no later than March, 1992, LCRA will submit an application to amend its Water Management Plan to reflect the results of the instream flow studies and the studies and evaluations referenced in Findings of fact #73, 74, & 75 above. LCRA shall do all things necessary to ensure that such application is administratively and technically complete within 6 months of submission. The Commission agrees to hold a hearing within one year of the date of LCRA's submission to

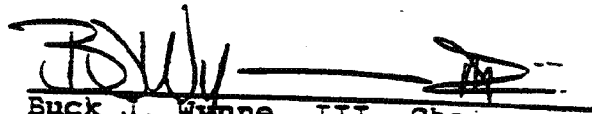
consider the amendments of the Plan, or, if the studies are not complete, to determine why such studies are not complete.

1. After completion of the TWDB and TPWD study on freshwater inflows into the bays and estuaries, as applicable to the Lavaca-Tres Palacios Estuary, and in any event no later than March, 1993, LCRA will submit an application to amend its Water Management Plan to reflect the results of the bays/estuary study. LCRA shall do all things necessary to ensure that such application is administratively and technically complete within 6 months of submission. The Commission agrees to hold a hearing within one year of the date of LCRA's submission to consider the amendments of the Plan, or, if the studies are not complete, to determine why such studies are not complete.
 - m. The combined firm yield as found by the Commission in this Order is subject to adjustment and refinement from time to time as additional studies and simulations are developed that more accurately reflect assumptions and operations as required by law.
 - n. The Commission retains jurisdiction to resolve any and all disputes regarding the allocation of stored water from Lakes Travis and Buchanan, notwithstanding the procedures and guidelines set forth in the Water Management Plan.
2. LCRA's applications to amend Certificates of Adjudication Nos. 14-5478 and 14-5482 are granted with the following conditions:
 - a. LCRA's certificates of adjudication shall reflect the combined annual firm yield of Lakes Travis and Buchanan to be as found by the Commission in this Order, and as may be modified by the Commission from time to time.
 - b. For purposes of perfection, LCRA's authorization to divert, release or use water for recreation purposes is limited to that quantity of water actually sold for that purpose whether used in, or released, or diverted from Lakes Buchanan and Travis.
3. The Chief Clerk of the Texas Water Commission forward a copy of this Order, subject to the filing of motions for rehearing, to all parties.
4. If any provision, sentence, clause or phrase of this Order is for any reason held to be invalid, the invalidity of any portion shall not affect the validity of the remaining portions of the Order.

5. Nothing in the Water Management Plan or this Order shall be construed to impair, or to authorize LCRA or any other person or entity to impair, senior or superior water rights in the Colorado River Basin.

Signed this 20th day of September, 1989.

TEXAS WATER COMMISSION


Buck J. Wynne, III, Chairman

(SEAL)


Brenda W. Foster, Chief Clerk

THE STATE OF TEXAS
COUNTY OF TRAVIS
TEXAS WATER COMMISSION



I hereby certify that this is a true and correct copy of a Texas Water Commission document, the original of which is filed in the permanent records of the Commission.

Given under my hand and the seal of office on
JAN 6 1992

Glenn A. Vannoy
Glenn A. Vannoy, Chief Clerk

BEFORE ME
TEXAS WATER COMMISSION

CONSIDERATION OF THE
LOWER COLORADO RIVER
AUTHORITY'S DROUGHT
MANAGEMENT PLAN

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ORDER APPROVING LOWER COLORADO
RIVER AUTHORITY'S DROUGHT MANAGEMENT PLAN

On the 18th day of December, 1991, the Texas Water Commission ("Commission") held a public hearing to consider the Lower Colorado River Authority's ("LCRA") proposed Drought Management Plan. At the hearing, the following were named as parties: the Lower Colorado River Authority; the Texas Parks and Wildlife Department ("TPWD"); the City of Austin; Garwood Irrigation Company; the Sierra Club, Lone Star Chapter; the Matagorda County Water Council; Houston Lighting and Power Company as Project Manager for the South Texas Project; the Executive Director of the Texas Water Commission; and the Public Interest Counsel of the Texas Water Commission. Having considered the proposed agreed order of the parties, the Commission makes the following Findings of Fact and Conclusions of Law:

FINDINGS OF FACT

1. Notice of the public hearing was published on October 10, 1991 in the Blanco County Record Courier, a newspaper regularly published and generally circulated in Blanco County, Texas; October 9, 1991 in the Austin American-Statesman, a newspaper regularly published and generally circulated in Travis County, Texas; on October 9, 1991 in the Colorado County Citizen, a newspaper regularly published and generally circulated in Colorado County, Texas; on October 10, 1991 in the San Saba News and Star, a newspaper regularly published and generally circulated in San Saba County, Texas; on October 10, 1991 in the Llano News, a newspaper regularly published and generally circulated in Llano County, Texas; on October 10, 1991 in the Highlander, a newspaper regularly published and generally circulated in Burnet County, Texas; on October 10, 1991 in the Bay City Daily Tribune, a newspaper regularly published and generally circulated in Matagorda County, Texas; on October 8, 1991 in the Fayette County Record, a newspaper regularly published and generally circulated in Fayette County, Texas; on October 5, 1991 in the El Campo Leader-News, a newspaper regularly published and generally circulated in Wharton County, Texas; and on October 7, 1991 in the Bastrop Advertiser, a newspaper regularly published and generally circulated in Bastrop County, Texas. These ten counties are

the only counties in which persons reside who may be affected by action taken as result of the hearing. Said notice was published not less than thirty (30) days before the date of the hearing.

2. On September 26, 1991, notice of the public hearing was sent by first-class mail to persons who may be affected by action taken as a result of the hearing and to each person as required by law.
3. LCRA is requesting approval of its Drought Management Plan for the Lower Colorado River, Colorado River Basin, in accordance with the Commission's September 7, 1989 Order approving LCRA's Water Management Plan and amending Certificates of Adjudication Nos. 14-5478 and 14-5482. LCRA's Water Management Plan was developed and submitted by LCRA in accordance with the Final Judgment and Decree entered by the court in Cause No. 115,414 A-1, 264th Judicial District, In Re: The Exceptions of the Lower Colorado River Authority and the City of Austin to the Adjudication of Water Rights in the Lower Colorado River Segment of the Colorado River Basin.
4. LCRA's proposed Drought Management Plan was filed with the Commission on October 19, 1990.
5. LCRA's procedures and guidelines set forth in the Water Management Plan and the Drought Management Plan for the allocation of firm water and interruptible water supplies are acceptable as conditioned by the provisions of this Agreed Order and with the understanding that the allocation procedures may be amended by the Commission at a later time for any justifiable reason including, but not limited to, an amendment to reflect the results of the instream flow and bay and estuary studies; provided, however, that the Commission shall retain jurisdiction to resolve all disputes regarding allocation of stored water that may arise in the future.
6. The priorities in LCRA's Water Management Plan and Drought Management Plan for interruptible water are subject to change after the completion of the studies on the instream flows and bays and estuaries required by conditions (k) and (l) of the September 7, 1989 Order.
7. Because of the water-availability and water-demand conditions that presently exist, it appears that 25,000 acre-feet of stored water per year probably will be adequate in the near future to firm up the minimum flows for instream flows and bays and estuaries set forth in condition (h) of the Commission's September 7, 1989 Order. Pursuant to conditions (k) and (l) of the Commission's September 7, 1989 Order, LCRA is required to submit applications to amend the Water Management Plan and the Drought Management Plan following completion of studies on instream flows and bays and estuaries

required by March 1992, and March 1993, respectively. Accordingly, it is unnecessary for the Commission to determine at this time whether the Commission, by its September 7, 1989 Order or otherwise, intended to give LCRA the authority or impose upon it the obligation to release more than 25,000 acre-feet of stored water in any one year to firm up those minimum flows.

8. Based on available studies and information, it is uncertain whether LCRA's proposed plan to begin curtailment of interruptible stored water supplies at a January 1 trigger level of 1.4 million acre-feet of water in storage is appropriate, in that it may provide more protection to firm supplies of stored water than is necessary. However, because of the water-availability and water-demand conditions that presently exist, it is likely that such level will not be reached in the near future. Accordingly, it is unnecessary for the Commission to determine at this time whether, or to what extent, such trigger level provides more protection to firm supplies than is necessary.
9. LCRA asserts that nothing in the Drought Management Plan should be construed to modify or impair in any way any contractual obligation of LCRA to supply water.

CONCLUSIONS OF LAW

1. The public hearing was held under the authority and in accordance with Chapter 11 of the Texas Water Code, as amended and the Texas Water Commission Permanent Rules.
2. The Texas Water Commission has jurisdiction to consider and take action on LCRA's proposed Drought Management Plan.
3. It is unnecessary at this time to determine whether the Commission, by its September 7, 1989 Order or otherwise intended to give LCRA the authority or impose upon it the obligation to release more than 25,000 acre-feet of stored water in any one year for instream flows and bays and estuaries. By approving the Drought Management Plan and entering this Order, the Commission specifically is not deciding these issues.

NOW, THEREFORE, BE IT ORDERED BY THE TEXAS WATER COMMISSION.
THAT:

1. LCRA's proposed Drought Management Plan is approved with the following conditions:
 - a. LCRA's Drought Management Plan is subject to LCRA's Water Management Plan and all findings, conclusions and conditions contained within the Commission's September 7, 1989 Order approving the Water

Management Plan including, without limitation, any findings, conclusions and conditions contained in this Order that are also contained within the September 7, 1989 Order.

- b. The Drought Management Plan shall be subject to the continuing right of supervision of the Commission, and the Commission, on its own motion, may reconsider any element of the plan at any time in the future.
- c. LCRA's responsibility and authority under the Drought Management Plan is limited to operational control of the Highland Lakes and LCRA's facilities downstream, and is limited by the terms of this Order and the Commission's September 7, 1989 Order.
- d. LCRA is required to pass all inflows to the Highland Lakes to the extent necessary to satisfy the demands of all downstream senior rights, and nothing in the Drought Management Plan or this order shall be construed to modify or impair this obligation.
- e. LCRA shall prepare and submit to the Commission, on or before March 1 of each year beginning with March 1, 1992, a report which documents compliance with the approved Drought Management Plan and any special conditions thereto during the previous year. Such report shall be in a form approved by the Executive Director.
- f. After the instream study by LCRA and TPWD is completed, but in any event not later than March, 1992, LCRA shall submit an application to amend its Water Management Plan and its Drought Management Plan to reflect the results of the instream flow studies and the studies and evaluations referenced in Findings of Fact Nos. 73, 74, and 75 of the Commission's September 7, 1989 Order. Such application shall also propose conditions for implementing or cancelling the declaration of a drought to be worse than the drought of record. LCRA shall do all things necessary to ensure that such application is administratively and technically complete within six months of submission. The Commission agrees to hold a hearing within one year of the date of LCRA's submission to consider the amendments of the Plans, or if the studies are not complete, to determine why such studies are not complete.

- g. After completion of the Texas Water Development Board ("TWDB") and TPWD study on freshwater inflows into the bays and estuaries, as applicable to the Lavaca-Tres Palacios Estuary, and in any event not later than March, 1993, LCRA shall submit an application to amend its Water Management Plan and its Drought Management Plan to reflect the results of the bays/estuary study. LCRA shall do all things necessary to ensure that such application is administratively and technically complete within six months of submission. The Commission agrees to hold a hearing within one year of the date of LCRA's submission to consider the amendments of the Plans, or, if the studies are not complete, to determine why such studies are not complete.
 - h. The combined firm yield as found by the Commission in Finding of Fact No. 47 of its September 7, 1989 Order is subject to adjustment and refinement from time to time as additional studies and simulations are developed that more accurately reflect assumptions and operations as required by law.
 - i. LCRA's proposed plan to begin curtailment of interruptible stored water at a January 1 trigger level of 1.4 million acre-feet of water in storage, and other aspects of LCRA's proposed curtailment plan, are subject to adjustment from time to time as additional studies and simulations may be developed that more accurately address the need to curtail interruptible supplies.
 - j. The Commission retains jurisdiction to resolve any and all disputes regarding the allocation of stored water from Lakes Travis and Buchanan, notwithstanding the procedures and guidelines set forth in the Water Management Plan and/or the Drought Management Plan.
2. The Chief Clerk of the Texas Water Commission shall forward a copy of this Order subject to the filing of motions for rehearing, to all parties.
 3. If any provision, sentence, clause or phrase of this Order is for any reason held to be invalid, the invalidity of any portion shall not affect the validity of the remaining portions of the Order.
 4. Nothing in the Drought Management Plan or this Order shall be construed to impair, or to authorize LCRA or any other person or entity to impair, senior or superior water rights in the Colorado River Basin.

Issued: DEC 23 1991

TEXAS WATER COMMISSION


John Hall, Chairman

ATTEST:


Gloria A. Vasquez, Chief Clerk

THE STATE OF TEXAS
COUNTY OF _____
TEXAS WATER COMMISSION

I hereby certify that this is a true and correct copy of a
Texas Water Commission document which is filed in the
permanent records of the Commission.
Witness my hand and the seal of office on



JAN 11 1993

CONSIDERATION OF THE
LOWER COLORADO RIVER AUTHORITY'S
APPLICATION TO AMEND ITS
WATER MANAGEMENT PLAN AND
DROUGHT MANAGEMENT PLAN

BEFORE THE Honorable Gloria A. Vasquez, Chief Clerk
TEXAS WATER COMMISSION

AGREED ORDER APPROVING AMENDMENTS TO LOWER COLORADO
RIVER AUTHORITY'S WATER MANAGEMENT
PLAN AND DROUGHT MANAGEMENT PLAN

On the 2nd day of December, 1992, the Texas Water Commission
("Commission") considered the Lower Colorado River Authority's
("LCRA") application to amend its Water Management Plan and Drought
Management Plan, and having heard evidence and arguments concerning
the proposed order, the Commission makes the following Findings of
Fact and Conclusions of Law:

Findings of Fact

- 1) Notice of the public hearing was published on September 3,
1992, in the Johnson City Record-Courier, a newspaper
regularly published and generally circulated in Blanco County,
Texas; on August 23, 1992 in the Austin American-Statesman, a
newspaper regularly published and generally circulated in
Travis County, Texas; on August 26, 1992 in the Colorado
County Citizen, a newspaper regularly published and generally
circulated in Colorado County, Texas; on August 27, 1992 in
the San Saba News & Star, a newspaper regularly published and
generally circulated in San Saba County, Texas; on September
3, 1992 in the Llano News, a newspaper regularly published and
generally circulated in Llano County, Texas; on August 27,
1992 in the Marble Falls Highlander, a newspaper regularly
published and generally circulated in Burnet County, Texas; on

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August 25, 1992 in the Bay City Daily Tribune, a newspaper regularly published and generally circulated in Matagorda County, Texas; on August 25, 1992 in the Fayette County Record, a newspaper regularly published and generally circulated in Fayette County, Texas; on August 22, 1992 in the El Campo Leader-News, a newspaper regularly published and generally circulated in Wharton County, Texas; and on August 27, 1992 in the Bastrop Advertiser, a newspaper regularly published and generally circulated in Bastrop County, Texas. These ten counties are the only counties in which persons reside who may be affected by action taken as a result of the hearing. Said notice was published not less than thirty (30) days before the date of the hearing.

- 2) On August 11, 1992, notice of the public hearing was sent by first-class mail to persons who may be affected by action taken as a result of the hearing and to each person as required by law.
- 3) LCRA's Application to Amend its Water Management Plan and Drought Management Plan ("Application") was received by the Commission on May 29, 1992 and July 15, 1992.
- 4) LCRA's Application was accepted by the Commission as administratively complete on July 23, 1992.
- 5) The Lake Travis Chamber of Commerce requested LCRA to amend its Water Management Plan to change the trigger level of Lake Travis from 660 feet msl to 667 feet msl; to limit new interruptible water contracts to the volume of water saved in the rice irrigation conservation program; and to revise the description of the lake's economy.
- 6) In response to the request by the Lake Travis Chamber of Commerce, LCRA proposes to amend the Water Management Plan to

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eliminate the trigger levels of 660 feet msl for Lake Travis and 1012 feet msl for Lake Buchanan; to limit sales of interruptible stored water, other than for the four major irrigation districts' Conservation Base or Priority Allocation acreage, based on the projected volume of water in Lakes Buchanan and Travis as of January 1, of each year. No such sales would occur if either lake is less than 94% of its maximum conservation capacity. If both lakes are projected to be at their maximum conservation capacity on January 1, then such interruptible water sales would be limited to a total of 80,000 acre-feet for that year. For projected lake volumes between 94% and 100% of the conservation capacity, such interruptible water sales would be limited proportionately, based on the storage reservoir with the lowest projected percentage of capacity on January 1. LCRA also proposes to increase the Conservation Base acreage for the Gulf Coast Irrigation Division from 37,000 acres to 50,000 acres and set the Priority Allocation acreage for Pierce Ranch at 10,476 acres.

- 7) LCRA's Drought Management Plan presently allows for the cancellation of curtailments of interruptible stored water to the four major irrigation districts if the combined storage of Lakes Buchanan and Travis is at least 1.4 million acre-feet on July 1.
- 8) LCRA proposes to amend LCRA's Drought Management Plan to provide that curtailment of interruptible stored water for the four major irrigation districts may be cancelled at any time during the year prior to July 31. The criteria for cancelling the curtailments is that the combined storage of Lakes Buchanan and Travis is projected to be equal to or greater than 1.4 million acre-feet of water anytime in July.

- 9) LCRA's Water Management Plan presently allows LCRA to reserve 50,000 acre-feet of the remaining combined firm yield of Lakes Buchanan and Travis for future uses under LCRA's certificates of adjudication. This reservation will be until water supply and demand assessments for LCRA's 10-county statutory district are completed or within three years, whichever is sooner.
- 10) LCRA has completed the water supply and demand assessments for its 10-county statutory district. The results of these studies indicate new surface water demands of approximately 39,000 acre-feet annually by the year 2013.
- 11) LCRA is presently in the process of updating these water supply and demand assessments to include the results of the 1990 federal census. To allow LCRA additional time to complete such updated assessments, it is reasonable to allow LCRA to continue to reserve 50,000 acre-feet of the remaining combined firm yield of Lakes Buchanan and Travis for future uses under its certificate of adjudication, through December 31, 1993.
- 12) The Commission's September 7, 1989 Order approving LCRA's Water Management Plan, directed LCRA in accordance with Findings of Fact No. 73, 74, and 75, to reference and summarize information on point and non-point pollution sources and loading on the Colorado River, identify new data needed to determine water quality effects on revision of the minimum flow schedule, and evaluate potential problems associated with anoxic hypolimnetic releases from reservoirs and the potential for related fish kills due to resulting low dissolved oxygen levels downstream. LCRA has completed these studies and evaluations. The instream flow schedule set forth in this Agreed Order was developed in response to those studies and evaluations.

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- 13) The Commission's December 23, 1991 Order approving LCRA's Drought Management Plan directed LCRA to propose conditions for implementing and cancelling a declaration of a drought worse than the drought of record.
- 14) LCRA proposes that its Drought Management Plan be amended to provide that the LCRA Board of Directors will declare a drought worse than the drought of record when the following three conditions are simultaneously met:
 - (a) drought at least 36 consecutive months (36 months since both Lakes Buchanan and Travis were last full); and
 - (b) the cumulative inflow deficit since the beginning of the drought exceeds the envelope curve for cumulative inflow deficits by at least 5% for six consecutive months; and
 - (c) the combined storage of Lakes Buchanan and Travis is less than 600,000 acre-feet.

The LCRA Board of Directors will cancel such a declaration if any of the following conditions are met:

- (d) the cumulative inflow deficit since the beginning of the drought is less than the envelope curve for cumulative inflow deficits by at least 5% for six consecutive months; or
 - (e) the combined storage in Lakes Buchanan and Travis is greater than 1.4 million acre-feet of water.
- 15) LCRA and TPWD have completed their instream flow needs study for the lower Colorado River. Based upon this study LCRA proposes that LCRA's Water Management Plan and Drought Management Plan be amended as follows:

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- (a) LCRA's existing commitment of 25,000 acre-feet of firm yield water supply, to supplement and maintain instream flows, be increased to an average of 31,800 acre-feet annually during any 10 consecutive year period.
 - (b) LCRA will maintain the daily river flows below the City of Austin's Longhorn Dam at no less than the subsistence/critical flows in all years.
 - (c) When the combined storage of Lakes Buchanan and Travis is projected to be above 1.4 million acre-feet of water on January 1, or if interruptible stored water curtailments are cancelled, LCRA will maintain during that calendar year or portion thereof target flows to the extent of inflows each day to the Highland Lakes as measured by upstream gages.
 - (d) Interruptible water contracts will be totally cutoff when the minimum January 1 storage of Lakes Buchanan and Travis is at or below 325,000 acre-feet of water.
- 16) The schedule of instream flows for the Colorado River downstream of the City of Austin's Longhorn Dam is as follows:

Subsistence/
Critical Flows (cfs) Target Flows (cfs)

Month	Austin	Bastrop	Bastrop	Eagle Lake	Egypt
January	46 ^c	120	370	300	240
February	46 ^c	120	430	340	280
March	46 ^c	500 ^b	560	500 ^a	360
April	46 ^c	500 ^b	600	500 ^a	390
May	46 ^c	500 ^b	1030	820	670
June	46 ^c	120	830	660	540
July	46 ^c	120	370	300	240
August	46 ^c	120	240	200	160
September	46 ^c	120	400	320	260
October	46 ^c	120	470	380	310
November	46 ^c	120	370	290	240
December	46 ^c	120	340	270	220

* Since target flow at Eagle Lake (based on overall community habitat availability) were insufficient to meet Blue Sucker (*Cycleptus elongatus*) spawning requirements during March and April target flows were superseded by critical flow recommendations for this reach.

^b This flow should be maintained for a continuous period of not less than six weeks during these months. A flow of 120 cfs will be maintained on all days not within the six week period.

^c LCRA will maintain a mean daily flow of 100 cfs at the Austin gage at all times, to the extent of inflows each day to the Highland Lakes as measured by upstream gages, until the combined storage of Lakes Buchanan and Travis reaches 1.4 million acre-feet of water. A mean daily flow of 75 cfs, to the extent of inflows each day to the Highland Lakes as measured by upstream gages, will

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then be maintained until the combined storage of Lakes Buchanan and Travis reaches 1.0 million acre-feet of water. When the combined storage of Lakes Buchanan and Travis is reduced below 1.0 million acre-feet of water, then a subsistence/critical flow of 46 cfs will be maintained at all times regardless of inflows.

In addition, if the subsistence/critical flow of 46 cfs should occur for an extended period of time, then operational releases will be made by LCRA to temporarily alleviate the subsistence/critical flow conditions. Specifically, should the flow at the Austin gage be below a 65 cfs daily average for a period of 21 consecutive days, LCRA will make operational releases from storage sufficient to maintain daily average flow at the Austin gage of at least 200 cfs for two consecutive days. If this operational release condition persists for three consecutive cycles (69 days), then a minimum average daily flow of at least 75 cfs will be maintained for the next 30 days.

- 17) The priorities in LCRA's Water Management Plan and Drought Management Plan for use of interruptible water are subject to change after the completion of the studies on bay and estuary inflows referenced in condition (1) of the September 7, 1989 Order Approving LCRA's Water Management Plan.
- 18) Until such time that the Commission amends the requirement for freshwater inflows into the Lavaca Tres-Palacios Estuary as a result of the completion of the Texas Water Development Board and Texas Parks and Wildlife Department study on freshwater inflows LCRA shall continue to maintain a minimum monthly mean flow of 200 cfs, a minimum seasonal mean flow of 375 cfs and a minimum annual flow of 272,121 acre-feet measured at the USGS gage at Bay City for freshwater inflow to the Lavaca-Tres Palacios estuarine system.

Conclusions of Law

- 1) The Commission considered this Agreed Order under the authority and in accordance with Chapter 11 of the Texas Water Code, as amended and 31 Texas Administrative Code ("TAC") § 295 et. al.
- 2) The Texas Water Commission has jurisdiction to consider and take action on LCRA's application to amend its Water Management Plan and Drought Management Plan.

NOW, THEREFORE, BE IT ORDERED BY THE TEXAS WATER COMMISSION THAT:

- 1) LCRA's proposed amended Water Management Plan and Drought Management Plan are approved with the following conditions:
 - a) LCRA's amended Water Management Plan is subject to all findings, conclusions, and conditions contained in the Commission's September 7, 1989 Order approving the Plan, except to the extent specifically provided otherwise by this Agreed Order.
 - b) LCRA's amended Drought Management Plan is subject to all findings, conclusions, and conditions, contained in the Commission's December 23, 1991 Order approving the Plan, except to the extent specifically provided otherwise by this Agreed Order.
 - c) Nothing in this Agreed Order shall be construed to impair any party's right to contest or seek clarification of, at anytime, any issue in connection with LCRA's Water Management Plan and Drought Management Plan. The Commission takes notice that the Sierra Club has contested the issue of priority of use of interruptible water and that contest has been remanded for hearing.

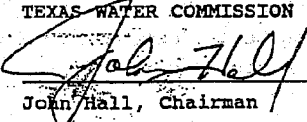
- 9 -

Nothing in this Agreed Order shall be construed as deciding that issue. Furthermore, if in that hearing, the priority of use for interruptible water, as it relates to instream flows, is determined by the Commission to be different than that set forth in those Plans, any party shall have the express right to reopen the issue of instream flow requirements by submitting a written request for hearing to the Office of Hearings Examiners.

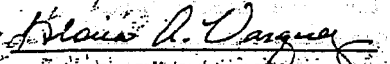
- 2) The Chief Clerk of the Texas Water Commission shall forward a copy of this Agreed Order subject to the filing of motions for rehearing, to all parties.
- 3) If any part of this Agreed Order is for any reason held to be invalid, the invalidity of any portion shall not affect the validity of the remainder of the Agreed Order.
- 4) Nothing in LCRA's Water Management Plan and Drought Management Plan or this Agreed Order shall be construed to impair, or to authorize LCRA or any other person or entity to impair, senior or superior water rights in the Colorado River Basin.

ISSUED: DEC 18 1992

TEXAS WATER COMMISSION


John Hall, Chairman

ATTEST:


Gloria A. Vasquez, Chief Clerk

BW12/05

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TEXAS NATURAL RESOURCE CONSERVATION COMMISSION



THE STATE OF TEXAS
COUNTY OF TRAVIS
I hereby certify that this is a true and correct copy of a Texas Natural
Resource Conservation Commission document, which is filed in the
permanent records of the Commission.
Given under my hand and the seal of office on

Debra A. Cantelmo MAR 04 1999

DOCKET NO. 98-1387-WR

La Donna Cantelmo, Chief Clerk
Texas Natural Resource
Conservation Commission

CONSIDERATION OF THE
LOWER COLORADO RIVER AUTHORITY'S
APPLICATION TO AMEND ITS WATER
MANAGEMENT PLAN INCLUDING ITS
DROUGHT MANAGEMENT
PLAN

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BEFORE THE
TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION

ORDER APPROVING AMENDMENTS TO LOWER COLORADO RIVER AUTHORITY'S WATER MANAGEMENT PLAN INCLUDING ITS DROUGHT MANAGEMENT PLAN

On the 24th day of February, 1999, the Texas Natural Resource Conservation Commission ("Commission") considered the Lower Colorado River Authority's ("LCRA") application to amend its Water Management Plan including its amended Drought Management Plan ("WMP"), and having heard evidence and arguments concerning the proposed order, the Commission makes the following Findings of Fact and Conclusions of Law:

Findings of Fact

- 1) Notice of the public comment meeting and notice of the Commission's Agenda Date on proposed amendments to LCRA's WMP was published on December 17, 1998, in the Johnson City Record-Courier, a newspaper regularly published and generally circulated in Blanco County, Texas; on December 18, 1998 in the Austin American-Statesman, a newspaper regularly published and generally circulated in Travis County, Texas; on December 23, 1998 in the Colorado County Citizen, a newspaper regularly published and

generally circulated in Colorado County, Texas; on December 17, 1998 in the San Saba News & Star, a newspaper regularly published and generally circulated in San Saba County, Texas; on December 17 and 24, 1998 in the Llano News, a newspaper regularly published and generally circulated in Llano County, Texas; on December 18, 1998 in the Marble Falls Highlander, a newspaper regularly published and generally circulated in Burnet County, Texas; on December 20, 1998 in the Bay City Daily Tribune, a newspaper regularly published and generally circulated in Matagorda County, Texas; on December 18, 1998 in the Fayette County Record, a newspaper regularly published and generally circulated in Fayette County, Texas; on December 19, 1998 in the El Campo Leader-News, a newspaper regularly published and generally circulated in Wharton County, Texas; and on December 19, 1998 in the Bastrop Advertiser, a newspaper regularly published and generally circulated in Bastrop County, Texas. These ten counties are the only counties in which persons reside who may be affected by action taken by the Commission on the proposal amendments. Said notice was published not less than thirty (30) days before the Commission's Agenda Date.

- 2) On December 16, 1998, notice of the public comment meeting and the Commission's Agenda Date was sent by first-class mail to persons who may be affected by action taken by the Commission and to each person as required by law.
- 3) By Commission order of September 20, 1989, the Commission conditionally approved LCRA's WMP. By Commission order of December 23, 1991, the Commission conditionally approved LCRA's Drought Management Plan, which is included as part of LCRA's WMP. Amendments to the plans were conditionally approved by Commission agreed order of December 18, 1992. These prior orders of the Commission required LCRA to submit an application to amend its WMP to reflect the results of a bay/estuary study to be completed

by Texas Water Development Board (TWDB) and Texas Parks & Wildlife Department (TPWD). In 1993, LCRA, TWDB, TPWD, and TNRCC entered into a cooperative agreement to complete the study. The study was completed in 1997 and LCRA filed its proposed amendments to the WMP to reflect the results of the study.

- 4) LCRA's application to Amend its WMP including its Drought Management Plan ("Application") was received by the Commission on May 29, 1997; addenda were received December 29, 1997 and September 29, 1998.
- 5) LCRA's Application was accepted by the Commission as administratively complete on November 13, 1998.
- 6) On January 5, 1999 the Commission held a public comment meeting. One person presented oral comments, which were not in opposition to the proposed amendments. No written public comments were provided by any person.
- 7) No protests and no requests for a contested case hearing have been filed with the Commission regarding the proposed amendments.
- 8) LCRA's WMP currently requires LCRA to meet an interim freshwater inflow need to the Lavaca-Tres Palacios Estuary, also known as the Lavaca-Colorado Estuary or the Matagorda Bay System of 272,000 acre-feet annually, as measured at the USGS Bay City gage.
- 9) LCRA's proposed amendments to the WMP would require LCRA to:
 - (a) release monthly inflows otherwise available for storage in the Highland Lakes to meet monthly target freshwater inflow needs of the Matagorda Bay System totaling 1.03 million acre-feet per year, as measured at the USGS Bay City gage, if January 1 storage levels in Lakes Travis and Buchanan combined is greater than 1.7 million acre-feet;

- (b) release monthly inflows otherwise available for storage in the Highland Lakes to meet monthly critical freshwater inflow needs of the Matagorda Bay System totaling 171,100 acre-feet per year, as measured at the USGS Bay City gage, in all years; and
 - (c) stored water releases will be a combination of firm and interruptible stored water supplies. Firm water will be supplied in years when the four major irrigation districts' stored water supplies are curtailed. Interruptible stored water will be supplied in all other years.
- 10) LCRA's WMP currently requires LCRA to use up to a maximum of 318,000 acre-feet of firm stored water over any ten (10) consecutive years for instream flows and freshwater inflow needs of the Matagorda Bay System. The WMP currently provides for a total commitment of 31,800 acre-feet per year from the Combined Firm Yield of Lakes Travis and Buchanan for instream flows and freshwater inflow needs of the Matagorda Bay System.
- 11) LCRA's proposed amendments to the WMP are as follows:
- (a) total commitments of the Combined Firm Yield from the Highland Lakes for instream flow maintenance will be an average of 12,860 acre-feet per year, with a maximum of 36,720 acre-feet in any one year; 58,700 acre-feet in any two consecutive years; 76,800 acre-feet in any three or four consecutive years; 106,100 acre-feet in any five consecutive years and 128,600 acre-feet in any six to ten consecutive years. Total commitments of the Combined Firm Yield from the Highland Lakes for freshwater inflows to the Matagorda Bay System will be an average of 3,090 acre-feet per year, with a maximum of 11,200 acre-feet in any one year; 19,700 in any two consecutive years; 24,200 acre-feet in any three or four consecutive years; 28,200 acre-feet in any five consecutive years and 30,900 acre-

feet in any six to ten consecutive years. The total firm stored water commitment for both purposes will be an average of 15,950 acre-feet per year. Estimated interruptible stored water supplied during the critical drought for both purposes will be an average of an additional 40,060 acre-feet per year.

- 12) Currently under the WMP the LCRA Board of Directors will declare a drought worse than the drought of record when three (3) conditions are simultaneously met. First, a drought of at least 36 consecutive months since both Lakes Travis and Buchanan were last full. Second, the cumulative inflow deficit since the beginning of the drought exceeds the envelope curve for cumulative inflow deficits by at least 5% for six consecutive months. Third, the combined storage of Lakes Travis and Buchanan is less than 600,000 acre-feet.
- 13) Because of the severity of the 1996 drought LCRA proposes the following amendments to the WMP:
 - (a) reduce the 36 month minimum to 24 months;
 - (b) curtailments of interruptible stored water due solely to the declaration of a drought to be worse than drought of record of less than 36 months in duration is only effective on the following January 1 or July 31, whichever occurs first following the declaration by the LCRA Board of Directors. Droughts more than 36 months in length have no restrictions as to when supply reductions can be implemented;
 - (c) prior to implementing curtailment of firm water supplies during droughts worse than drought of record, LCRA will meet with its firm water customers and develop a specific stored water curtailment plan approved by the LCRA Board of Directors and the Commission.

- (d) Such a declaration will be canceled when the combined storage in Lakes Travis and Buchanan is greater than 1.1 million acre-feet of water, which is simply the recommended threshold for curtailment of interruptible water during a repetition of the drought of record. Prior to declaring a drought worse than the drought of record, the LCRA will re-evaluate this threshold level to determine if a more accurate cancellation storage level in lieu of 1.1 million acre-feet can be determined.
- 14) LCRA's WMP currently states that the storage level for initial curtailment of interruptible stored water for the four (4) major irrigation districts (Lakeside, Gulf Coast, Garwood and Pierce Ranch) will commence when the combined storage in Lakes Travis and Buchanan is less than or equal to 1.4 million acre-feet projected on January 1.
 - 15) LCRA's proposed amendment reduces the combined storage level from 1.4 to 1.1 million acre-feet projected on January 1.
 - 16) LCRA's WMP currently provides that the allocation of interruptible stored water to users other than the four (4) major irrigation districts is made annually based on projected January 1 storage levels in Lakes Travis and Buchanan taken separately. The maximum supply of interruptible stored water available currently under the WMP is 80,000 acre-feet per year.
 - 17) LCRA's proposed amendments will change the allocation of interruptible stored water to users other than the four (4) major irrigation districts to a semiannual allocation as follows:
 - (a) the supply for January through June is based on January 1 storage levels in Lakes Travis and Buchanan taken separately;
 - (b) the supply for July through December is based on the minimum of the maximum storage levels in April, May and June in Lakes Travis and Buchanan taken separately.

- (c) maximum supply available under LCRA's proposed amendments is 30,000 acre-feet per year.
- 18) LCRA's WMP currently provides that the LCRA Board of Directors has committed to reserving 50,000 acre feet of the remaining Combined Firm Yield of the Highland Lakes through December 31, 1993 for future uses within LCRA's service area.
- 19) LCRA's proposed amendment is to reserve 50,000 acre-feet of water of the remaining Combined Firm Yield of the Highland Lakes for future uses within LCRA's service area indefinitely, as reflected in current LCRA Board of Directors policy.
- 20) On March 29, 1996 the Commission issued its Order severing a portion of the water rights authorized by Certificate No. 14-2564 (Hudson et ux) and combining it with all of the water rights authorized by LCRA's Certificate No. 14-5478, (Lake Buchanan) as amended. Certificate No. 14-5478C was issued to LCRA on the same date and authorizes LCRA to transfer downstream 532 acre-feet of water for use by LCRA out of Lake Buchanan with consumption use limited to 500 acre-feet per year.
- 21) Because the priority date of the water severed from Certificate No. 14-2564 and purchased by LCRA is 1929, senior to the 1938 Lake Buchanan priority date, LCRA is requesting that the WMP be amended to reflect an increase of 500 acre-feet in the Combined Firm Yield of Lakes Buchanan and Travis from 535,812 acre-feet to 536,312 acre-feet.
- 22) On June 2, 1997, the Commission issued its Order severing the water rights authorized by Certificate No. 14-5477B from Certificate No. 14-5477(Pierce Ranch), as amended, and combined it with LCRA's water rights authorized by Certificate No. 14-5475. (LCRA's Lakeside Irrigation Service Area)
- 23) LCRA proposed amendments to the WMP reflect the Commission's June 2, 1997 Order.

- 24) LCRA is proposing throughout the current WMP several non-substantive amendments to reflect factual changes that have occurred during the period 1993-1997 relating to water demands, both actual and projected; changes to models; operations procedures; LCRA Board Policy and general background information. All of these proposed non-substantive amendments to the current WMP are detailed in mark-ups of the current WMP dated May 28, 1997, December 29, 1997 and September 29, 1998 that have been filed with the Commission by the LCRA.

CONCLUSIONS OF LAW

- 1) The Commission considered this Order under the authority and in accordance with Chapter 11 of the Texas Water Code, as amended, and 30 Texas Administrative Code ("TAC") § 295 et. al.
- 2) The Commission has jurisdiction to consider and take action on LCRA's application to amend its Water Management Plan.

NOW, THEREFORE, BE IT ORDERED BY THE TEXAS NATURAL CONSERVATION COMMISSION THAT:

- 1) LCRA's proposed amended Water Management Plan, which includes LCRA's amended Drought Management Plan as reflected in LCRA's detailed mark-ups of the current WMP dated May 28, 1997, December 29, 1997 and September 29, 1998, is approved with the following conditions:
 - a) LCRA's amended Water Management Plan is subject to all findings, conclusions, and conditions contained in the Commission's September 20, 1989 Order approving the Plan, except to the extent specifically provided otherwise by this Order.
 - b) LCRA's amended Drought Management Plan is subject to all findings, conclusions, and conditions, contained in the Commission's December 23, 1991 Order approving the Plan, except to the extent specifically provided otherwise by this Order.
 - c) LCRA's amended Water Management Plan, including LCRA's amended Drought Management Plan, is subject to all findings, conclusions, and conditions contained

in the Commission's December 18, 1992 Agreed Order approving amendments to the Plans, except to the extent specifically provided otherwise by this Order.


- d) Any party shall have the right, at any time, to petition the Commission to seek to amend or clarify any issue in connection with LCRA's amended Water Management Plan, which includes LCRA's amended Drought Management Plan. Nothing in this Order shall be construed to impair any party's right to contest or seek clarification of, at anytime, any issue in connection with LCRA's amended Water Management Plan, which includes LCRA's amended Drought Management Plan.
 - e) The Commission takes notice that in 1993 the Sierra Club contested the issue of priority of use of interruptible water and that contest has been remanded to the State Office of Administrative Hearings ("SOAH") for hearing and is still pending.
 - f) Nothing in this Order shall be construed as deciding the issue pending at SOAH. Furthermore, if as a result of that hearing, the priority of use for interruptible water, as it relates to instream flows, is determined by the Commission to be different than that set forth in these Plans, any party shall have the express right to reopen the issue of instream flow and bay and estuary inflow requirements by submitting a written request for hearing to the Commission.
- 2) The Chief Clerk of the Texas Natural Resource Conservation Commission shall forward a copy of this Order subject to the filing of motions for rehearing, to all parties.
 - 3) If any part of this Order is for any reason held to be invalid, the invalidity of any portion shall not affect the validity of the remainder of the Order.
 - 4) If the Texas Parks and Wildlife Department, the Texas Water Development Board, or the Commission, acting on their own motion or as a result of a petition filed by any party, shall

determine that there is a need for any updates to the freshwater inflow needs as a result of a new study for the Matagorda Bay System, the LCRA shall amend its amended Water and Drought Management Plans and submit these proposed amendments to the Commission for review and approval within one (1) year of completion of such new studies. Any party may reopen the issue of bay and estuary inflows by submitting a written request for hearing to the Commission within thirty (30) days of receiving notice of the filing of the new studies or any proposed amendment to the Plans.

- 5) Nothing in LCRA's Amended Water Management Plan and Amended Drought Management Plan or this Order shall be construed to impair, or to authorize LCRA or any other person or entity to impair, senior or superior water rights in the Colorado River Basin.

ISSUED: MAR 01 1999

TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION


Robert J. Huston, Chairman

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY



AGREED ORDER APPROVING AMENDMENTS TO LOWER COLORADO RIVER AUTHORITY'S WATER MANAGEMENT PLAN

On the 27th day of January, 2010, the Texas Commission on Environmental Quality ("Commission") considered the Lower Colorado River Authority's ("LCRA") application (Application No. 5838) to amend its Water Management Plan (WMP) and having heard evidence and arguments concerning Application No. 5838 and the proposed order, the Commission makes the following Findings of Fact and Conclusions of Law:

FINDINGS OF FACT

- 1) LCRA's Application No. 5838 to amend the WMP was received by the Commission on May 16, 2003, and was declared administratively complete on May 7, 2004.
- 2) Notice of the application to amend the WMP and of the public meeting on the proposed amendments to the WMP was published on September 27, 2004, in the Austin American-Statesman, a newspaper regularly published and generally circulated in Travis County, Texas; on September 29, 2004, in the Colorado County Citizen, a newspaper regularly published and generally circulated in Colorado County, Texas; on October 10, 2004, in the Matagorda County Tribune, a newspaper regularly published and generally circulated in Bastrop County, Texas; on October 10, 2004, in the Bay City Tribune, a newspaper regularly published and generally circulated in Matagorda County, Texas; on October 1, 2004, in the Fayette County Record, a newspaper regularly published and generally circulated in Fayette County, Texas; on September 29, 2004, in the El Campo Leader-News, a newspaper regularly published and generally circulated in Wharton County, Texas; and on September 25, 2004, in the Bastrop Advertiser, a newspaper regularly published and generally circulated in Bastrop County, Texas. These counties are the only counties in which persons reside who may be affected by action taken by the Commission on the proposed amendments.
- 3) On September 14, 2004, notice of an application to amend the WMP and notice of the public meeting was sent by first-class mail to the water right holders of record in the Colorado River Basin as required by law.
- 4) On November 8, 2004, the Commission held a public meeting. One person presented oral comments, and five (5) entities provided written comments in opposition to the proposed amendments.
- 5) The following persons/entities filed protests and requested a contested case hearing with the Commission regarding the proposed amendments: STP Nuclear Operating Company; City of Austin; Texas Parks and Wildlife Department; Sierra Club, Lone Star Chapter; and the National Wildlife Federation.

- 6) The applicant, LCRA, has requested numerous editorial and organization changes to the WMP designed to correct errors, improved readability and achieve internal consistency in the documents. All of these proposed non-substantive amendments to the WMP are detailed in mark-ups of the existing approved WMP dated May 16, 2003, June 10, 2004, April 29, 2005, March 1, 2006, April 24, 2009, November 25, 2009, and December 17, 2009, that were filed with Commission by the LCRA.
- 7) LCRA's proposed amendments to the WMP fall within four areas: curtailment policy for interruptible stored water supplies; allocation of stored water for environmental protection; incorporation of LCRA's Drought Contingency Plan into the WMP; and update of the WMP Appendices.
- 8) LCRA's proposed amendments to the WMP show the 2000 reported surface water demands by its firm customers from all sources of supply as approximately 296,600 acre-feet annually. The ten-year projected firm demands (through 2010), developed in 2000, were approximately 360,071 acre-feet per year - an increase of 63,471 acre-feet per year. The primary reason for this projected increase is additional water use around the Highland Lakes. Since LCRA filed its application in 2003, its obligations to provide firm supply to the STP Nuclear Operating Company (STPNOC) have been clarified in an Amended and Restated Contract which, among other things, obligates LCRA to provide no more than 20,000 acre-feet per year (rolling five-year average) of firm supply for up to two nuclear generating units and up to 40,000 acre-feet per year (rolling five-year average) of firm supply for more than two generating units, with staged deliveries based on STPNOC's reservoir level subject only to LCRA bay and estuary restrictions and according to a Water Delivery Plan. Contractual Permit No. 327A was issued by the Commission on August 31, 2009, based on the Amended and Restated Contract and the included Water Delivery Plan. The total estimated firm demands for all LCRA customers to be satisfied under this WMP are sufficient to address any additional firm demand that STPNOC might have in the timeframe for which these present amendments to the WMP are intended to be effective, after taking into consideration firm water allocated for environmental purposes.
- 9) With this large projected increase in firm water demand, and because firm water demands take priority over all other uses, LCRA requested the proposed amendments to the WMP to provide a compensating reduction in interruptible supplies. This reduction will be achieved by revising the annual interruptible water supply curtailment policy. LCRA's proposal to amend curtailment policy is as follows:
 - (a) If the total water in storage in either Lakes Buchanan or Travis is less than 94% on January 1 or June 1, then interruptible water supplies will not be made available to any customers located outside the four downstream irrigation operations (Pierce Ranch, Garwood, Gulf Coast, and Lakeside).
 - (b) If the total combined water in storage in Lakes Buchanan and Travis on January 1 is equal to or greater than 1,400,000 acre-feet, then LCRA will supply the interruptible stored water demands of the downstream four irrigation operations. This is based on the assumption that the maximum annual demand for the interruptible stored water acreage of 83,700 acres projected for 2010, under a 1 in 5 dry year condition, was 273,000 acre-feet. Using that as the greatest interruptible stored water demand, a set of smaller interruptible stored water supplies were assumed to generate a set of first and second crop acreages expected to be cultivated by each particular irrigation operations.

- (c) Curtailment of interruptible supply to the irrigation operations will commence when the total combined January 1 storage in Lake Buchanan and Travis is less than 1,400,000 acre-feet. When the combined storage in Lakes Buchanan and Travis on January 1 is between 1,400,000 acre-feet and 1,150,000 acre-feet, the interruptible stored water supply available will vary beginning at 273,000 acre-feet available at 1.4 million acre-feet of storage and decreasing at a rate of approximately 31,200 acre-feet for each 100,000 acre-foot decrease in combined storage until a value of 195,000 acre-feet available at a combined storage of 1.15 million acre-feet. When the combined storage in Lakes Buchanan and Travis on January 1 is less than 1,150,000 acre-feet, the interruptible stored water supply made available to the irrigation operations will vary beginning at 195,000 acre-feet available at 1.15 million acre-feet of storage and decreasing at a rate of approximately 4,250 acre-feet for each 100,000 acre-foot decrease in combined storage until a value of 160,000 acre-feet available at a combined storage of 325,000 acre-feet. This curtailment is depicted in Figure 4-1 of the Water Management Plan.
 - (d) Cutoff of the interruptible stored water supply for any purpose for the coming year will occur when the combined storage in Lakes Buchanan and Travis on January 1 is less than or equal to 325,000 acre-feet.
 - (e) If at any time during the year the total storage in Lakes Buchanan and Travis, combined, is less than or equal to 200,000 acre-feet, then all use of interruptible stored water will be stopped.
 - (f) During any period of curtailment or cutoff of interruptible supplies to the irrigation operations that is instituted on January 1, LCRA will cancel such curtailment at any time during the year prior to July 31, if the combined storage in Lakes Buchanan and Travis is projected to be equal to or greater than 1,400,000 acre-feet anytime in July. Further, the remaining available interruptible stored water supplies for the year may be reallocated, at this time, between irrigation operations if such allocations do not adversely affect any irrigation operation.
 - (g) During periods of curtailment, LCRA will allow each irrigation operation the option of either: (1) using up to a maximum authorized volume of interruptible stored water allocated to that operation, or (2) using sufficient water to cultivate a level of acreage agreed upon among the customers within each irrigation operation and LCRA.
- 10) LCRA's proposed amendments to the WMP also include a change in the procedure for supplying water for instream flow needs at certain locations downstream of Lady Bird Lake.
- (a) To the extent that inflows are legally available for storage in Lakes Buchanan and Travis, LCRA will release such inflows to help satisfy target instream flow needs, as set out in Table 2-1 of the WMP, whenever the combined water storage in Lakes Buchanan and Travis on January 1 is at or above 1,400,000 acre-feet.

- (b) LCRA will make such releases from Lakes Buchanan and Travis as are needed to help maintain critical instream flows, as set out in Table 2-1 of the WMP, at certain locations downstream of Lady Bird Lake. The level of releases to help maintain critical instream flows will not be limited by the inflows that are legally available for storage in Lakes Buchanan and Travis.
 - (c) In rare instances, LCRA's ability to meet the instream flow requirements set forth in this WMP may be impaired by certain unavoidable constraints such as the capacity of its hydro-generation units and hydro-generation scheduling mandates as well as unforeseen diversions, unforeseen changes in flow conditions downstream, and adjustments to the ratings of the applicable gages.
- 11) LCRA's proposed amendments to the WMP include a change in the reservoir operation procedure for providing water for estuarine fresh water inflow needs. The proposed amendment adds an intermediate level of supply for estuarine freshwater inflows that provides for a slightly more gradual reduction of the supply made available to Matagorda Bay than contained in the previously approved WMP. LCRA is required to release water from Lakes Buchanan and Travis to help maintain monthly estuarine inflows in accordance with the following procedure only to the extent that inflows are legally available for storage in Lake Buchanan and Travis as measured at the upstream gages:
 - (a) when the combined storage in Lakes Buchanan and Travis on January 1 is greater than or equal to 1,700,000 acre-feet, LCRA will release those storable inflows up to but not exceeding the amount needed to provide target freshwater inflow needs; and
 - (b) when the combined storage in Lakes Buchanan and Travis on January 1 is less than 1,700,000 acre-feet and greater than 1,100,000 acre-feet, LCRA will release those storable inflows up to but not exceeding the amount needed to provide one hundred and fifty percent of the critical freshwater inflow needs; and
 - (c) when the combined storage in Lakes Buchanan and Travis on January 1 is equal to or less than 1,100,000 acre-feet, LCRA will release those storable inflows up to but not exceeding the amount needed to provide critical freshwater inflows in all years.
- 12) The proposed amendments are deemed by LCRA as a balance between a modest incremental decrease in irrigation water supplies during drought conditions and modest increased inflow to Matagorda Bay during non-drought years to help maintain ecologically important freshwater inflows to the Bay.
- 13) Based on LCRA's determination of a balance of environmental and irrigation impacts, the recommended amendments to the WMP include an increase of stored water released for estuarine freshwater inflow. This increase would be provided in years when the January 1 storage level in Lakes Buchanan and Travis is between 1,100,000 and 1,700,000 acre-feet (55 and 86 percent full, respectively).
- 14) Among the issues raised in the hearing requests filed regarding the proposed amendments was the degree to which the amendments reflected consideration of the best information on environmental flow needs available at that time. While that issue remains in dispute, all parties agree that credible and extensive scientific information relating to environmental flow needs is available at

this time that is not incorporated in this order, but should be considered in developing and implementing an updated version of the WMP in the near future. That credible scientific information includes but is not limited to the August 2006 Matagorda Bay Freshwater Inflow Needs Study; the October 10, 2008 Matagorda Bay Health Evaluation; the March 31, 2008 Lower Colorado River, Texas Instream Flow Guidelines; and data collected by LCRA, TPWD, TWDB, and other agencies and researchers.

- 15) During the critical drought, LCRA proposes that the total stored water provided for environmental protection remain essentially the same as provided under the previously approved WMP. However, LCRA's proposed amendments provide that more of this commitment be met with firm, rather than interruptible stored water. The firm stored water so designated would increase from 16,950 acre-feet to 33,440 acre-feet. This additional firm commitment would be provided from available, but uncommitted supplies from Lakes Buchanan and Travis.
- 16) The LCRA Drought Contingency Plan (DCP), as required by Commission rules (30 Texas Administrative Code §§ 288.20 *et seq.*), was approved by the LCRA Board of Directors and submitted to the Commission in April 2000. The 2000 DCP was based on Chapter 4 of the WMP. Under current Commission rules, the DCP must be updated every five years. The DCP filed by LCRA with the Commission in 2000 was updated and approved by the LCRA Board of Directors and submitted to the Commission in April 2005. Consistent with the requirements of Chapter 288 of the Commission rules, LCRA also reviewed its DCP prior to May 1, 2009, but did not make any further changes to the DCP at that time. In December 2009, the LCRA Board approved further modifications to the DCP to reflect customer comment received in response to recent severe drought conditions. LCRA has submitted redline changes to Chapter 4 of the WMP that incorporates these recent changes.
- 17) On March 29, 1996 the Commission issued an Order severing a portion of the water rights authorized by Certificate of Adjudication No 14-2564 and combining them with LCRA's Certificate of Adjudication No. 14-5478 (Lake Buchanan). Certificate of Adjudication 14-5478C was issued to LCRA on the same date and authorized LCRA to transfer 532 acre-feet of water downstream to Lake Buchanan and consumptively use 500 acre feet per year of this water. Because the priority date of the severed water was senior to LCRA's rights to divert water from Lake Buchanan, LCRA requested and was granted on March 4, 1999, an increase in the Combined Firm Yield of Lakes Buchanan and Travis from 535,812 acre-feet to 536,312 acre-feet.
- 18) On August 29, 2003, LCRA filed a request with the Commission to cancel Certificate of Adjudication 14-5478C and for the Commission to rescind the March 29, 1996 Order severing water rights from Certificate Adjudication 14-2564 and combining them with LCRA's water rights authorized by Certificate of Adjudication 14-5478. On March 22, 2004, LCRA filed a Request to Abandon Certificate of Adjudication 14-5478C. Based on the abandonment, LCRA proposes that the WMP be amended to reflect a Combined Firm Yield of 535,812 acre-feet of water, which is the amount of the Combined Firm Yield prior to the issuance of Certificate of Adjudication 14-5478C.
- 19) The WMP contains two appendices: Volume I, which includes relevant LCRA Board policies, and Volume II, which contains technical information on the WMP and previous amendments. Changes to Volume I will reflect revisions made to LCRA Board policies since 1999. Changes to Volume II will reflect changes in agreements between LCRA and the Colorado River Municipal Water District, delete obsolete appendices, and update LCRA's standard form contracts and raw water contract rules.

- 20) LCRA supports this Order. In order to provide some certainty and to ensure prompt action on a new revision to the WMP, each of the parties identified in Finding of Fact No. 5 agree not to oppose the approval of this Order.

CONCLUSIONS OF LAW

- 1) The Commission considered this Order under the authority and in accordance with Chapter 11 of the Texas Water Code, as amended, and 30 Texas Administrative Code ("TAC") Chapter 295.
- 2) The Commission has jurisdiction to consider and take action on LCRA's application to amend the WMP.

NOW, THEREFORE, BE IT ORDERED BY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY THAT:

- 1) LCRA's amended Water Management Plan is approved with the following conditions:
- a) LCRA's amended Water Management Plan is subject to all findings, conclusions, and conditions contained in the Commission's Order dated September 20, 1989, December 23, 1991, December 18, 1992 and March 1, 1999, approving and amending the WMP, except to the extent that this Order specifically provides otherwise.
 - b) Notwithstanding any other provision in the revised Water Management Plan, for purposes of establishing LCRA's obligations to supply interruptible stored water for agricultural use within the four major irrigation operations and to provide water for instream flows and freshwater inflows in calendar year 2010, the following shall apply:
 - 1. LCRA's obligations to provide water for instream flows and freshwater inflows in January 2010 shall be governed by the Water Management Plan in effect on January 1, 2010.
 - 2. From February 1, 2010 through December 31, 2010, LCRA's obligations shall be governed by the WMP in effect on February 1, 2010. In providing interruptible stored water for agricultural use within the four major irrigation operations and in providing water for instream flows and freshwater inflows during this period, LCRA's obligations shall be determined based on the combined storage in Lakes Buchanan and Travis on February 1, 2010.
 - c) LCRA shall implement the provisions of the amended Water Management Plan regarding the provision of instream flows in a manner so as maintain, on an instantaneous basis, instream flows of 46 cfs and 500 cfs critical flows as set forth in Table 2-1 during the times those respective flow values are in effect. During those times when the target instream flow requirements as set forth in Table 2-1 of the WMP are in effect, LCRA will schedule the passage of inflows to lakes Buchanan and Travis that are legally available for storage to maintain the target flows as a daily average. Furthermore, during those times when target instream flow requirements are in effect and when such inflows are sufficient to allow LCRA to satisfy the daily target flow requirement at the Bastrop gage, LCRA will also schedule the passage of

these inflows to maintain the following minimum flows, as measured at any time at the Bastrop gage:

Month	Minimum Flow (cfs) 100% of the time	Minimum Flow (cfs) 95% of the time
January	266	
February	269	
March	233	
April	244	287
May	492	579
June	355	418
July	295	347
August	165	
September	201	
October	208	
November	241	
December	264	

It is hereby recognized that, in rare instances, LCRA's ability to meet the instream flow requirements set forth in this WMP may be impaired by certain unavoidable constraints such as the capacity of its hydro-generation units and hydro-generation scheduling mandates as well as unforeseen diversions, unforeseen changes in flow conditions downstream, and adjustments to the ratings of the applicable gages.

- d) For purposes of estimating required releases of water from Lakes Buchanan and Travis to meet the instream flow or freshwater inflow requirements of this WMP, LCRA shall rely on stage data obtained from the gaging system jointly maintained and operated by the U.S. Geological Survey and LCRA for determining these requirements. If the ratings used to convert stage to flow published by LCRA and the USGS are not identical at the time required releases are estimated, LCRA shall have discretion to rely on the latest updated rating of the gage.
- e) The approval of the amended WMP does not reflect a final determination, or create a presumption, that the environmental flow provisions contained therein are adequate or appropriate based upon more recent information available at this time.
- f) Because of the importance of updating the environmental flow and drought curtailment provisions of the WMP to reflect the best available science and information, LCRA shall promptly initiate, by not later than July 1, 2010, a revision process designed to develop further proposed amendments to the Water Management Plan. The revision process should be reasonably calculated to allow meaningful participation by interested basin stakeholder groups and to achieve regional consensus, where possible.

LCRA shall file an application for approval of proposed amendments with the Executive Director by not later than July 1, 2013. That application shall include a summary of the steps taken by LCRA to further public participation and to achieve consensus, where possible, in developing the proposed amendments. To the extent that the Executive Director determines such application is not administratively complete, LCRA shall make reasonable and good faith efforts to timely provide any

additional information necessary to have the application declared administratively complete at the earliest possible time.

Those proposed amendments shall address, at a minimum, the following:

1. Interruptible curtailment procedures needed to ensure that LCRA can satisfy projected firm customer demand should intense drought conditions such as those experienced over the past several decades recur;
2. An evaluation of the adequacy of the criteria for declaring a drought worse than drought of record;
3. An evaluation of the minimum combined storage of water in Lakes Buchanan and Travis necessary or appropriate to protect firm customers through a repeat of the drought of record or under conditions worse than a drought of record;
4. Incorporation of appropriate changes to reflect LCRA's agreements and obligations to STPNOC under the Settlement Agreement and Amended and Restated Contract, including the Water Delivery Plan;
5. LCRA's agreement with the City of Austin regarding return flows, consistent with Section VIII(C)(1) of the Settlement Agreement by and between the City of Austin and the LCRA Regarding Joint Water Resource Management and the Resolution of Certain Regulatory Matters Pending at the TCEQ, dated June 18, 2007;
6. Revisions to provisions governing the manner in which LCRA provides water from Lakes Buchanan and Travis to address environmental flow needs that shall use the best available scientific information, including the information referenced in Finding of Fact 15, and shall provide water for such needs to the maximum extent reasonable and practicable when considering all public interests as set forth in Texas Water Code §11.147 and any applicable environmental flow standards adopted pursuant to Texas Water Code § 11.1471. Such revisions shall include:
 - i. a mechanism for adjusting the manner in which LCRA provides water for environmental flow needs that addresses significant improvements in storage conditions during the course of a year;
 - ii. a mechanism for limiting harmful intra-daily fluctuations of instream flows to prevent significant adverse impacts from periods of low flows; and

- iii. specification, to the maximum extent reasonable, of an overall instream flow regime.

The Commission hereby directs the Executive Director's staff to make all reasonable efforts to complete its technical review of the application for proposed amendments to the Water Management Plan by not later than one year after the date of LCRA's application is declared administrative complete and, as part of that staff review process, to allow other interested persons who request the opportunity to do so to submit, consistent with the timeline established by Commission staff, information regarding environmental flow issues and other issues addressed by the amendments for consideration. To facilitate the prompt completion of the technical review, LCRA shall respond fully to all requests from the Executive Director's staff for additional information within 30 days after receipt of those requests unless otherwise agreed upon by the Executive Director's staff. Upon completion of the technical review, the application and associated hearing requests, if any, on that application will be given high priority and set for prompt consideration and action by the Commission.

- g) Consistent with 30 Tex. Admin. Code Ch. 288, LCRA shall review and update, as appropriate, in accordance with the schedule required by such rules, those portions of Chapter 4 that relate to its Drought Contingency Plan (DCP) that do not change the triggers or amount of curtailment of interruptible supply or the triggers related to instream flows and bay and estuary inflows. Changes to other portions of the DCP, including any changes to LCRA's specific, quantified targets for water use reductions of firm customers required by chapter 288, do not constitute an amendment to the Water Management Plan requiring notice and an opportunity for contested case hearing, but must otherwise comply with the public notice requirements of Chapter 288 of the Commission's rules. Prior to implementing any mandatory firm water customer curtailment allowed under Texas Water Code section 11.039, LCRA shall work with its firm customers to develop a specific water curtailment plan, which must be approved by the LCRA Board and the Commission pursuant to other applicable procedures.
- h) Nothing in this Order shall be construed to impair or limit any party's right to contest the LCRA's proposal for incorporating the results of existing or future freshwater inflow or instream flow studies in any future proceedings relating to amendments of the Water Management Plan.
- i) Nothing in this Order, other than Findings of Fact 17 and 18, shall be construed as addressing the calculation of the combined firm yield of Lakes Buchanan and Travis and no party shall be deemed to have waived the right to contest in any future proceeding the calculation of the combined firm yield of Lakes Buchanan and Travis solely as a result of this Order.
- j) The Commission acknowledges the challenges to the adequacy of the environmental flow provisions included in the proposed amendments to the Water Management Plan previously raised by the Texas Parks and Wildlife Department, National Wildlife Federation, and the Lone Star Chapter of the Sierra Club. Those parties have agreed that compliance by LCRA with the provisions of this Order would eliminate the need for a Commission proceeding

to resolve those challenges. However, in the event that LCRA fails to meet any requirement set out in decretal paragraph (f) above, the Commission expressly recognizes that the issues raised by those challenges will again require consideration. Accordingly, any of those parties may, if it has reason to believe LCRA has failed to meet any such requirement, file, with the Office of the Chief Clerk, a written request seeking a hearing on the adequacy of environmental flow provisions approved by this Order and detailing the alleged failure by LCRA to comply with the requirements of decretal paragraph (f). Any such hearing request shall be set for prompt consideration by the Commission and, subject to compliance with routine requirements for hearing requests, shall be granted unless the Commission determines that LCRA has fully complied with the requirements of decretal paragraph (f).

- k) LCRA agrees to be bound by the terms, conditions and provisions contained herein and such agreement is a condition precedent to the approval of the proposed amendments.
 - l) LCRA shall conform the text of the Water Management Plan to be consistent with the provisions of this Order.
- 2) The Chief Clerk of the Texas Commission on Environmental Quality shall forward a copy of this Order, to all parties.
 - 3) If any part of this Order held to be invalid, the invalidity of any portion shall not affect the validity of the remainder of the Order.
 - 4) Nothing in LCRA's Water Management Plan, as amended, or this Order shall be construed to impair, or to authorize LCRA or any other person or entity to impair, senior or superior water rights in the Colorado River Basin.


For the Commission

DATE ISSUED **JAN 27 2010**