LOWER COLORADO RIVER AUTHORITY SELF-EVALUATION REPORT

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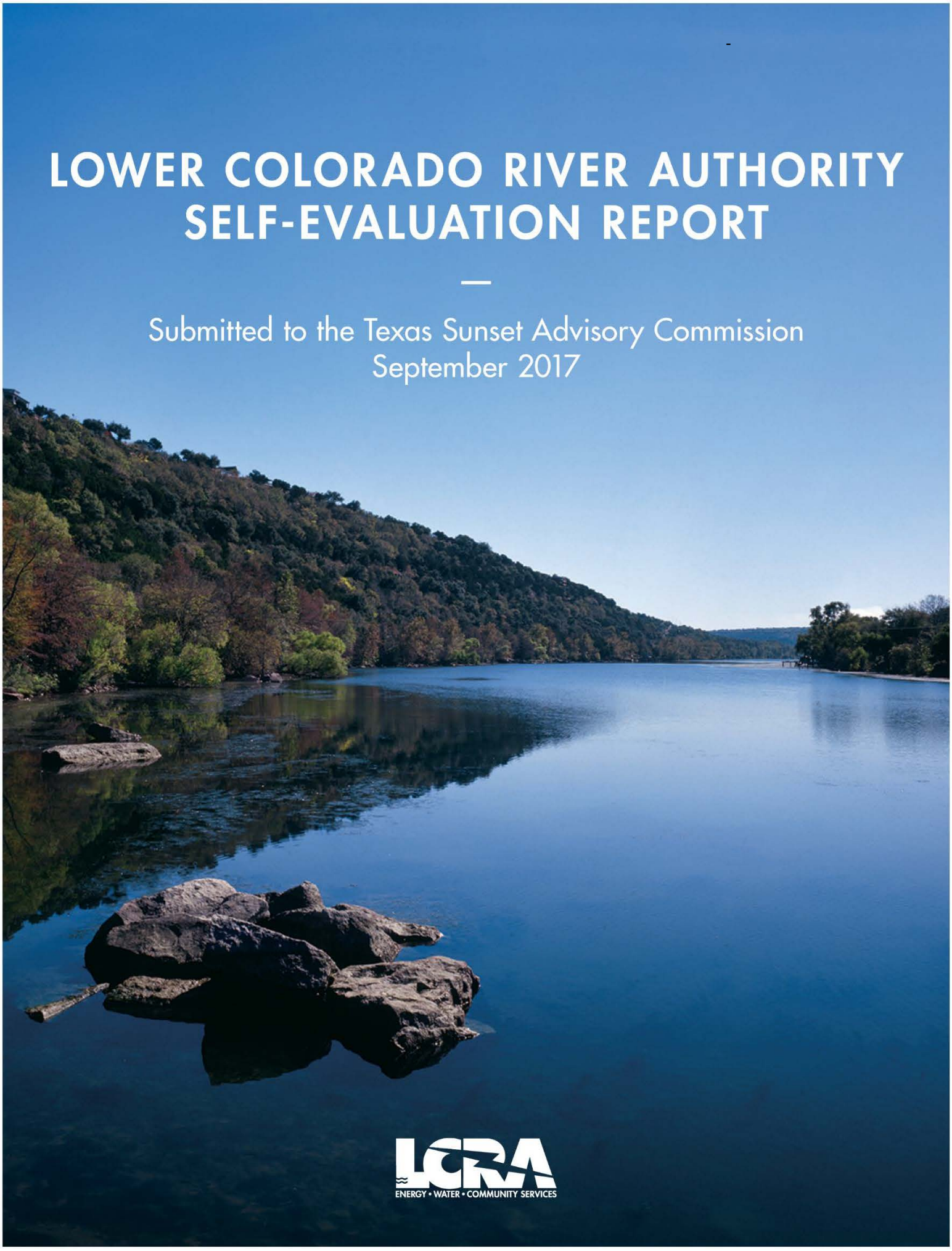
Submitted to the Texas Sunset Advisory Commission
September 2017



LCRA
ENERGY • WATER • COMMUNITY SERVICES

INTRODUCTION

The Lower Colorado River Authority is pleased to submit our Self-Evaluation Report to the Texas Sunset Advisory Commission.

The Texas Legislature created LCRA in 1934 as a conservation and reclamation district pursuant to Article XVI, Section 59 of the Texas Constitution. LCRA's enabling legislation is codified in the Special District Local Laws Code, Title 6, Subtitle G, Chapter 8503. The statute charges LCRA with multiple responsibilities including:

> *"… the control, storing, preservation, and distribution of the waters of the Colorado River and its tributaries within the boundaries of the authority for irrigation, generation of electric energy and power, and other useful purposes; the reclamation and irrigation of arid, semiarid, and other lands needing irrigation; the development of parks on lands owned or acquired by the authority; and the conservation and development of the forests, water, and electric power in this state."*

We have a proud record of carrying out our legislatively prescribed responsibilities since we opened our doors for business in 1935. As a public utility doing a public good, LCRA supports a dynamic Texas by providing water, producing and transmitting power, and delivering community services. The Highland Lakes and the dams that create them are vital to a region prone to both droughts and floods. The electric power we provide is essential for our growing state. LCRA and our affiliated corporations own or have output rights to enough wholesale power to serve the needs of about a million Texans, and LCRA Transmission Services Corporation provides electric transmission service throughout much of the state.

Our community services also make real differences in the lives of the Texans we serve. Along with our network of more than 40 parks, LCRA provides economic development assistance to communities through our Community Development Partnership Program.

LCRA is committed to fulfilling our mission:

To enhance the quality of life of the Texans we serve through water stewardship, energy and community service.

During the 2015 regular session, the Legislature passed legislation that provided that all river authorities would be reviewed by the Sunset Advisory Commission without the possibility of abolishment. The legislation amended LCRA's enabling legislation and limited the scope of the LCRA review as follows:

> *"The review shall not include the management of the generation or transmission of electricity under the wholesale electricity operation of the authority and the authority's affiliated nonprofit corporations."*

LCRA's Self-Evaluation Report is, therefore, primarily focused on the organization's water operations.(1)

(1) *"… a Sunset review will give citizens the ability to publicly discuss the governance and efficiency of how their water is managed …"*

Senator Brian Birdwell, author of SB 523, press release, April 9, 2015

"My intent all along has been that we sunset the river authorities talking about the water, because of the drought and water implementation … simply the water end of all of the water authorities."

Representative Jim Keffer, House sponsor of SB 523, upon laying the bill out on the floor of the House, May 15, 2015

After years of devastating floods and ferocious drought, the Legislature in 1934 called upon LCRA to build a series of dams to corral the unruly lower Colorado River. LCRA went to work by building six dams along the river to help protect the state's capital city and other communities in the basin. LCRA continues to be at the forefront in managing floods and protecting the lives and property of the people within the basin.

As a result of constructing the dams, LCRA created six water reservoirs that have become known as the Highland Lakes. Two of the reservoirs – Lake Buchanan and Lake Travis – were designed as water supply reservoirs, while the remaining four are generally referred to as pass-through reservoirs. As they have for decades, lakes Buchanan and Travis capture water when rains are plentiful to use for our region's water needs, including times when the region turns to drought.

LCRA oversees and protects the water supply for more than a million people, and for businesses, industry, agriculture and the environment. We also monitor water quality and work to preserve and increase water supplies.

Since 1989, our management of lakes Travis and Buchanan has been governed by a Water Management Plan (attached to this report as an integral component of our operations) approved by the Texas Commission on Environmental Quality. During drought, the plan requires the curtailment or cutback of *interruptible* stored water from the Highland Lakes, which may be curtailed during times of drought and is primarily used for downstream agriculture, to ensure that *firm* water, which is available even during a severe drought, will be available for the basic needs of cities, businesses and industries throughout the basin. The plan also requires LCRA to provide water from the lakes to help meet the environmental needs of the lower Colorado River and Matagorda Bay.

During the most recent severe drought (from about 2008 to early 2016) the tension between the competing water management philosophies of upstream interests (those above Austin) and downstream interests (those below Austin) became acute, particularly after the single most severe drought year on record in 2011, as no interruptible water was released downstream from the Highland Lakes to the Gulf Coast, Lakeside and Pierce Ranch irrigation operations for the four consecutive years that followed (2012-2015). The current Water Management Plan approved by the TCEQ in November 2015 is designed to equitably address this tension.

Despite the significant improvements brought about by the 2015 Water Management Plan, some stakeholders continue to argue that LCRA's use of water to serve downstream communities, agriculture, industry and the environment should be subordinated to keeping lakes Travis and Buchanan at higher, near-constant levels. Our governing statute and founding mission would indicate otherwise. Again, the two largest of the six Highland Lakes – Buchanan and Travis – are the water supply reservoirs for the entire lower river basin from San Saba County in the Hill County to Matagorda County on the coast. Because they were created to store water during wet seasons and provide water even during times of drought, their levels vary by design. Keeping these lakes at near-constant levels would significantly reduce the reliable amount of water these lakes could supply even to the communities along the lakes. The only way to maintain near-constant levels for these lakes in times of drought would be to severely restrict or eliminate downstream flows.

We are proud of the mission and purpose that was established for LCRA by the Texas Legislature, and our employees are working hard to meet that mission and purpose every day. To that end, we are committed to full and open cooperation with the Sunset Advisory Commission in its evaluation centered on LCRA's water operations.

Thank you for your time, and I look forward to welcoming you to LCRA at your convenience.

Sincerely,

Phil Wilson
LCRA General Manager

Please note:

LCRA has made every effort to be fully responsive. If something was missed, please let us know, and we will transmit the requested information as soon as possible. We also encourage you to access LCRA's website, which is a comprehensive source of information that can facilitate gaining an understanding of LCRA.

Because LCRA is not a state agency and receives no state appropriations, a number of the original questions have been modified to more accurately reflect the financial or administrative nature of LCRA while still providing comparable data where appropriate.

Table of Contents

Lower Colorado River Authority
Self-Evaluation Report

I. Agency Contact Information

A. Please fill in the following chart.

Lower Colorado River Authority
Agency Contacts

	Name	Address	Telephone and Fax Numbers	Email Address
Agency Head	Phil Wilson General Manager	3700 Lake Austin Blvd. Austin, TX 78703	512-578-3562	phil.wilson@lcra.org
Agency's Sunset Liaison	Charlie Johnson General Auditor	3700 Lake Austin Blvd. Austin, TX 78703	512-578-3547	charlie.johnson@lcra.org

II. Key Functions and Performance

Provide the following information about the overall operations of your agency. More detailed information about individual programs will be requested in a later section.

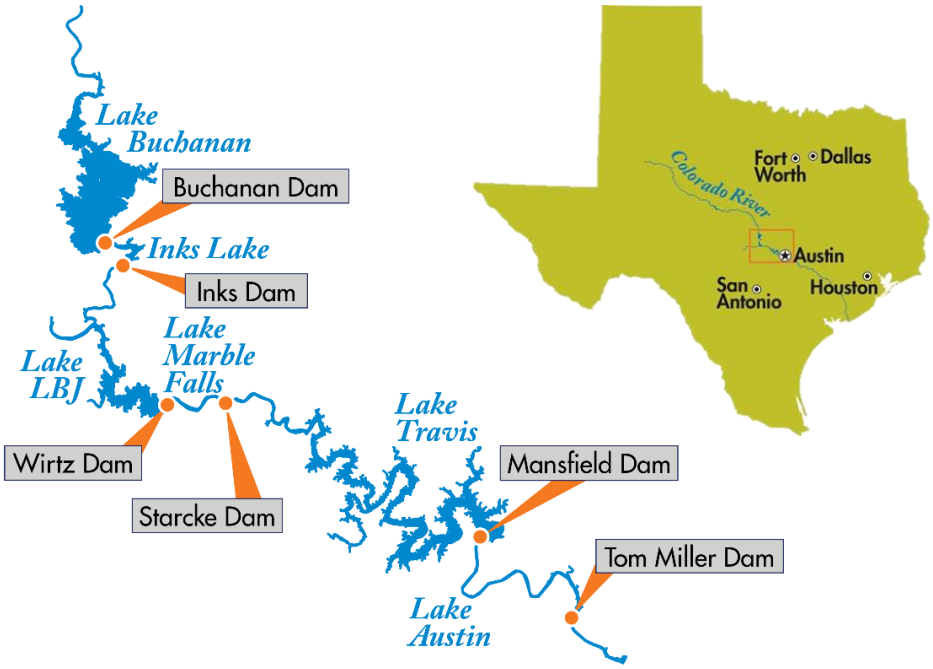
A. Provide an overview of your agency's mission, objectives, and key functions.

The Lower Colorado River Authority's mission is to enhance the quality of life of the Texans we serve through water stewardship, energy and community services. Simply put, we exist to serve the people of Texas. It's been that way since the Texas Legislature created LCRA in 1934.

LCRA provides a multitude of vital services, including managing water supplies for our region according to a state-approved Water Management Plan and other state-issued water rights, managing floods along the Highland Lakes, producing and delivering power, providing parks and recreation areas, and supporting community development. As our enabling legislation excludes the management of the generation or transmission of electricity from the Sunset Advisory Commission review, our Self-Evaluation Report primarily focuses on the key functions of our water operations: water supply and flood management.

LCRA manages the lower 600 miles of the Texas Colorado River, securing and protecting the water supply for more than a million people and managing floodwaters that otherwise could devastate Austin and other communities. Cities, businesses and industries, agriculture, and the environment all rely on water from the Colorado River.

LCRA built and operates six dams on the lower Colorado River in Central Texas: Buchanan, Inks, Wirtz, Starcke, Mansfield and Tom Miller. The dams create the six Highland Lakes: Buchanan, Inks, LBJ, Marble Falls, Travis and Austin. LCRA owns lakes Buchanan, Inks, LBJ, Marble Falls and Travis, and the City of Austin owns Lake Austin. Austin manages recreation on Lake Austin and regulates land use around the lake. LCRA operates Tom Miller Dam, which creates Lake Austin, pursuant to a long-term lease with Austin.

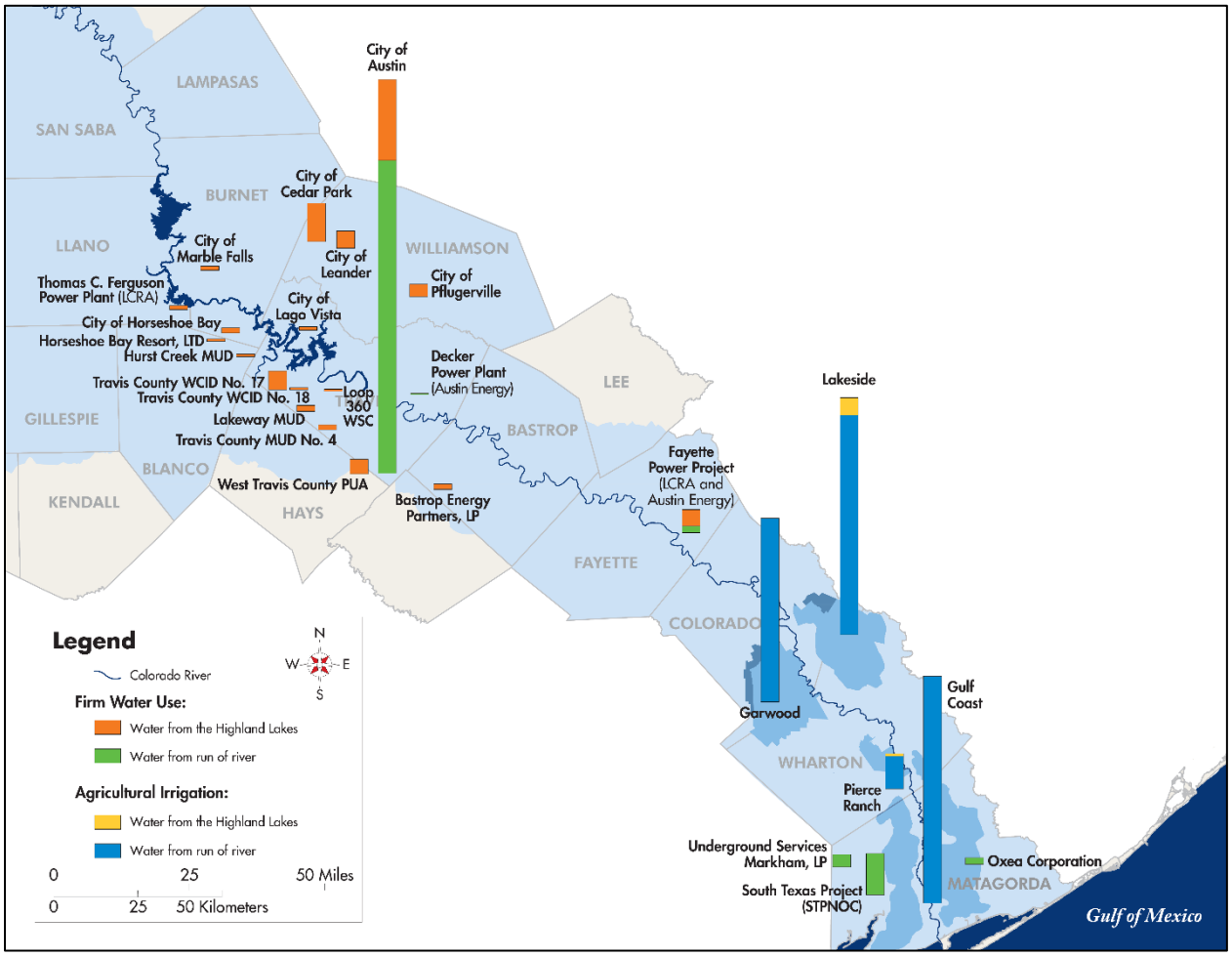


The dams in the Highland Lakes chain have hydroelectric generation facilities that contribute to the Central Texas energy supply. Together, the hydroelectric plants at the dams can provide more than 295 megawatts of electricity per year. Hydroelectricity was once the major source of power for LCRA's electric service area, but hydroelectric generation now is primarily a byproduct of other river operations. On the rare occasions when we have an emergency shortage of electricity, water is moved through hydroelectric generation solely to create power at the request of the Electric Reliability Council of Texas, the electric grid operator for most of Texas.

The Highland Lakes sit in the Texas Hill Country, home to withering, multiyear droughts and sudden, torrential rains that earned it the nickname “Flash Flood Alley.” LCRA manages the region’s water supplies through both working vigorously to manage floods during heavy rains and conserving water supplies for when the rains dry up.

Two of the Highland Lakes – Travis and Buchanan – are water supply reservoirs whose levels rise during wet times and fall during droughts. The Texas Commission on Environmental Quality approves the Water Management Plan that governs our operation of lakes Travis and Buchanan to supply water to users throughout the lower Colorado River basin. TCEQ approved the current plan in November 2015.

During drought, the plan requires the curtailment or cutback of stored water from the Highland Lakes for downstream interruptible use (mainly agriculture) so firm water supplies – which are available even during a severe drought and are subject to a higher rate than interruptible water supplies – will be available for the basic needs of cities, businesses, industries and other firm water users. During water shortages, interruptible water, which is mostly used for agriculture, is cut back or cut off. The plan also requires LCRA to provide water from the lakes to help meet the environmental needs of the lower Colorado River and Matagorda Bay. Water customers and their water use in 2016 are shown on the map and tables below.



2016 Total Water Pumped by LCRA's Firm Water Customers

Water supplied from the Highland Lakes	Volume (acre-feet)
City of Austin, municipal and parks	30,063
City of Cedar Park	14,241
Travis County WCID No. 17	7,007
LCRA power plants, includes:	6,976
• Fayette Power Project (LCRA share)	5,440
• Sim Gideon Power Plant*	0
• Lost Pines 1 Power Project*	0
Thomas C. Ferguson Power Plant	1,536
City of Leander	6,361
West Travis County Public Utility Agency	5,482
City of Pflugerville	4,628
Domestic water users on Highland Lakes	3,899
Lakeway MUD	2,210
Bastrop Energy Partners, LP	1,996
City of Horseshoe Bay	1,933
Travis County MUD No. 4	1,917
City of Marble Falls	1,516
City of Lago Vista	1,260
Hurst Creek MUD (The Hills)	994
Horseshoe Bay Resort, LTD	926
Austin Energy (AE) power plants, includes:	922
• Fayette Power Project (AE share)	714
• Decker Power Plant	208
Travis County WCID No. 18	811
Loop 360 WSC	805
Other firm customers	14,790
• Diverted from Lake Buchanan	362
• Diverted from Inks Lake	393
• Diverted from Lake LBJ	1,703
• Diverted from Lake Marble Falls	1
• Diverted from Lake Travis	3,122
• Diverted from Lake Austin	4,163
• Diverted downstream of Lake Austin	5,046
Subtotal from Highland Lakes	**108,737**
Water supplied from other water rights	**Volume (acre-feet)**
City of Austin / Austin Energy, includes:	116,365
• Municipal and parks	113,495
• Fayette Power Project (AE share)	2,426
• Decker Power Plant	444
South Texas Project Nuclear Operating Co.	15,421
Gulf Coast municipal and industrial use, includes:	7,142
• Underground Services Markham, LP	4,673
• Oxea Corporation	2,469
Bastrop Energy Partners, LP	180
Subtotal from other water rights	**139,108**
Total from both sources	**247,845**

**Groundwater was used to meet demand.*

2016 Total Water Pumped for LCRA's Interruptible Water Customers (Agriculture)

Water supplied from the Highland Lakes	Volume (acre-feet)
Garwood Irrigation Division	0
Lakeside Irrigation Division	6,581
Gulf Coast Irrigation Division	91
Pierce Ranch Irrigation Company	983
Subtotal from Highland Lakes	**7,655**
Water supplied from downstream water rights	**Volume (acre-feet)**
Garwood Irrigation Division	68,325
Lakeside Irrigation Division	81,560
Gulf Coast Irrigation Division	84,409
Pierce Ranch Irrigation Company	12,134
Subtotal from downstream water rights	**246,428**
Total from both sources	**254,083**

Protecting water quality in the lakes and river also is a vital part of LCRA's mission. LCRA implements numerous programs to monitor and assess water quality in the Colorado River basin, including:

- Clean Rivers Program: LCRA is the lead agency for the Clean Rivers Program in the Colorado River basin, implementing the program from below O.H. Ivie Reservoir to Matagorda Bay. The Clean Rivers Program is a state fee-funded water quality monitoring, data assessment and public outreach program administered by TCEQ. River authorities, water supply districts and government councils coordinate the program throughout the state.
- Reservoir and Stream Sampling Program: Every other month, LCRA analyzes water samples collected at 58 locations.
- Routine Biological Monitoring: Three locations on the lower Colorado River are sampled twice per year.
- Bay Monitoring Program: LCRA currently maintains five continuous monitoring stations throughout the Matagorda Bay system.
- Colorado River Watch Network: Dedicated people who volunteer their time to monitor water quality in the lower Colorado River basin make up the Colorado River Watch Network. Volunteers provide extensive geographic coverage and frequent data reports, while also serving as an early warning system for potential water quality issues.

LCRA has been serving Texans through water stewardship for more than 80 years. We are honored to continue that legacy today.

B. Do your key functions continue to serve a clear and ongoing objective? Explain why each of these functions is still needed. What harm would come from no longer performing these functions?

Water Supplies: LCRA continues to serve a critical water supply function in the lower Colorado River basin as the water supply needs continue to grow in a region prone to drought. LCRA provides water for more than 1 million people as well as business, industries, the environment and, when available, agriculture in the lower Colorado River basin. Population projections for the region suggest a demand for water that will only grow over time. LCRA meets these needs by managing our region's existing water supply and also is developing new water supplies. No other entity in the lower Colorado River basin is positioned to provide these critical services.

Managing Floods: Central Texas, known as "Flash Flood Alley," is home to frequent and sudden heavy rains and flooding. LCRA's management of these flood events is critical to protecting life and property. No other entity in the lower Colorado River basin is positioned to provide these critical services.

C. What evidence can your agency provide to show your overall effectiveness and efficiency in meeting your objectives?

Water Supply

The lower Colorado River basin is subject to significant droughts. Available water supplies can be stressed significantly when nature takes hold – river flows drop, temperatures increase, evaporation increases and water demands spike. Through our management of the river and lake system, LCRA has provided essential water supplies to customers through even the most significant drought events.

- Managing Existing Supply
    - LCRA holds state-issued water rights to store and use water from lakes Buchanan and Travis. Since 1989, LCRA has supplied water from these lakes pursuant to a state-approved Water Management Plan (attached to this report as an integral component of our operations) that dictates how much water can be supplied for interruptible (primarily, agricultural) purposes while ensuring that demands for firm water (primarily municipal and industrial) are met during severe droughts. The Water Management Plan also sets forth the conditions under which LCRA provides water from lakes Travis and Buchanan to help meet environmental needs of the river and Matagorda Bay. The Water Management Plan has been amended several times, most recently in November 2015.
    - LCRA also holds water rights to divert available downstream river flows. LCRA purchased these rights over several decades to ensure the long-term availability of water supply for our region. LCRA currently uses these rights to supply water for interruptible agricultural needs and some industrial water needs in the lower basin.
    - The lower Colorado River basin recently experienced what many consider is a new “drought of record.” The new 2015 Water Management Plan reflects new operational criteria to allow LCRA to respond more quickly to changing hydrologic conditions similar to those experienced in this recent drought. While this plan was being developed and reviewed by TCEQ, LCRA recognized a need to act to protect essential water supplies for cities and industries and obtained a series of emergency orders from TCEQ to depart from the requirements of the older Water Management Plan and to increase our ability to use our downstream river rights to meet industrial needs and relieve pressure on the Highland Lakes. To ensure that essential water supplies were protected, LCRA received permission from TCEQ to suspend water supply to most interruptible customers in the lower basin from 2012-2015. Since that time, LCRA has operated under the new WMP and, due to plentiful rainfall, has been able to meet all firm and interruptible water supply needs.

- New Water Supply

    - LCRA is aggressively pursuing development of new water supplies to serve continued economic growth in this region. Several new water supply projects are underway.

    - LCRA is constructing a new reservoir in Wharton County (Lane City Reservoir), which is the first significant new water supply reservoir developed in the lower Colorado River basin in decades. The reservoir could add up to 90,000 acre-feet of water to the region's supply. The new reservoir will benefit the entire basin by helping reduce the amount of water otherwise required to be released from the Highland Lakes to serve downstream demands, including industrial and agricultural customers.

    - LCRA drilled four wells on property we own at our Lost Pines Power Park as part of the Bastrop County groundwater project. The project has added 10,000 acre-feet to the water supply by allowing LCRA to pump up to 10,000 acre-feet of water a year, under certain conditions.

    - LCRA recently has been selected to receive federal funds to assist in the construction of a small reservoir in our Lakeside Irrigation Division (the Prairie Conservation Reservoir). This 2,000 acre-foot, off-channel reservoir will provide increased reliability and improve operational efficiencies within the Lakeside Division and has the potential to significantly reduce the amount of stored water released for agriculture in a typical year.

    - LCRA is exploring additional water strategies for Central Texas, including using surface water, treated effluent and groundwater to address the needs of the high-growth areas of LCRA's water service area. LCRA currently is working on feasibility and permitting studies to help shorten the time needed to bring the new projects on-line when they are needed. LCRA plans to spend more than $41 million from FY 2018 to FY 2022 for new regional water supply projects prior to the construction phases (e.g., permitting, engineering, etc.).

Managing Floods

Throughout our history, LCRA has successfully managed flood events on the lower Colorado River, helping to protect human life and property. While the six dams that create the Highland Lakes were built to help manage floods, Mansfield Dam is the only dam in the Highland Lakes designed to hold back floodwaters.

- The dams upstream of Lake Travis pass floodwaters downstream to Lake Travis.
- Water is stored temporarily in the Lake Travis flood pool until LCRA can release it downstream in a controlled manner.
- Floodwaters below Lake Travis flow along the Colorado River to Matagorda Bay.

Often, LCRA can pass floodwaters safely through the Highland Lakes without the need for floodgate operations. More significant flood events, however, require significant coordination of gate operations at LCRA facilities. Since 1990, the lower Colorado River has experienced 16 flood events requiring LCRA to operate floodgates at one or more of our dams (for as little as a few days to several months in the case of the "Christmas Flood" of 1991), to safely pass or retain floodwaters through the system. The tables below provide a summary of the events since 1990 requiring gate operations on the dams LCRA operates:

	December 1991	**May 1995**	**October 1996**	**March 1997**
Rainfall duration	3 days	5 days	2 days	3 weeks
Storm center	Basinwide	Sandy Creek	Llano River	Upper basin
Gates used:				
Buchanan Dam (creates Lake Buchanan)	6	0	0	1
Wirtz Dam (creates Lake LBJ)	5	4	5	6
Starcke Dam (creates Lake Marble Falls)	10	10	10	10
Mansfield Dam (creates Lake Travis)	5	2	0	2
Tom Miller Dam (creates Lake Austin)	3	2	0	2
Additional information	"Christmas Day Flood," highest level of Lake Travis (710.44 feet above mean sea level, Dec. 25, 1991)	"Memorial Day Flood"	N/A	Refilled Lake Austin with floodwater releases

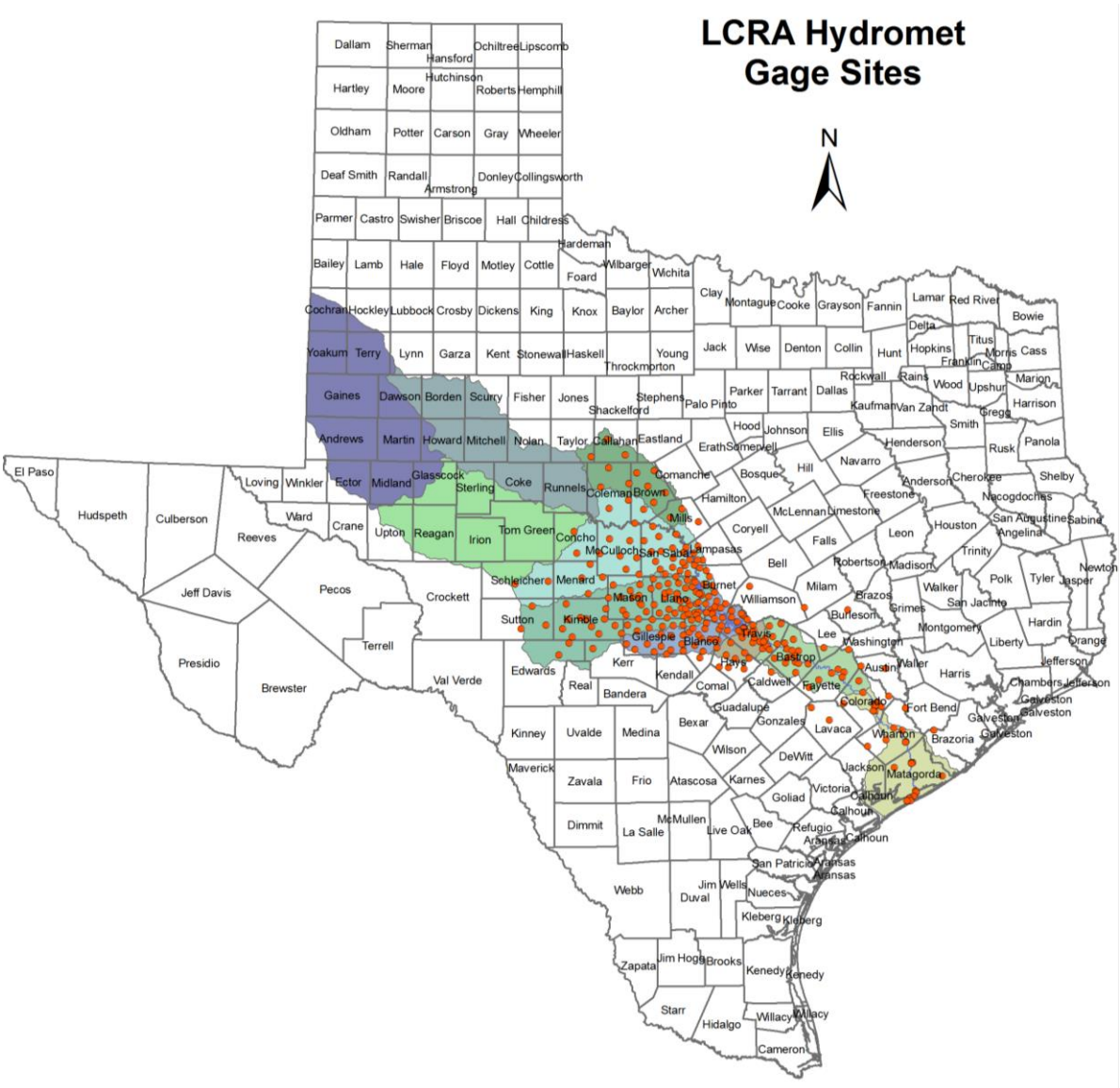
	June 1997	**March 1998**	**October 1998**	**November 2000**
Rainfall duration	4 days	2 days	2 days	2 weeks
Storm center	Basinwide	Upper basin	Colorado River downstream of LCRA's dams	Upper basin
Gates used:				
Buchanan Dam	6	3	0	0
Wirtz Dam	10	1	1	10
Starcke Dam	10	5	3	10
Mansfield Dam	4	1	0	0
Tom Miller Dam	3	1	2	0
Additional information	Third-highest level of Lake Travis (705.11 feet msl, June 26, 1997)	No flood stage exceeded, yet floodgate operations required	No releases from Lake Travis; Onion Creek and Cedar Creek cause severe flooding downstream of LCRA's dams	Drought-ending flood filled Lake Travis conservation pool

	November 2001	July 2002	June 2004	November 2004
Rainfall duration	3 days	2 weeks	2 weeks	3 weeks
Storm center	Upper basin	Upper basin	Upper basin	Basinwide
Gates used:				
Buchanan Dam	0	2	5	3
Wirtz Dam	4	4	3	4
Starcke Dam	7	5	8	10
Mansfield Dam	0	4	2	4
Tom Miller Dam	2	5	2	6
Additional information	Flash flooding in Central Texas	"Independence Day Flood"	Significant rise at Lake Buchanan	"Thanksgiving Day Flood," Army Corps of Engineers ordered floodgates closed

	June 2007	September 2010	October 2013	Spring 2016
Rainfall duration	Multiple storms	3 days	1 day	Multiple storms
Storm center	Upper basin	Basinwide	Onion Creek	Basinwide
Gates used:				
Buchanan Dam	4	0	0	4
Wirtz Dam	4	1	0	2
Starcke Dam	10	2	0	5
Mansfield Dam	4	0	0	4
Tom Miller Dam	4	4	4	3
Additional information	Drought-ending series of storms, 500-year "rain bomb" near Marble Falls, all Highland Lakes except Buchanan closed on Fourth of July holiday, fourth-highest level of Lake Travis (701.52 feet msl, July 6, 2007)	"Tropical Storm Hermine," no releases from lakes Buchanan and Travis; heaviest rain occurred in Travis and Williamson counties, leading to high flows through Austin	"Halloween Flood," no releases from lakes Buchanan and Travis	Drought-ending series of storms both upstream and downstream of the Highland Lakes, ninth-highest level on Lake Travis (692.7 feet msl, June 7, 2016)

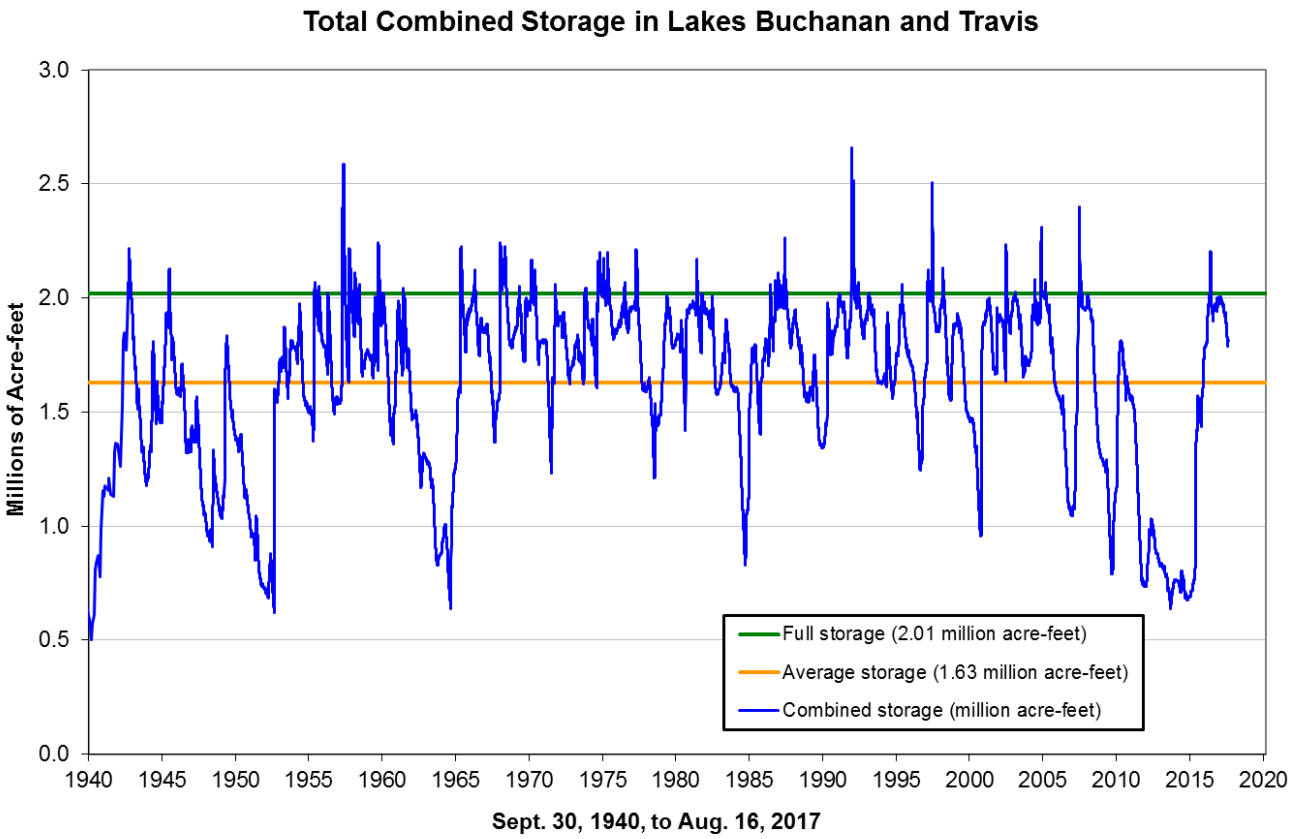
We use our Hydromet system of more than 275 automated river and weather gauges throughout the lower Colorado River basin in Texas to help in managing floods. Our Hydromet is the only monitoring system of its size and scope in Texas, and it provides LCRA's state-of-the-art River Operations Center with near-real-time data on streamflow, river stage, rainfall totals, temperature and humidity.

LCRA uses data collected by the Hydromet system to manage water releases from the Highland Lakes for water supply and flood management. The data also is automatically shared with the National Weather Service, local officials, media and others, and is available to the public on the LCRA website and mobile applications. A map showing the location of LCRA's Hydromet gauges is below.



LCRA also is helping to keep residents in the lower Colorado River basin safe by investing in our dams to ensure their continued safe and effective operation, which is critical for water supplies and flood management in the basin. Since the mid-1990s through LCRA's fiscal year 2017, which ended June 30, 2017, LCRA has invested more than $134 million in improvements to our dams to ensure their continued safety and operational efficiency. LCRA also plans to spend $39.3 million from FY 2018 through FY 2022 on dam rehabilitation projects for their safe and effective operation.

Because our region is prone to both droughts and floods, the levels of lakes Buchanan and Travis – water reservoirs for our region – vary. Total combined storage of the two lakes has fluctuated since 1940 as shown in the graph below. This paints a vivid picture of the droughts (low points in the graph) and floods (high points in the graph) our region has experienced. The lakes have operated as they were designed to operate, and LCRA has successfully managed water supplies and floods through the weather extremes of our region.



D. Does your agency's enabling law continue to correctly reflect your mission, objectives, and approach to performing your functions?

Yes, LCRA's enabling legislation reflects LCRA's mission, objectives and approach to performing our water supply and flood management services.

E. Have you recommended changes to the Legislature in the past to improve your agency's operations? If so, explain. Were the changes adopted?

No, LCRA has not recommended any changes to the Legislature to improve LCRA's operations.

F. Do any of your agency's functions overlap or duplicate those of another state or federal agency? Explain if, and why, each of your key functions is most appropriately placed within your agency. How do you ensure against duplication with other related agencies?

LCRA's regulatory programs, including the Highland Lakes Marina Ordinance, the Highland Lakes Watershed Ordinance, and the Land and Water Use Regulations, may overlap with municipalities or counties. In cases of overlapping jurisdiction, LCRA works with the local jurisdiction to determine which entity's regulations should apply. In many instances, especially in the case of smaller municipalities without sufficient enforcement resources, the municipality will prefer that LCRA's rules apply.

LCRA has been designated as an authorized agent of the state of Texas to permit septic systems in certain areas around the Highland Lakes. LCRA coordinates with TCEQ, which is the authorizing agency on behalf of Texas.

LCRA also coordinates with TCEQ regarding water quality matters within the lower Colorado River watershed. For example, LCRA is the lead agency in the Colorado River basin for the Clean Rivers Program – a grant program administered by TCEQ. LCRA coordinates data collection and evaluation by partnering with other water resource agencies in the Colorado River basin. A strong stakeholder process allows water quality issues to be examined without regard to governmental boundaries.

G. In general, how do other states carry out similar functions?

Water supplies in many other arid, Western states are managed by water districts or similar entities that have flood management and water supply functions similar to those of LCRA. However, like all river authorities and water conservation and reclamation districts in Texas, each is unique based on their respective enabling acts and other governing laws. Moreover, in many Western states, unlike Texas, the U.S. Bureau of Reclamation has and continues to play a major role in water supply development and delivery, often controlling the water supply available to these local districts and their customers.

H. What key obstacles impair your agency's ability to achieve its objectives?

No obstacles are impairing LCRA's ability to achieve our objectives.

I. Discuss any changes that could impact your agency's key functions in the near future (e.g., changes in federal law or outstanding court cases).

The U.S. Fish and Wildlife Service is considering whether to list five Central Texas freshwater mussels for protection under the Endangered Species Act. Four of these five are located in the lower Colorado River basin. If listed, LCRA's operations and those of our customers could be subject to additional restrictions to protect the mussels and their habitat. In some other Western states, federal protections for endangered aquatic species have significantly reduced water supply available for other needs.

J. What are your agency's biggest opportunities for improvement in the future?

LCRA serves one of the fastest-growing regions in the nation and remains focused on planning and developing additional water supplies while preserving current water supplies. In addition to building the Lane City Reservoir, described in detail above, we are actively exploring a wide variety of options for further developing water supplies, including multiple new regional water supply and groundwater possibilities.

K. Provide information regarding your agency's key performance measures included in your appropriations bill pattern, including outcome, input, efficiency, and explanatory measures. Please provide information regarding the methodology used to collect and report the data.

Serving a region prone to droughts and floods, LCRA has a strong record of planning for and responding to extreme weather events in order to fulfill our water supply and flood management responsibilities. LCRA's strong performance throughout droughts is demonstrated by the fact that although we have implemented drought response measures, we have continued to meet our firm customers' needs. Moreover, our strong performance throughout floods – including all the floods described on pages 14-15 – is demonstrated by the fact that we have created tools and successfully used those tools, along with the expertise accumulated through decades of flood management in "Flash Flood Alley," to manage these floods and mitigate their impacts. The Lake Travis flood pool has worked as designed and contained every flood event that we have had so far, even in extreme weather events such as the 2007 "rain bomb" that sent more than 1 million acre-feet of water into the Highland Lakes system.

Top 10 highest levels for Lake Travis

Rank	Date	Height (feet above mean sea level)
1	Dec. 25, 1991	710.44
2	May 18, 1957	707.38
3	June 25, 1997	705.11
4	Feb. 9, 1992	704.68
5	July 6, 2007	701.51
6	Nov. 25, 2004	696.70
7	July 7, 2002	693.50
8	June 14, 1987	693.48
9	June 7, 2016	692.70
10	Oct. 7, 1959	692.58

Lowest Lake Travis elevations

Rank	Drought	Date	Height* (feet msl)
1	1947-1957	Aug. 14, 1951	614.18
2	1963-1964	Nov. 8, 1963	615.02
3	2008-2016	Sept. 20, 2013	618.64
4	1983-1984	Oct. 7, 1984	636.58
5	1999-2000	Oct. 15, 2000	640.24
6	2005-2006	Dec. 13, 2006	643.55

*Based on daily readings at 8 a.m.

L. Please discuss any "high-value data" your agency possesses, as defined by Section 2054.1265 of the Government Code. In addition, please note whether your agency has posted those data sets on publically available websites as required by statute.

LCRA is not a state agency; therefore, the requirements of Section 2054.1265 of the Government Code do not apply to LCRA. However, LCRA has significant amounts of data that are analogous to the concept of "high-value data," such as the information described in the previous pages of this report. LCRA posts a multitude of high-value data on its website, such as information about:

- LCRA, including our mission, operations, leadership, history, business and capital plans, and financial statements.
- Water supply, including water supply contracts, an annual summary of our customers' water use, the TCEQ-approved Water Management Plan for lakes Buchanan and Travis, and new water projects.
- Flood management, including key elevations for Lake Travis during floods, federal flood control regulations for Mansfield Dam and Lake Travis, and how to sign up for our Flood Operations Notification Service – a free service to notify subscribers when flood operations begin at dams along the Highland Lakes and Lake Bastrop.
- The Highland Lakes and Colorado River, including how the Highland Lakes system works, monthly inflows into the lakes, current lake storage, lake level and water storage forecasts, upstream flow conditions and gauged inflows, downstream flow conditions, water releases from the dams, and freshwater inflows to Matagorda Bay, including a daily report with much of this information updated on a daily basis.
- Regulatory programs, including the Highland Lakes Marina Ordinance and Safety Standards for residential docks, the Highland Lakes Watershed Ordinance, and our On-Site Sewage Facility Program.
- Water quality, including the Clean Rivers Program, the Colorado River Watch Network and water quality data.

III. History and Major Events

Provide a timeline of your agency's history and key events, including:

- **The date your agency was established:**

The Texas Legislature created the Lower Colorado River Authority as a conservation and reclamation district in 1934. Texas Governor Miriam "Ma" Ferguson signed the legislation creating LCRA on Nov. 13, 1934. We opened our doors for business on Feb. 19, 1935.

- **The original purpose and responsibilities of your agency:**

The Legislature created LCRA in response to the need for flood management and a reliable water supply to end the devastating cycle of droughts and floods along the lower Colorado River. At the time, the Colorado River that meandered through the Hill County was a constant threat – in times of drought it could all but dry up, but when rains fell, anything nearby could be in danger and under water.

Before LCRA built the dams that formed the Highland Lakes, floods ravaged Central Texas. Fifteen major floods hit the Colorado River valley between 1843 and 1935. More than once, flooding from the untamed river destroyed dams and even rose above the iconic Congress Avenue Bridge in Austin. After years of devastating floods and ferocious droughts, lawmakers directed LCRA to build dams to corral the unruly river.

- **Major changes in responsibilities or statutory authority:**

Following is a description of the most significant changes to the LCRA enabling legislation related to water supply and flood management. LCRA has provided a more comprehensive listing of all significant changes to the LCRA enabling legislation (provided as Appendix I to the enabling legislation, "Summary of Amendments to the Lower Colorado River Authority Enabling Legislation") to the Sunset Advisory Commission.

1971

Authorized LCRA to study, correct and control pollution in the groundwaters and surface waters of the Colorado River and its tributaries. Gave LCRA the power to promulgate and enforce related rules and regulations.

1973

Authorized LCRA to control and charge for the commercial use of the surface of any lakes developed by LCRA.

1975

Made general laws relating to conservation and reclamation districts applicable to LCRA.

Expanded LCRA's authority to control the use of the surface of the lakes to include noncommercial uses.

Subordinated LCRA's use of water for hydroelectric generation to certain beneficial uses by cities, towns and other political bodies.

Clarified that LCRA is authorized spend money to build dams on the Colorado River downstream of Austin.

Authorized LCRA to acquire facilities necessary to supply water for irrigation and other useful purposes.

Eliminated the requirement that water impounded by dams on the Colorado River and its tributaries be used during emergencies resulting from subnormal rainfall.

Made LCRA's rights, powers, privileges, authority and functions subject to chapters 5, 6 and 21 of the Texas Water Code.

1993

Expanded the area in which LCRA may use, distribute and sell water to include, in addition to the statutory district, the watershed that contributes inflows to the Colorado River below the intersection of Coleman, Brown and McCulloch counties.

1995

Added a new section allowing LCRA to provide water or wastewater services in Lampasas County with the written consent of the Brazos River Authority.

1997

Added a new section allowing LCRA to provide water services in the Brazos River watershed portion of Williamson County with the prior written consent of the Brazos River Authority; prohibited LCRA from transferring surface water to any place in Williamson County that is outside the Colorado River watershed except for the cities of Leander and Cedar Park.

1999

Authorized LCRA, with the consent of the Brazos River Authority, to sell water to persons or entities other than the cities of Leander and Cedar Park at places throughout Williamson County, including those places outside the Colorado River basin. Such sales are limited to 25,000 acre-feet per year, are conditioned on there being no net loss of water to the Colorado River watershed, and are subject to a surcharge to be set by the LCRA Board.

2001

Authorized LCRA to enter into a long-term contract to sell water to a municipality located outside of its water service area, pursuant to certain limitations and restrictions and provided that such a sale is consistent with regional water plans. Requires LCRA to charge the municipality a surcharge determined by the LCRA Board to enable LCRA to develop and manage water resources sufficient to address the projected needs of LCRA's water service area and the needs of the municipality.

2015

Subjected LCRA to a limited review by the Sunset Advisory Commission, but not abolishment, to be conducted under Section 325.025, Government Code, as if LCRA were a state agency scheduled to be abolished Sept. 1, 2019, and every 12 years thereafter.

Authorized the state auditor to perform an audit of LCRA before Dec. 1, 2016, and the option of making recommendations to the Legislature.

Also consider including the following information if beneficial to understanding your agency:

- **Changes to your policymaking body's name or composition:**

There have not been any changes to the Lower Colorado River Authority's name. The LCRA Board of Directors was originally composed of nine members. It expanded to 12 in 1951 and to its present-day 15 directors in 1975.

- **Significant changes in state/federal legislation, mandates, or funding:**

(1) S.B. 1 (1997) – Adopted a revised process for regional and state water planning; LCRA is heavily involved in the Region K water planning group, sitting as the river authority representative and serving as the administrator for the group.

(2) H.B. 2694 (2011) – Established specific review timelines for TCEQ to process LCRA's applications to amend its Water Management Plan (the operating plan for lakes Buchanan and Travis).

- **Significant state/federal litigation that specifically affects your agency's operations:**

(1) *In Re: The Exceptions of the LCRA and the City of Austin to the Adjudication of Water Rights in the Lower Colorado River Segment of the Colorado River Basin,* in the District Court of Bell County, Cause No. 115, 414-A-1 Final Judgment and Decree issued April 20, 1988

(2) *Lower Colo. River Auth. v. Texas Dept. of Water Resources*, 689 S.W.2d 873 (Tex. 1985)

(3) TCEQ Docket No. 2006-1819-WR; SOAH Docket No. 582-08-0689; *LCRA's Water Rights Permit No. 5731* (April 29, 2011) (floodflows permit) (settlement and agreed order)

(4) *LCRA's Water Management Plan (various proceedings)*

a. Several dockets related to original application and amendments (settled or resolved without evidentiary hearing):

i. Order Approving LCRA's Water Management Plan and Amending Certificate of Adjudication Nos. 14-5478 and 14-5482 (Sept. 20, 1989)

ii. Order Approving LCRA's Drought Management Plan (Dec. 23, 1991)

iii. Agreed Order Approving Amendments to LCRA's Water Management and Drought Management Plan (Dec. 18, 1992)

iv. TCEQ Docket No. 98-1387-WR; Agreed Order Approving Amendments to LCRA's Water Management and Drought Management Plan (March 1, 1999)

v. TCEQ Docket No. 1995-1317-WR; Order Overruling Objections to LCRA's System of Priorities Set Forth in its Water Management Plan(June 3, 2003)

vi. LCRA's Application No. 5838; Agreed Order Approving Amendments to LCRA's Water Management Plan (Jan. 27, 2010)

vii. TCEQ Docket No. 2011-2097-WR; Order Approving LCRA's Firm Water Curtailment Plan (Dec. 12, 2011)

viii. TCEQ Docket No. 2014-0124-WR; LCRA's Application for Emergency Relief under 2010 Water Management Plan, January 2014

ix. TCEQ Docket No. 2015-1444-WR; Order Approving LCRA's Water Management Plan (Nov. 18, 2015)

(5) Water rights and contract-related litigation in district court and before TCEQ between STP Nuclear Operating Company and LCRA, including but not limited to *STP Nuclear Operating Company v. Lower Colo. River Auth.*, Cause No. GN-301008, Travis County District Court (filed March 28, 2003) and various water rights applications then pending at TCEQ; resulted in renegotiated contract and settlement of several pending water rights matters.

(6) Water rights related litigation before TCEQ between the City of Austin and LCRA related to indirect reuse of treated wastewater, including but not limited to City of Austin's Application Nos. 5779 & 5915 and LCRA's completing Application Nos. 14-5478D & 14-5482D; resulted in settlement of several pending water rights matters and additional Supplemental Water Supply Agreement.

(7) *Wynne v. Lower Colo. River Auth*., Cause No. 03-10-00402-CV (Tex. App. Austin Dec. 9, 2010, pet. denied), *Wynne v. Klein*, Cause No. 03-11-00574-CV (Tex. App. Austin Oct. 31, 2012)

(8) *City of San Antonio v. Lower Colo. River Auth*., 369 S.W.3d 231 (Tex. App. Austin July 29, 2011, no pet.)

IV. Policymaking Structure

A. Complete the following chart providing information on your policymaking body members.

Lower Colorado River Authority
Board of Directors

Member Name	Term/Appointment Dates /Appointed by	Qualifications	County
Timothy Timmerman Board Chair	Then-Gov. Rick Perry appointed Chair Timmerman to the Board in February 2008 and named him LCRA Board chair in January 2011. He was reappointed in 2013 for a term that expires Feb. 1, 2019.	Timothy Timmerman of Austin is a real estate investor/developer and owns Commerce Texas Properties, Inc. He developed the Star Ranch Community and Golf Course north of Austin. He is a certified public accountant and holds a Texas real estate broker's license. He serves on the boards of International Bank of Commerce – Austin, the Round Rock Community Foundation and St. David's Medical Center in Round Rock. He is a member of Good Shepherd Episcopal Church of Austin. Timmerman received a bachelor's degree from Texas A&M University and a master's degree from The University of Texas at Austin.	Travis County
Thomas Michael Martine Board Vice Chair	Then-Gov. Rick Perry appointed Director Martine to the Board in 2009 and reappointed him in 2013 for a term that expires Feb. 1, 2019.	Thomas Michael Martine of Cypress Mill is president of Martine Properties Inc. He is a member of the Urban Land Institute, Austin Commercial Real Estate Society, Real Estate Council of Austin, and Austin Apartment Association. He also is a member of the Westcave Preserve Council, Texas Wildlife Association, Austin Woods and Waters, and the Tributary League, which supports the Colorado River Alliance. He received his bachelor's degree from The University of Texas at Austin.	Blanco County
Steve K. Balas Board Secretary	Then-Gov. Rick Perry appointed Director Balas to the Board in 2007 for a term that expired in 2011 and reappointed him in March, 2011 to a term that expired Feb. 1, 2017. The governor appoints new directors or reappoints directors; directors serve until a new (or reappointed) director is sworn in.	Steve K. Balas of Eagle Lake is a pharmacist and owner of Eagle Lake Drugstore Inc. He also owns and manages a rice farm in Eagle Lake. Balas is a member of the Lower Colorado Regional Water Planning Group for the state's Region K water planning area and a past Board member of the Texas Rice Producers Association and the U.S. Rice Producers Association. He is a Board member of the First National Bank of Eagle Lake and a past advisory director of The Federal Reserve Bank of Dallas. He also serves on the boards of the Rice Medical Foundation, the David and Eula Wintermann Foundation of Eagle Lake, and United Drugs, a national pharmacy cooperative. He received a bachelor's degree from The University of Texas at Austin.	Colorado County

Member Name	Term/Appointment Dates /Appointed by	Qualifications	County
Lori A. Berger	Then-Gov. Rick Perry appointed Director Berger to the LCRA Board in 2009. Gov. Greg Abbott reappointed her in 2015 for a term that expires Feb. 1, 2021.	Lori A. Berger of Flatonia is self-employed. Berger, a former city council member and mayor of the City of Flatonia, has been vice chair of the Association of Rural Communities in Texas and has served on the boards of the Fayette County Gardenia Jansen Animal Shelter, Fayette Memorial Hospital Foundation, St. Marks Hospital, and the Texas Department of Housing and Community Affairs Board Regional and State Review committees. She served as co-chair of the Flatonia Czhilispiel and as a member of the Houston Livestock Show and Rodeo Committee, Flatonia ISD Education Foundation, and Flatonia Chamber of Commerce.	Fayette County
Stephen F. "Steve" Cooper	Gov. Greg Abbott appointed Director Cooper to the LCRA Board in December 2015 for a term that expired Feb. 1, 2017. The governor appoints new directors or reappoints directors; directors serve until a new (or reappointed) director is sworn in.	Stephen F. "Steve" Cooper is owner and principal of Emerald Ag Investments and former president and owner of La Tierra de Esmeralda/Emerald Sod Farms, which he oversaw for 28 years. He also is vice chairman of the El Campo Memorial Hospital Board of Directors and serves as an advisor to the El Campo Youth Memorial Park for Little League. He formerly served as chairman of the Leadership Advisory Board of Wharton County AgriLife for 10 years. Cooper earned a bachelor's degree in agricultural economics from Texas A&M University. He is an Eppright Distinguished Donor and a member of the Association of Former Students Endowed Century Club, the Champions Council and Athletic Ambassadors of the 12th Man Foundation, the Chancellor's Century Council, the A&M Department of Agricultural Economics' Tyrus R. Timm Honor Registry, the College of Agriculture development council and the Texas A&M Foundation Legacy Society. He is recipient of the 2015 Distinguished Alumnus Award, the highest honor bestowed upon a former student of Texas A&M University, awarded since 1962 to only 249 of Texas A&M's 436,000 former students.	Wharton County
Joseph M. "Joe" Crane	Gov. Greg Abbott appointed Director Crane to the Board in May 2015 for a term that expires Feb. 1, 2021.	Joseph M. "Joe" Crane is a managing general partner of BU Growers, Ltd. and Lester Winfree Rice & Cattle, LLC in Bay City, Texas. He currently serves on the Matagorda County Drainage District and as a member of the Wharton County Fair Association. Crane received a Bachelor of Science from Texas A&M University and a Master of Business Administration from Houston Baptist University.	Matagorda County

Member Name	Term/Appointment Dates /Appointed by	Qualifications	County
Pamela Jo "PJ" Ellison	Then-Gov. Rick Perry appointed Director Ellison to the Board in May 2013 for a term that expires Feb. 1, 2019.	Pamela Jo "PJ" Ellison of Brenham is president and owner of Ellison's Greenhouses Inc. She is a member of the Society of American Florists, a past director of the Texas State Florists Association, and past grower director of the Texas Nursery and Landscape Association. Ellison currently serves as chair of the Ellison Chair in International Floriculture Advisory Committee at Texas A&M University in the Department of Horticulture. She also is a member of the American Floral Endowment Board of Trustees, a member and past president of the Brenham Historical Society, and a past member of the Brazos River Authority Board of Directors. Ellison received a bachelor's degree from Texas A&M University and a Master of Business Administration from Notre Dame College.	Washington County (Represents LCRA's electric service area outside the statutory district)
John M. Franklin	Then-Gov. Rick Perry appointed Director Franklin in March 2011 for a term that expired Feb. 1, 2017. The governor appoints new directors or reappoints directors; directors serve until a new (or reappointed) director is sworn in.	John M. Franklin of Burnet County is a program manager for Celestica Aerospace Technologies, a defense contractor. He is a University of Texas graduate and former mayor of Pflugerville, Texas.	Burnet County
Raymond A. "Ray" Gill Jr.	Then-Gov. Rick Perry appointed Director Gill to the LCRA Board in 2011 for a term that expired Feb. 1, 2017. The governor appoints new directors or reappoints directors; directors serve until a new (or reappointed) director is sworn in.	Raymond A. "Ray" Gill Jr. of Horseshoe Bay is an architect and realtor and owner of R. Gill and Associates, an architectural firm. He has provided architectural design services for a variety of projects that include schools, city and county facilities, as well as banks, office and medical buildings, car dealerships, resorts and golf-related facilities. Gill is a member of the National Council of Architectural Registration Boards, National Association of Realtors and National Homebuilders Association, and former vice chairman of LCRA's LBJ/Marble Falls Regional Council. He has served as president of the Chandler Creek Municipal Utility District, a director at MBank and chairman of the Round Rock Chamber of Commerce, chairman of the Round Rock Economic Development Committee, and on the Texas Board of Architectural Examiners and the City of Round Rock Historic Commission. Gill also was chairman of the Architectural Registration Exam Committee and has received awards and honors from the Austin Associated General Contractors, Central Texas Masonry Contractors Association and the school board of the Irving, Texas Independent School District. He is a graduate of The University of Texas at Austin.	Llano County
Charles B. "Bart" Johnson	Gov. Greg Abbott appointed Director Johnson to the Board in May 2015 for a term that expires Feb. 1, 2021.	Charles B. "Bart" Johnson is president/principal of Painter & Johnson Financial in Brownwood. He is an Eagle Scout, a Rotary Paul Harris Fellow and a Master Mason. He also is chairman of the development board of Howard Payne University, fellow of the Life Underwriter Training Council and a former president of both the Brownwood Chamber of Commerce and the Brownwood Industrial Foundation. Johnson attended Texas Tech University.	Brown County (Represents LCRA's electric service area outside the statutory district)

Member Name	Term/Appointment Dates /Appointed by	Qualifications	County
Sandra Wright "Sandy" Kibby	Then-Gov. Rick Perry appointed Director Kibby in May 2011 for a term that expired Feb. 1, 2017. The governor appoints new directors or reappoints directors; however, Director Kibby is not eligible for reappointment because she is one of the directors who represents LCRA's electric service area outside the statutory district. Director Kibby will serve until a new director is sworn in.	Sandra Wright "Sandy" Kibby of New Braunfels is vice president of Wright Distributing Co., Inc. and vice president of the Wholesale Beer Distributors of Texas. A native of Bastrop, she also serves as vice president of the New Braunfels Chamber of Commerce Board of Directors and is a past member of the New Braunfels Women's Chamber of Commerce. She is a member of the Brauntex Performing Arts Theater advisory committee, the New Braunfels Foundation Trust, and a past member of the New Braunfels ISD Education Foundation. She is a past Board member of the National Beer Wholesaler Association and founder and past Board member of Calvary Episcopal School in Bastrop. She also received the New Braunfels Masonic Lodge's Community Builder Award. She is a graduate of The University of Texas.	Comal County (Represents LCRA's electric service area outside the statutory district)
Robert "Bobby" Lewis	Then-Gov. Rick Perry appointed Director Lewis to the Board in May 2013 for a term that expires Feb. 1, 2019.	Robert "Bobby" Lewis of Elgin is president of Elgin Veterinary Hospital Inc. He is a member of the American Veterinary Medical Association and Texas Equine Veterinary Association, a member and past president of the American Association of Equine Practitioners (AAEP), and Board chair and AAEP representative for the Racing Medication and Testing Consortium. Lewis served as president of the Texas Horse Racing Association and Texas State Board of Veterinary Medical Examiners, and is a past member of the Texas Veterinary Medical Association and The Breeder's Cup Board of Directors. Lewis attended Northwestern State University and received a Doctor of Veterinary Medicine from the Louisiana State University School of Veterinary Medicine.	Bastrop County
George W. Russell	Gov. Greg Abbott appointed Director Russell to the Board in May 2015 for a term that expires Feb. 1, 2021.	George W. Russell served three terms as mayor of Marble Falls, a position he held from 2009 to 2015. He previously served as the city manager of Georgetown and Marble Falls. Prior to his service as a city manager, he was director of Regional Administrative Services for the Texas Department of Health. He serves on the Texas Tech Hill Country Advisory Board, the Hill Country Children's Advocacy Center Board of Directors, and the Baylor Scott & White Hospital-Marble Falls Board of Directors, and is a Rotary Paul Harris Fellow. He also served in the National Guard from 1969 to 1976. Russell received a Bachelor of Business Administration from The University of Texas at Austin.	Burnet County

Member Name	Term/Appointment Dates /Appointed by	Qualifications	County
Franklin Scott Spears Jr.	Then-Gov. Rick Perry appointed Director Spears to the Board in 2007 and reappointed him in 2013 to a term that expires Feb. 1, 2019.	Franklin Scott Spears Jr. of Austin has been an attorney and partner with Arenson & Spears for more than 20 years. He is an AV-rated attorney, meaning that his peers have given him the highest possible rating for his legal ability and ethical standards. Spears is a member of the St. Mary's Law School Alumni Board and an advisory Board member of Ministry of Challenge. Additionally, he is a member of the Rotary Club of Austin, the State Bar of Texas, the Austin Bar Association and a past director of Austin Young Lawyers Association. He also is a member of the Tributary League, which supports the Colorado River Alliance. After graduation from law school, Spears began his legal career as a clerk for a U.S. district judge. He went on to serve as assistant attorney general of Texas from 1981 to 1983 and retired as a commander in the U.S. Navy Reserve, Judge Advocate General Corps, after 24 years of service. He received a bachelor's degree from The University of Texas and law degree from St. Mary's University.	Travis County
Martha Leigh M. Whitten	Gov. Greg Abbott appointed Director Whitten to the Board in May 2015 for a term that expires Feb. 1, 2021.	Martha Leigh M. Whitten is an owner and operator of Alamo Pecan & Coffee Company and Martin & Whitten Real Estate in San Saba. She serves on the San Saba City Council, the economic development corporation Board and the parks Board. After receiving her accounting degree from Texas A&M University, Whitten worked at Ernst & Whinney (now Ernst & Young), Whitten & Rennscheidt CPAs and Whitten & Williams CPAs. She also serves as the assistant treasurer for the First Baptist Church Stewardship Committee and on the Angel Tree Project for Needy Children.	San Saba County

B. Describe the primary role and responsibilities of your policymaking body.

Per LCRA Board Policy 102.201 – Responsibilities of the Board of Directors, “The Board of Directors (Board) will establish the overall goals and objectives of LCRA, review them on an ongoing basis and adopt Board policies setting forth desired direction of management actions to attain such goals and objectives. The Board will approve an annual business plan that provides funding for the realization of those goals and objectives. The Board will consider and establish policies in the public interest. The Board will faithfully discharge its public trust by conducting its affairs in a highly moral, ethical and sound business manner. Board members, collectively and severally, will not direct the policies and actions of LCRA from perspectives of private gain or personal advantage.”

Also, per LCRA’s bylaws, Section 2.01. Responsibilities, “Directors will represent the citizens of the district and LCRA's service area in accordance with the provisions of the enabling legislation, the Constitution and laws of the United States and the state of Texas. Directors will avoid conflicts of interest and conduct themselves so as to avoid even the appearance of a conflict of interest. Where a conflict of interest exists, a director will recuse himself or herself and neither participate in the deliberations nor vote. Directors will keep informed in order to competently discuss issues that come before the Board.

Directors will attend meetings regularly, be prepared, take an active part in discussions and maintain an active, diligent approach to Board responsibilities. The Board will have the responsibility for and the authority to establish the policies of LCRA for the management of its affairs and to direct the GM/CEO and, through the GM/CEO, the other officers and employees of LCRA to carry out adopted policies. The Board will exercise reasonable diligence to be assured that its directives and policies are carried out."

Additional details are available in the table below, which shows Board or committee actions required by Board policies and the time frames, deadlines and triggers for the actions.

Board	**When**	**Policy**
Review goals and objectives	ongoing	102
Approve business plan	annually	102
Evaluate performance of general manager/chief executive officer and general auditor and approve their goals for upcoming fiscal year	annually	107
Appoint independent auditors, with recommendations of Audit and Risk Committee and general auditor	annually	221
Approve business and capital plans	prior to start of each fiscal year	301
Review Policy 301 – Finance	periodically	301
Review and approve Policy 303 – Banking and Investments	annually	303
Executive Committee	**When**	**Policy**
Implement performance review process and complete written evaluation of general manager/chief executive officer	annually	107
Audit and Risk Committee	**When**	**Policy**
Conduct review of the Board support expenses	periodically	105
Implement performance review process and complete written evaluation of general auditor	annually	107
Review and approve audit plan	annually	221

C. How is the chair selected?

The governor designates one member of the LCRA Board as the chair of the LCRA Board pursuant to the LCRA enabling legislation. The chair serves at the pleasure of the governor.

D. List any special circumstances or unique features about your policymaking body or its responsibilities.

The LCRA Board of Directors is composed of 15 members appointed to six-year terms by the governor with advice and consent of the Texas Senate.

Twelve of LCRA's 15 directors represent the 10 counties in LCRA's statutory district in the lower Colorado River basin (San Saba, Llano, Burnet, Blanco, Travis, Bastrop, Fayette, Colorado, Wharton and Matagorda counties). Each of the 10 counties has one director, except for Travis, which has two. The remaining director's seat is an "at large" position that rotates among the other nine counties.

Three directors represent LCRA's electric service area outside the statutory district. These are "at large" positions that rotate among the counties in LCRA's electric service area.

E. In general, how often does your policymaking body meet? How many times did it meet in FY 2016? In FY 2017?

Unless otherwise authorized by a vote of the Board, the Board convenes in regular session no less than once each quarter. Special meetings of the Board may be called by the chair to be held at such times and at such places as the chair may deem proper.

There were eight Board meetings (including regular and special meetings) in each of FY 2016 and FY 2017. In addition, the Board held a work session each year to review LCRA's annual business and capital plans, and Board committees met on 10 days each year.

	FY 2016	FY 2017
Regular Board meetings	6	5
Special Board meetings	2	3
Board work session for the annual business and capital plans	1	1
Committee meetings	10	10

F. What type of training do members of your agency's policymaking body receive?

New Board members receive an ethics presentation by the general counsel, an overview of their Board responsibilities, and an in-depth orientation to LCRA, including topical briefings by executives and site visits. They also meet all training requirements related to the Texas Open Meetings Act and the Public Information Act.

Throughout the regular meetings of the Board and its committees, regular training presentations on governance responsibilities are provided by external experts. LCRA also provides for all Board members to attend local and regional meetings and conferences on water topics, e.g., Texas Water Conservation Association Conferences and conferences on Texas water law offered by various sponsors (State Bar of Texas, University of Texas, etc.) and general governance including National Association of Corporate Directors and Society for Corporate Governance.

G. Does your agency have policies that describe the respective roles of the policymaking body and agency staff in running the agency? If so, describe these policies.

Yes, LCRA has the following Board policies, which are available on our website:

LCRA Board Policies
101 – LCRA Mission Statement
102 – Authority and Responsibilities
103 – Public Information and Communication to the Board, and Executive Session
104 – Communication on Legislation
105 – Directors' Fees and Expense Reimbursement
106 – Ethics
107 – Process of Evaluating the General Manager/Chief Executive Officer and General Auditor
201 – Employment Practices
207 – Outside Legal Representation and Related Matters
209 – Environmental Stewardship
220 – Telecommunications
221 – Auditors
222 – Risk Management
301 – Finance
303 – Banking and Investments
308 – Purchasing Contracts
401 – Land Resources
403 – Community Services
404 – Grants and Economic Development
405 – Property Rights
501 – Water Resources
602 – LCRA Wholesale Power Customer Input
603 – Energy Transactions

H. What information is regularly presented to your policymaking body to keep them informed of your agency's performance?

LCRA's general manager/CEO is responsible for keeping the Board fully and currently informed of the business and activities of LCRA and for presenting policy issues to the Board for decision in a timely manner. Additional details are available in the table below, which shows actions required by Board policies and the responsible party, time frames, deadlines and triggers for the actions.

General Manager/Chief Executive Officer	When	Policy
Provide objectives, goals and priorities to Board	annually	102
Present business plan to Board for approval	annually	102
Provide updates on budget performance to Board	quarterly	102
Brief the Board on anticipated legislation that may be considered by the Legislature and potential impact on LCRA	prior to start of each regular session of Texas Legislature	104
Update the Board on significant legislative actions impacting LCRA	ongoing during legislative session	104
Provide to Board a report on significant legislation considered and/or enacted into law that impacts LCRA	upon completion of legislative session	104
Submit to Board a report on LCRA's efforts to accomplish the policy set out in Policy 201 – Employment Practices	annually	201
Provide updates on LCRA's risk management program to Board	twice per year	222
Provide updates on operational and financial performance to Board	quarterly	301
Provide to Board a report on financial provider and other related professional service provider contracts	annually	301
Submit to Board a report of activities related to the implementation of Section 8503.029, Texas Special District Local Laws Code, including management and use of the Agricultural Water Conservation Fund, the sufficiency of the separate charge to implement the requirements, and updated projections of anticipated water demands for customers subject to the requirements of Section 8503.029	at or before the April Board meeting	301
Review Policy 301 – Finance	periodically	301
Provide to Board a report on purchasing contracts	quarterly	308

General Auditor	**When**	**Policy**
Audit compliance with Policy 105 – Directors' Fees and Expense Reimbursement and present written results to Audit and Risk Committee	periodically	105
Provide to Audit and Risk Committee a written self-evaluation of past fiscal year's performance and goals for the next year	annually	107
Provide to Board a report on compensation and expenses paid to special counsel to Board	each quarter in which services are provided	207
Independent Auditor	**When**	**Policy**
Meet with Audit and Risk Committee	at least twice a year	221
Audit management controls and compliance with investments policy, and financial safekeeping and custodial system (as part of independent financial audit)	annually	303
General Counsel	**When**	**Policy**
Report to Board the name of firm and type of work for contracts for outside legal or related services	no later than 30 days after date of contract	207
Chief Financial Officer	**When**	**Policy**
Review Board Policy 301– Finance	periodically	301
Provide investment portfolio summary to Board	quarterly	303
Provide performance and portfolio reports to Board	quarterly	303
Report to Board any changes to the Texas Public Funds Investment Act	within 180 days after last day of regular session of Texas Legislature	303
Management and Staff	**When**	**Policy**
Prepare business and capital plans for Board approval	prior to start of each fiscal year	301
Communicate to Board any capital projects approved by the general manager/chief executive officer	quarterly	301
Provide to Board a report on activities of the Flood Recovery and Disaster Fund and the Agricultural Water Conservation Fund	annually	301

I. How does your policymaking body obtain input from the public regarding issues under the jurisdiction of the agency? How is this input incorporated into the operations of your agency?

LCRA has in place Board Policy 103 – Public Information and Communication to the Board, and Executive Session to ensure LCRA has procedures that provide the public the opportunity to provide timely input to the LCRA Board of Directors. As stated in the policy, "The LCRA Board values public input and will afford the public reasonable opportunity to provide written or oral comment on proposed Board actions. The Board will allow reasonable time for presentations and ensure consideration is shown to all members of the public attending any public meeting of the LCRA Board. The LCRA Board will conduct all of its meetings, including those in executive session, in compliance with the Texas Open Meetings Act." The Board also has adopted protocols for public participation in Board meetings. The protocols are available on LCRA's' website. In addition, as part of its enabling legislation, the LCRA Board is required to consult with an advisory committee regarding the use of its Agricultural Water Conservation Fund.

Board Policy 501 – Water Resources also includes a section on public input, stating "Implementation of new rates will be carried out within a time frame that attempts to minimize adverse impacts upon the customers of LCRA. All contract rules and rates will be presented to the LCRA Board of Directors for approval, and the public, including all water customers, will be afforded an opportunity to comment on such actions prior to the Board's consideration for approval."

J. If your policymaking body uses subcommittees or advisory committees to carry out its duties, fill in the following chart. See Exhibit 4 Example. In addition, please attach a copy of any reports filed by your agency under Government Code Chapter 2110 regarding an assessment of your advisory committees.

LCRA Board does not delegate responsibility to Board committees, and committees do not carry out duties of the Board of Directors. However, the Board is organized into seven standing committees, including Executive, Planning and Public Policy, Water Operations, Energy Operations, Audit and Risk, Finance, and Land and Community Resources committees. The duties and responsibilities of each committee, within its areas of oversight, are to: monitor management's operation of LCRA's business so as to ensure programs and policies adopted by the Board are implemented; evaluate, research and recommend programs and policies to the Board; and report to the Board on matters within its oversight.

Special committees, known as Ad Hoc Committees, may be appointed by the chair of the Board for specific purposes for a term not to extend beyond the term of the chair. In addition, before an election of a vice chair and secretary, the chair of the Board will appoint a Nominations Committee of no fewer than three sitting directors. The Nominations Committee will be charged with evaluating candidates for the vice chair and secretary positions and nominating a candidate for each position.

Lower Colorado River Authority
Board Committees

Name of Committee	Size/Composition/ How are members appointed?	Purpose/Duties	Legal Basis for Committee
Executive Committee	The Executive Committee will be composed of the Board officers and the chairs of the Audit and Risk Committee, the Finance Committee, the Water Operations Committee, and the Energy Operations Committee. The chair of the committee will be the chair of the Board.	The Executive Committee is responsible for assisting the Board in fulfilling its responsibilities with respect to the oversight of legal, personnel, employment, compensation plans, benefits programs, bylaw and Board policy revisions, and any other matters not expressly assigned to the other standing committees. The committee confers with the Board chair and GM/CEO on agendas for Board meetings.	Amended and restated bylaws of the Lower Colorado River Authority
Planning and Public Policy Committee	Each member of the Board will be an ex officio voting member of the Planning and Public Policy Committee. The chair of the committee will be the vice chair of the Board.	The Planning and Public Policy Committee has responsibility for evaluating strategies and briefings for future Board approval and long-range trends that will affect LCRA's business operations and the services LCRA will provide to its customers over a 20-30 year planning horizon.	Amended and restated bylaws of the Lower Colorado River Authority
Water Operations Committee	Each member of the Board will be an ex officio voting member of the Water Operations Committee.	The Water Operations Committee is responsible for assisting the Board in fulfilling its responsibilities with respect to oversight of all aspects of the water operations of LCRA, including water rate setting, flood management within the Colorado River basin, and providing an adequate supply of clean water for municipal, agricultural, industrial and other uses. The committee has oversight of water conservation and drought contingency matters and all environmental protection and pollution control matters within the jurisdiction of LCRA.	Amended and restated bylaws of the Lower Colorado River Authority
Energy Operations Committee	Each member of the Board will be an ex officio voting member of the Energy Operations Committee.	The Energy Operations Committee is responsible for assisting the Board in fulfilling its responsibilities with respect to oversight of energy generation and rate setting, supply, commercial operations, and wholesale electric customer relationships.	Amended and restated bylaws of the Lower Colorado River Authority
Audit and Risk Committee	The Audit and Risk Committee will have no more than six members, including at least one Board officer. The Board chair will appoint up to six committee members, naming one of them as the chair of the committee, all subject to the approval of the Board.	The Audit and Risk Committee is responsible for assisting the Board in fulfilling its responsibilities with respect to the oversight of scope and results of audits, including approval of audit plans, the adequacy and effectiveness of risk management and internal controls, LCRA's safety and security procedures, directors' expenses, accounting policy, insurance (excluding employee benefit programs), risk management processes, and information technology. The committee will meet with the independent auditors appointed by the Board and will approve any changes to the scope of the independent auditors' services.	Amended and restated bylaws of the Lower Colorado River Authority

Name of Committee	Size/Composition/ How are members appointed?	Purpose/Duties	Legal Basis for Committee
Finance Committee	The Finance Committee will have no more than six members, including at least one Board officer. The Board chair will appoint up to six committee members, naming one of them as the chair of the committee, all subject to the approval of the Board.	The Finance Committee is responsible for assisting the Board in fulfilling its responsibilities with respect to oversight of all financial and budgetary matters, expenditures of funds, and employee pension plans. The committee has oversight of the financial adequacy of LCRA's electric generation and water rates and the formation and performance of the annual business plan and budget.	Amended and restated bylaws of the Lower Colorado River Authority
Land and Community Resources Committee	The Land and Community Resources Committee will have no more than six members, including at least one Board officer. The Board chair will appoint up to six committee members, naming one of them as the chair of the committee, all subject to the approval of the Board.	The Land and Community Resources Committee is responsible for assisting the Board in fulfilling its responsibilities with respect to the efficient use and management of lands held by LCRA. The committee oversees LCRA's land management strategies and all recreational facilities. The committee also is responsible for overseeing LCRA's community assistance programs.	Amended and restated bylaws of the Lower Colorado River Authority

V. Funding

A. Provide a brief description of your agency's funding.

LCRA generates revenue by selling electricity, electric transmission and water services; LCRA neither levies taxes nor receives state appropriations.

B. List all riders that significantly impact your agency's budget.

LCRA does not receive appropriations from the state; therefore, this question is not applicable.

C. Show your agency's expenditures by strategy.

As LCRA is not a state agency, we are providing our fiscal year 2017 business and capital plans for our Water business unit.

LCRA's Goal and Strategies – Water

Goal: Increase and preserve the region's water supplies.

Strategies:

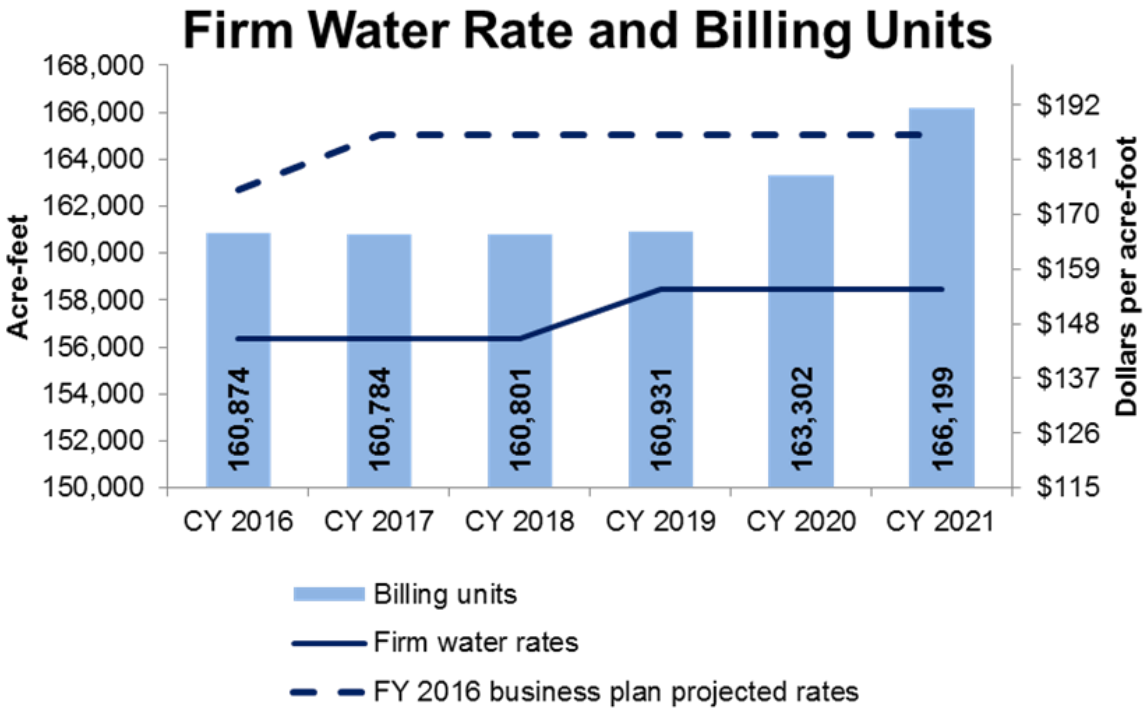
- Expand the region's water supplies by constructing the Lane City Reservoir and pursuing additional future water development opportunities.
- Minimize costs for customers by:
  - Efficiently operating and maintaining equipment and infrastructure.
  - Identifying new, cost-effective sources of water supply for the region.
  - Pursuing low-cost, innovative measures – including grants and loans – to pay for new water supplies.
  - Working toward full recovery of all costs associated with providing water for downstream interruptible customers.
- Implement the state-approved Water Management Plan, including providing water and managing the river under the provisions of the plan. Work with existing and future customers to meet their long-term water needs.
- Maintain and invest in LCRA's system of dams to ensure their continued safe and effective operation, which is critical for water supplies in the basin.
- Monitor and protect the water quality and the health of the lower Colorado River basin. Obtain the data and analysis necessary to do this.
- Focus on water conservation with programs such as:
  - Teaming with municipal customers on cost-sharing grants and rebates for conservation projects.
  - Providing irrigation evaluations for domestic water users.
  - Providing technical assistance and review of customer water conservation and drought contingency plans.

Water – Firm Billing Units and Rates

LCRA lowered the firm water rate to $145 per acre-foot starting with the January 2016 billing period. Lane City Reservoir financing costs are excluded from the firm water rate.

Managing costs under a lower firm water rate:

- Billing units are forecast to be flat through calendar year 2019 and then grow about 1.5 percent annually.
- Lane City Reservoir financing costs are excluded from the firm water rate during the planning horizon.
- Future funding for new regional water supply projects is still being developed.
- The firm water rate is projected to increase to $155 per acre-foot beginning January 2019 to fund the ongoing rehabilitation projects at the Mansfield and Buchanan water supply dams.



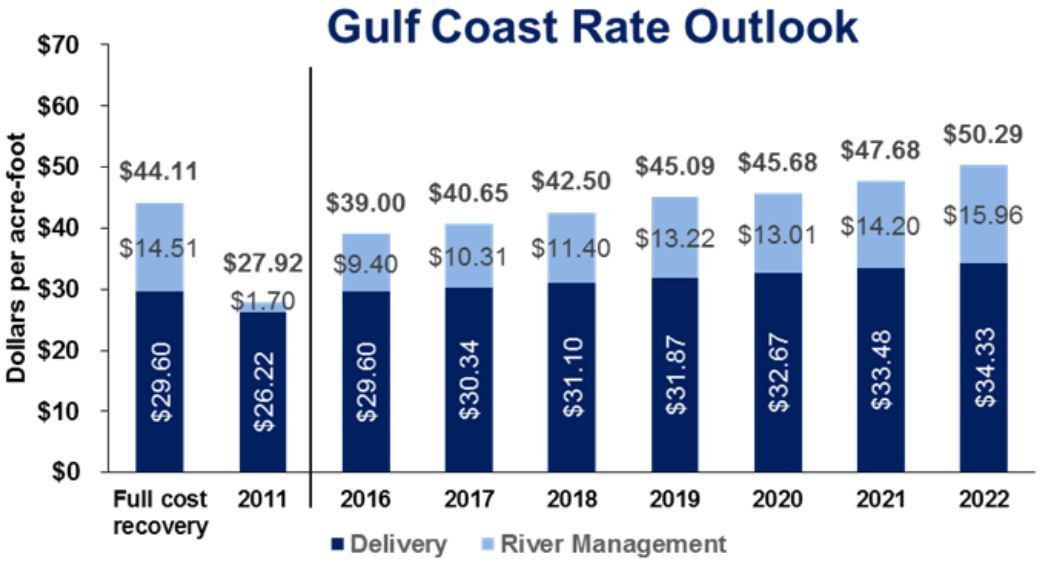
Note: Water supplies managed by LCRA are divided into firm and interruptible water. Firm water is available even during a severe drought. During water shortages, interruptible water is cut back or cut off.

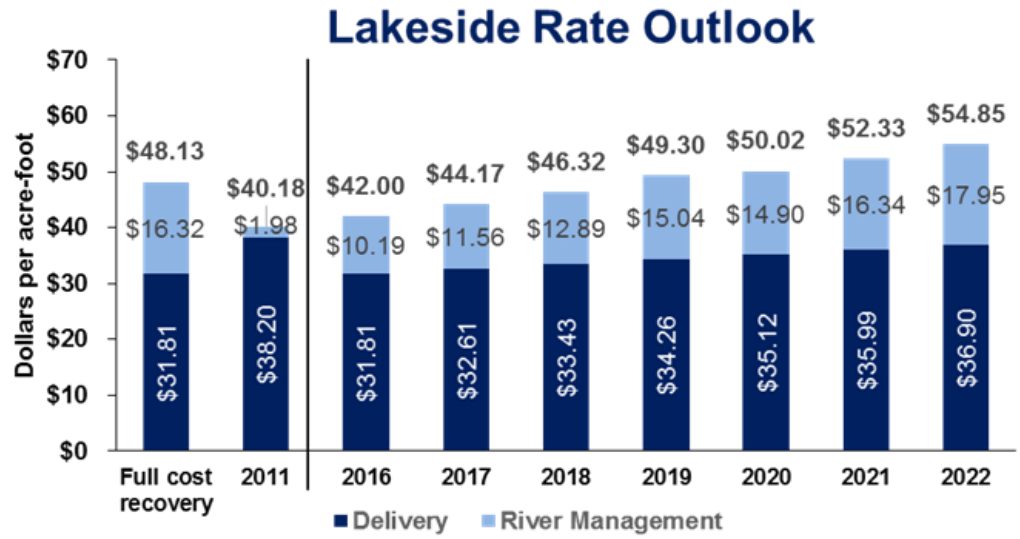
Water – Interruptible Rates

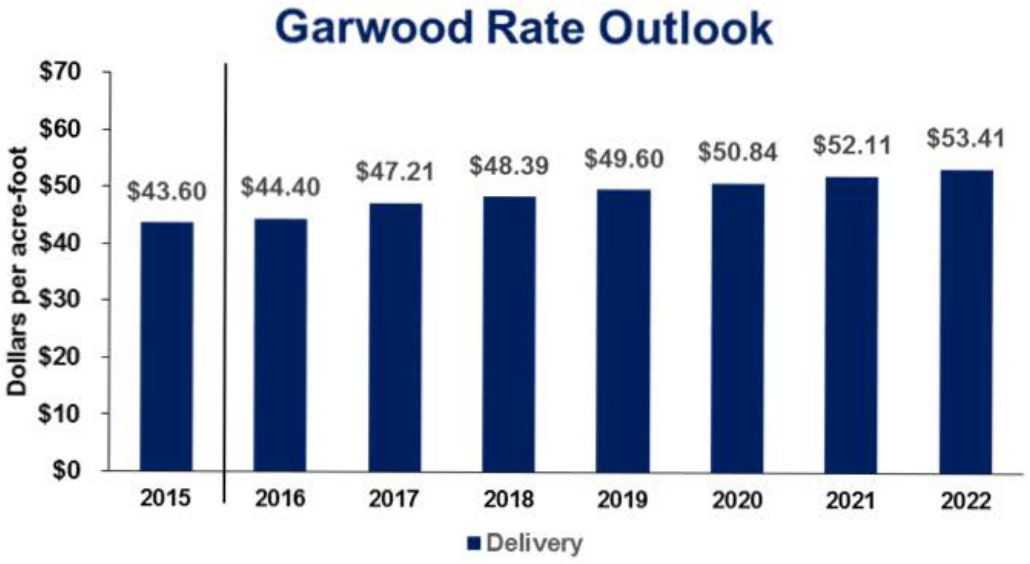
Interruptible sales to Gulf Coast, Lakeside and Pierce Ranch resumed in 2016.

Full cost recovery assumes a gradual approach:

- Rates for calendar year 2016 were approved by the Board in December 2015.
- Calendar year rates for Gulf Coast, Lakeside and Garwood irrigation divisions are projected to increase to recover all delivery costs and gradually recover allocated share of river management costs by calendar year 2022, assuming full water availability.



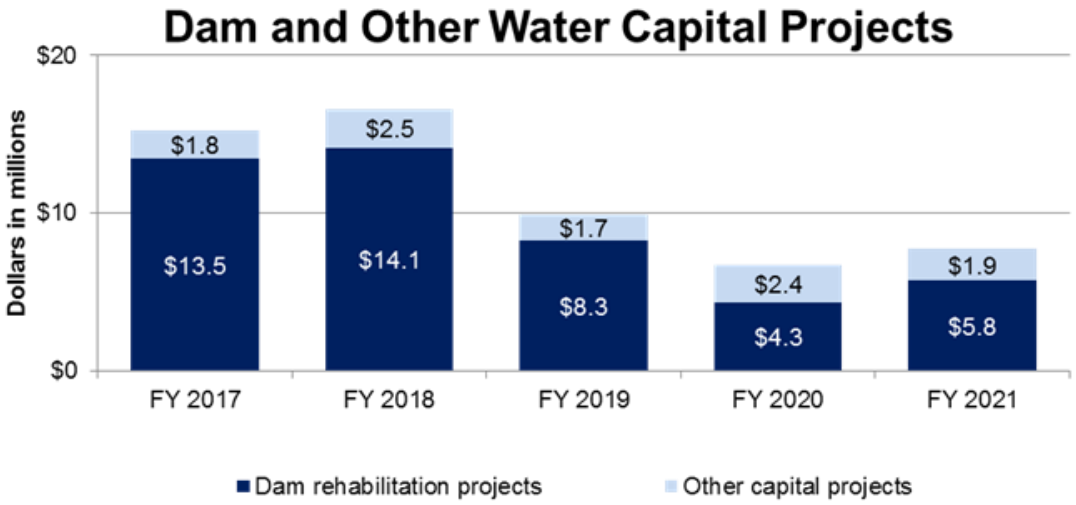



Garwood Rate Outlook
Dollars per acre-foot
$70
$60
$50
$40
$30
$20
$10
$0
$43.60
$44.40
$47.21
$48.39
$49.60
$50.84
$52.11
$53.41
2015
2016
2017
2018
2019
2020
2021
2022
Delivery

Water – Capital

Dam rehabilitation and other capital projects:

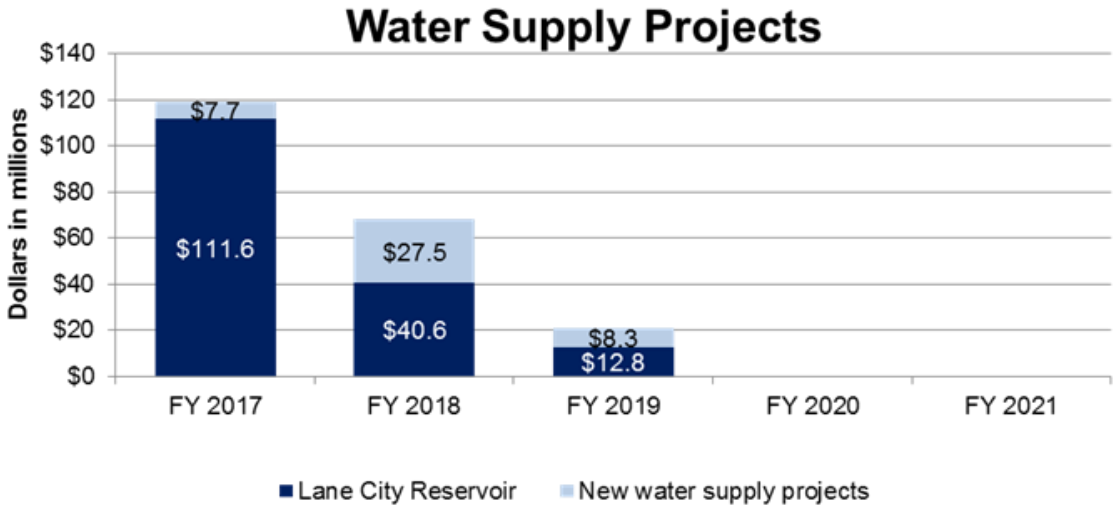
- LCRA planned to spend $46 million from FY 2017 to FY 2021 on dam rehabilitation projects for their safe and effective operation.
- As the projects continue, the costs to rehabilitate the dams could increase.
- LCRA will issue debt to pay for these projects and recover the costs in the firm water rate.



Note: Other capital projects include capital for irrigation and minor capital needs for Water.

New water supply capital projects:

- Capital costs for the Lane City Reservoir will continue through FY 2019, but the financing costs are excluded from the firm water rate for the first 20 years.
- LCRA planned to spend more than $43 million from FY 2017 to FY 2021 for new regional water supply projects prior to the construction phases (e.g., permitting, engineering, etc.), which will be debt-funded.
- Timing and funding for the construction phases have not yet been identified.



Water – Financial Summary

Providing long-term water supply at a lower rate.

Financial summary:

- FY 2017 revenues reflect the firm rate of $145 per acre-foot.
- A portion of firm revenues is deferred to a rate stabilization fund, which is excluded from revenues until the fund is used.
- The financial summary assumes agricultural water deliveries in every year.
- Annual debt service includes the Texas Water Development Board Lane City Reservoir debt, paid from the Resource Development Fund.

(Dollars in millions)	Budgeted	Proposed	Forecast			
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Water Revenues						
Firm Water	$ 28.2	19.4	20.3	22.8	23.7	23.3
Agricultural	4.3	11.5	12.0	12.6	13.4	13.4
Other	3.3	3.3	3.3	3.3	3.4	3.4
Total Water Revenues	35.8	34.2	35.6	38.7	40.5	40.1
Operations and Maintenance	14.3	17.7	17.6	17.9	19.2	17.9
Net Operating Margin	21.5	16.5	18.0	20.8	21.3	22.2
Plus: Interest Income	0.0	0.0	0.2	0.5	0.6	0.6
Less: Assigned Enterprise Expense	4.8	3.9	4.8	5.0	5.1	5.2
Public Service Fund	1.1	1.0	1.1	1.1	1.2	1.2
Net Margin Available for Debt Service	15.7	11.6	12.4	15.1	15.6	16.5
Debt Service	$ 18.9	14.7	15.5	18.8	18.2	20.6
Debt Service Coverage	0.83x	0.79x	0.80x	0.80x	0.86x	0.80x
Plus: Resource Development Fund	11.6	10.2	10.2	10.2	10.7	13.0
Debt Service Coverage Adjusted	1.44x	1.48x	1.46x	1.34x	1.44x	1.43x

Note: The Water financial summary includes water and wastewater utilities, which LCRA is phasing out due to the divestiture of the assets.

Water Projects

Water projects in the capital plan included capital improvements for managing and delivering raw water and for water utilities. The plan focused resources on managing the river, improving infrastructure – including LCRA's Hydromet system – and planning to meet the basin's future water needs. The plan also assumed the June 2016 status of the sale agreements for LCRA's then-remaining water and wastewater utilities. Therefore, it only included water utility capital expenditures that supported the continued reliable operation of, or fulfilled regulatory requirements for, the remaining systems and the systems that were being purchased by Corix Utilities (Texas), pending completion of the sale, transfer and merger process.

Water recommended and approved projects totaled $130.7 million in FY 2017 and $212.3 million over the five-year period through FY 2021. Future projects totaled $52.3 million through FY 2021.

FY 2017 Recommended Projects

- **Dam Instrumentation Raw Water** – The dams LCRA operates for water supply, hydroelectric generation and power plant cooling must be monitored continually for dam safety compliance. Instruments are installed in the dam to evaluate the stability of the dam, which may be affected by uplift forces under the dam's base. The recommended project scope is to install instruments at Buchanan Dam to measure hydrostatic pressures under the dam, collect the measurement data and transmit the data to a central repository.
- **Gulf Coast Plant No. 1 Intake and Banks** – Gulf Coast Plant No. 1 distributes water to the OXEA Corporation chemical plant – a firm water customer – and to interruptible water customers irrigating about 8,000 acres of farmland. The intake structure houses two vertical turbine pumps, which pump water from the Colorado River into the canals. Significant erosion on the bank of the Colorado River immediately adjacent to the Gulf Coast Plant Number 1 threatens surface level infrastructure, such as roads, fences and existing sheet piling walls. Continued erosion would create safety concerns and threaten the building's structural integrity. The recommended project scope is to reconstruct the sheet piling retaining wall to eliminate these problems.
- **Oyster Lake Gates** – The Gulf Coast Irrigation Division has a serviceable area of 490 square miles and 350 miles of managed canals. Water is conveyed and controlled through the canal system using manually operated lock structures and gates built in the 1920s and 1930s. This operation is inefficient with frequent spillages of water. The recommended project scope is to retrofit and install 17 lock structures consisting of aluminum slide gates for 12 sites with actuators and instrumentation for automatic control; a fully automated system with level monitoring instrumentation; a spill monitoring site; and a radio-based data communication system. The project scope also includes incorporating the new gate data communication system into the existing supervisory control and data acquisition (SCADA) system. Automating new aluminum lock structures will decrease loss of water over the gates and eliminate staff time to reposition gates.

- **General Additions** – General addition projects will maintain infrastructure and improve reliability and efficiency for the following: Hydromet; Irrigation; Raw Water; and Water Utilities.
- **Minor Capital** – The scope of minor capital projects is to purchase equipment that, essentially, is ready to place in service upon delivery for the following: Hydromet; Irrigation; and Raw Water.

Water
FY 2017 Capital Plan Recommended and Approved Projects
(Dollars in thousands)

Project Name	Contingency	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Five-Year Total	Lifetime
Recommended								
Raw Water								
Dam Instrumentation Raw Water	15%	765	-	-	-	-	765	765
General Additions – Hydromet – FY 2017	0%	30	-	-	-	-	30	30
General Additions – Irrigation Systems – FY 2017	0%	420	-	-	-	-	420	420
General Additions – Raw Water – FY 2017	0%	200	-	-	-	-	200	200
Gulf Coast Plant Number 1 Intake and Banks	9%	300	-	-	-	-	300	300
Oyster Lake Gates	6%	400	-	-	-	-	400	400
Minor Capital – Hydromet – FY 2017	0%	98	-	-	-	-	98	98
Minor Capital – Irrigation – FY 2017	0%	292	-	-	-	-	292	292
Minor Capital – Raw Water – FY 2017	0%	35	-	-	-	-	35	35
Water Utility								
General Additions – FY 2017	0%	12	-	-	-	-	12	12
Recommended Subtotal		2,552	-	-	-	-	2,552	2,552
Approved								
Raw Water								
Buchanan Dam Spalling Concrete Rehabilitation – Phase 3	7%	3,009	2,819	3,493	3,165	4,967	17,453	36,000
Buchanan Floodgate Rehabilitation – Phase 2	14%	8,013	6,405	3,906	-	-	18,324	50,072
Buchanan Intake Structure	9%	810	-	-	-	-	810	1,119
New Regional Water Supply Projects - Phase 1 (formerly Integrated Water Projects – Phase 1)	0%	3,891	-	-	-	-	3,891	6,179
Lane City Reservoir	10%	111,562	40,644	12,789	-	-	164,995	250,000
Mansfield Dam Paradox Gate Rehabilitation – Phase 2	7%	859	893	861	851	808	4,272	10,416
Approved Subtotal		128,144	50,761	21,049	4,016	5,775	209,745	353,786

Water
FY 2017 Capital Plan Future Projects
(Dollars in thousands)

Project Name	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Five-Year Total	Lifetime
Future							
Raw Water							
Buchanan 7 Gate Deck and Hoist Recoating	-	500	-	-	-	500	500
General Additions – Irrigation Systems	-	565	455	455	255	1,730	1,730
General Additions – Raw Water	-	390	200	300	-	890	890
Gulf Coast Plant No. 1 – Pumps 1 and 2	-	-	-	700	-	700	700
Gulf Coast Wadsworth Gates	-	365	-	-	-	365	365
New Regional Water Supply Projects - Phase 2 (formerly Integrated Water Projects – Phase 2)	3,775	27,453	8,281	-	-	39,509	39,509
Irrigation Supervisory Control and Data Acquisition System	-	235	257	-	-	492	492
Lakeside Automated Gates	-	-	-	370	370	740	1,850
Lakeside Canal Easement Acquisition	-	-	300	300	300	900	1,200
Lakeside Lake Plant Building Office and Meeting Room	-	-	-	-	300	300	300
Lakeside Lake Plant Variable Frequency Drive and Switch Gear Building	-	500	-	-	-	500	500
Mansfield Dam Bridge and Structures	-	2,230	-	-	-	2,230	2,230
Mansfield Dam Dehumidification System	-	500	-	-	-	500	500
Mansfield Dam Floodgate Hydraulic Piping	-	785	-	-	-	785	785
Minor Capital – Hydromet	-	167	167	167	167	668	668
Minor Capital – Irrigation	-	250	287	375	555	1,467	1,467
Future Subtotal	3,775	33,940	9,947	2,667	1,947	52,276	53,686
Total Water	**134,471**	**84,701**	**30,996**	**6,683**	**7,722**	**264,573**	**410,024**

Water Financial Table

(Dollars in millions)	Budgeted	Proposed	Forecast			
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Revenues						
Firm water	$ 28.2	19.4	20.3	22.8	23.7	23.3
Agricultural	4.3	11.5	12.0	12.6	13.4	13.4
Other	3.3	3.3	3.3	3.3	3.4	3.4
Total Revenues	35.8	34.2	35.6	38.7	40.5	40.1
Operations and Maintenance	14.3	17.7	17.6	17.9	19.2	17.9
Net Operating Margin	21.5	16.5	18.0	20.8	21.3	22.2
Plus: Interest Income	0.0	0.0	0.2	0.5	0.6	0.6
Less: Assigned Enterprise Expense	4.8	3.9	4.8	5.0	5.1	5.2
Public Service Fund	1.1	1.0	1.1	1.1	1.2	1.2
Net Margin Available for Debt Service	15.7	11.6	12.4	15.1	15.6	16.5
Debt Service	$ 18.9	14.7	15.5	18.8	18.2	20.6
Debt Service Coverage	0.83x	0.79x	0.80x	0.80x	0.86x	0.80x
Plus: Resource Development Funding	11.6	10.2	10.2	10.2	10.7	13.0
Adjusted Debt Service Coverage	1.44x	1.48x	1.46x	1.34x	1.44x	1.43x
Net Margin After Debt Service	$ 8.4	7.1	7.1	6.5	8.1	8.9
Less:						
Operating Reserves	0.1	0.0	0.2	0.1	0.3	0.0
Assigned Enterprise Capital	0.7	0.8	0.8	0.5	0.7	0.5
Revenue-Funded Capital	2.6	4.4	4.1	3.9	5.1	6.4
Restricted for Capital/Debt Retirement	3.1	0.0	0.0	0.0	0.1	0.1
Noncash Revenues	1.9	1.9	1.9	1.9	1.9	1.9
Net Cash Flow	$ 0.0	0.0	0.0	0.0	0.0	0.0

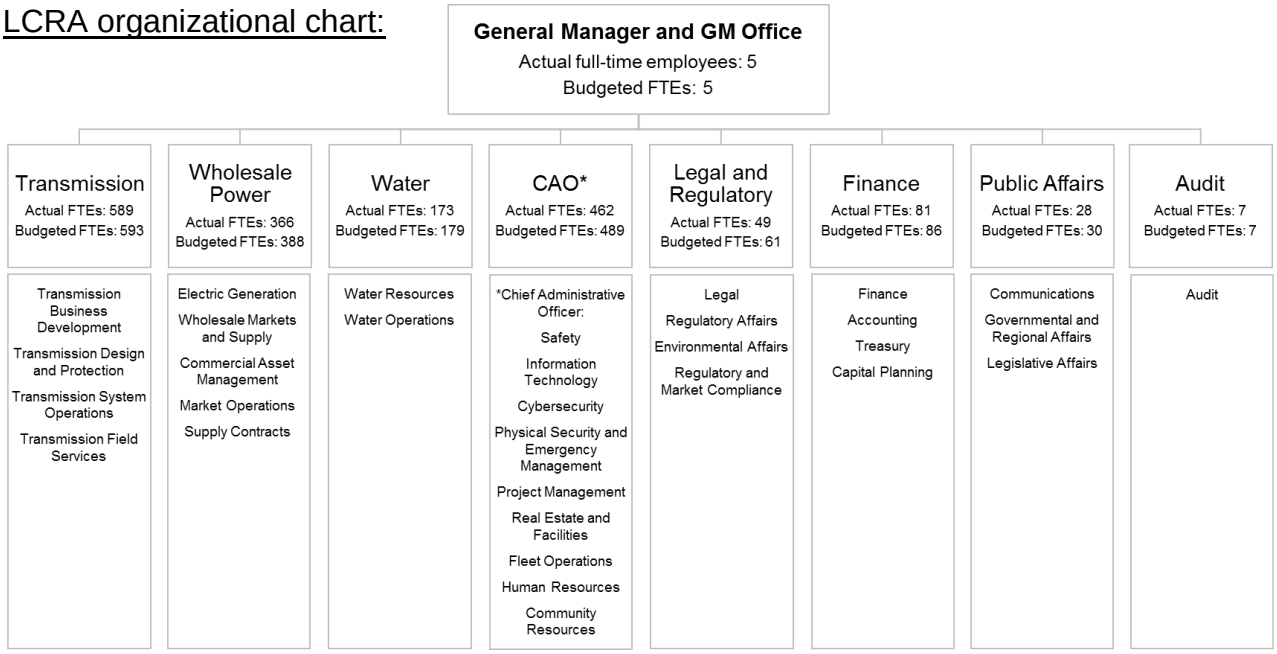
Note: The Water financial summary includes water and wastewater utilities, which LCRA is phasing out due to the divestiture of the assets.

VI. Organization

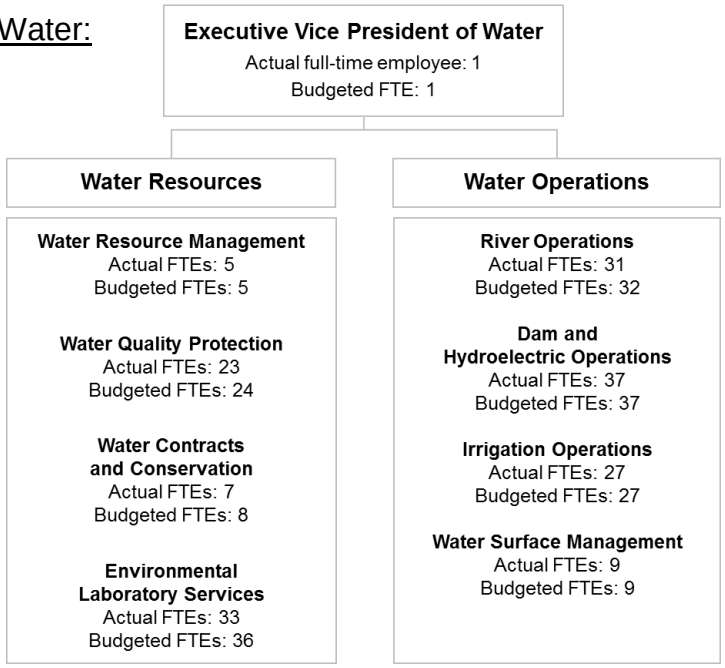
A. Provide an organizational chart that includes major programs and divisions, and shows the number of FTEs in each program or division. Detail should include, if possible, Department Heads with subordinates, and actual FTEs with budgeted FTEs in parenthesis.

The organizational charts and all data in this section are as of June 30, 2016, which reflects the end of LCRA's fiscal year 2016.

LCRA organizational chart:



Additional details for Water:



B. If applicable, fill in the chart below listing field or regional offices.

Lower Colorado River Authority
Full-time Employees by Location – FY 2016

Headquarters, Region or Field Office	Location	Co-Location? Yes / No	Number of Budgeted FTEs FY 2016	Number of Actual FTEs as of June 30, 2016
Water	Multiple locations in Texas; see below for details	Yes	179	173
Water Leadership	Austin	Yes	1	1
Water Resource Management	Austin	Yes	5	5
Water Quality Protection	Austin and Marble Falls	Yes	24	23
Water Contracts and Conservation	Austin	Yes	8	7
River Operations	Buchanan Dam, La Grange and Austin	Yes	32	31
Dam and Hydroelectric Operations	Buchanan Dam, Austin, Marble Falls and Granite Shoals	Yes	37	37
Irrigation Operations: Lakeside, Gulf Coast and Garwood Irrigation Divisions	Eagle Lake, Bay City and Garwood	Yes	27	27
Water Surface Management	Austin and Marble Falls	Yes	9	9
Environmental Laboratory Services	Austin	Yes	36	33
Wholesale Power	Multiple locations in Texas	Yes	388	366
Transmission	Multiple locations in Texas	Yes	593	589
Enterprise Support and Community Resources	Multiple locations in Texas	Yes	678	632
Total			**1,838**	**1,760**

C. What are your agency's FTE caps for fiscal years 2016–2019?

LCRA does not receive appropriations from the state; therefore, we do not have FTE caps. However, we have Board-approved business plans that include positions:

Fiscal Year	Number of Positions	Notes
FY 2016	1,838	Contained in Board-approved FY 2016 business plan
FY 2017	1,891	Contained in Board-approved FY 2017 business plan
FY 2018	1,914	Contained in Board-approved FY 2018 business plan
FY 2019	1,914	Projected for FY 2019 in LCRA's FY 2018 business plan

D. How many temporary or contract employees did your agency have as of August 31, 2016? Please provide a short summary of the purpose of each position, the amount of expenditures per contract employee, and the procurement method of each position.

LCRA had eight temporary workers supporting our water supply and flood management functions as of June 30, 2016.

Number of Temporary Workers	Purpose	Expenditures	Procurement Method
2	Supporting work in the Irrigation Operations area	Varied based on hours worked and length of assignment Hourly bill rate for each temporary worker was $24.48	Competitively bid contract
6	Supporting work in the Dam and Hydroelectric Operations area	Varied based on hours worked and length of assignment Hourly bill rate ranged from $14.50 to $17.40	Competitively bid contract

E. List each of your agency's key programs or functions, along with expenditures and FTEs by program.

Lower Colorado River Authority
List of Program Budgeted and Actual FTEs – FY 2016

Program/Functional Area		Number of Budgeted FTEs FY 2016	Number of Actual FTEs as of June 30, 2016
Water		179	173
	Water Leadership	1	1
	Water Resource Management	5	5
	Water Quality Protection	24	23
	Water Contracts and Conservation	8	7
	River Operations	32	31
	Dam and Hydroelectric Operations	37	37
	Irrigation Operations: Lakeside, Gulf Coast and Garwood Irrigation Divisions	27	27
	Water Surface Management	9	9
	Environmental Laboratory Services	36	33
Wholesale Power		388	366
Transmission		593	589
Enterprise Support and Community Resources		678	632
Total		**1,838**	**1,760**

See Section V. Funding for information on Water expenditures.

VII. Guide to Agency Programs

Complete this section for **each** agency program (or each agency function, activity, or service if more appropriate). Copy and paste the questions as many times as needed to discuss each program, activity, or function. Contact Sunset staff with any questions about applying this section to your agency.

A. Provide the following information at the beginning of each program description.

Name of Program or Function: Managing Water Supply and Flood Operations of the Highland Lakes
Location/Division: The lower Colorado River, Highland Lakes, six dams, river operations and LCRA water staff
Contact Name: John Hofmann, Executive Vice President of Water
Actual Expenditures, FY 2017: See Section V. Funding
Number of Actual FTEs as of June 30, 2016: 173
Statutory Citation for Program: See Section VIII. Statutory Authority and Recent Legislation.

B. What is the objective of this program or function? Describe the major activities performed under this program.

Water Supplies: Central Texas is subject to droughts, as discussed in Section II. Lakes Buchanan and Travis serve as water supply reservoirs, storing water for communities, industries, agriculture and the environment.

- Together, the two lakes can hold 2.01 million acre-feet of water. (An acre-foot, which is equal to 325,851 gallons of water, is the amount of water it would take to cover 1 acre 1 foot deep.)
- Water levels can fluctuate significantly on lakes Buchanan and Travis – going up during floods and down during droughts. The levels of these lakes go down as water is used by customers, released for the environment or evaporates in hot and windy weather.
- Nature causes droughts and only nature can end a drought. Rain is needed to feed the rivers and streams that flow into the lakes.

Managing Floods: Central Texas, known as “Flash Flood Alley,” is home to frequent and sudden heavy rains and flooding. While the six dams that create the Highland Lakes were built to help manage floods, Mansfield Dam is the only dam in the Highland Lakes designed to hold back floodwaters.

- The dams upstream of Lake Travis pass floodwaters downstream to Lake Travis.
- Water is stored temporarily in the Lake Travis flood pool until LCRA can release it downstream in a controlled manner.
- Floodwaters below Lake Travis flow along the Colorado River to Matagorda Bay.

C. What evidence can you provide that shows the effectiveness and efficiency of this program or function? Provide a summary of key statistics and outcome performance measures that best convey the effectiveness and efficiency of this function or program. Also please provide a short description of the methodology behind each statistic or performance measure.

Please see answers provided in answers to Section II, question C.

D. Describe any important history regarding this program not included in the general agency history section, including how the services or functions have changed from the original intent.

The dams that create the Highland Lakes were built to create and manage water supply. The operation of the lakes and dams still fulfill their necessary and original intents.

The establishment of the Hydromet gauging system (discussed in Section II) throughout the watershed and improved modeling tools, combined with over 70 years of data on inflows, weather and lake levels, has provided LCRA with improved ability to predict and respond to floods and manage the water supply through severe droughts. We built our original Hydromet system of 74 river and weather gauges in the early 1980s. Since then, LCRA has expanded and upgraded the network with additional gauges and more powerful computers and state-of-the-art equipment to transmit Hydromet data over LCRA's radio system.

Since the 1980s, LCRA has had a water conservation program for our raw water customers to encourage more efficient use of the overall water supply. As communities were created and grew around the Highland Lakes, LCRA implemented water quality programs as well as programs to provide for the public's safety on the water surface and better manage floods.

E. Describe who or what this program or function affects. List any qualifications or eligibility requirements for persons or entities affected. Provide a statistical breakdown of persons or entities affected.

LCRA's water supply serves firm and interruptible water customers throughout the lower Colorado River basin as well as helping to meet environmental needs. The water supplies LCRA provides benefit more than a million people as well as businesses, industry, agriculture and the environment in the Colorado River basin. Firm water customers are primarily municipalities and industries; interruptible water customers are primarily agricultural users in Colorado, Wharton and Matagorda counties. The flood management purpose of the Highland Lakes protects lives and property along the Highland Lakes, in Austin and in other downstream communities. We have provided a list of water customers in Section II.

F. Describe how your program or function is administered, including a description of the processes involved in the program or function. Include flowcharts, timelines, or other illustrations as necessary to describe agency policies and procedures. Indicate how field/regional services are used, if applicable.

LCRA's water rights, customer demands, the TCEQ-approved Water Management Plan and federal rules governing operations during floods largely dictate conditions under which LCRA releases water from the lakes it manages. These releases are managed by LCRA's River Operations Center in Austin. Daily decisions for water releases are planned and executed by LCRA hydrologists pursuant to policies and procedures. During flood operations, water releases are planned according to LCRA's flood policies, which are based on Army Corp of Engineers requirements at Lake Travis as well as the Federal Emergency Management Agency requirements at Lake Buchanan.

G. Identify all funding sources and amounts for the program or function, including federal grants and pass-through monies. Describe any funding formulas or funding conventions. For state funding sources, please specify (e.g., general revenue, appropriations rider, budget strategy, fees/dues).

LCRA's water operations are supported primarily through the sale of firm and interruptible water. Rates for these water customers are described in Section V. LCRA also has received some state and federal funds (such as Texas Water Development Board grants) for water conservation projects and money from the federal Clean Rivers Program for water quality.

LCRA also collects a surcharge on out-of-basin water sales to the Brazos River Authority in Williamson County, consistent with requirements in Section 8503.030 of LCRA's enabling legislation.

H. Identify any programs, internal or external to your agency, that provide identical or similar services or functions to the target population. Describe the similarities and differences.

LCRA is the sole provider of raw (untreated) surface water supply and flood management programs on the lower Colorado River below the confluence of Coleman, Brown and McCulloch counties. Smaller flood control structures constructed with funds from the U.S. Department of Agriculture in smaller tributary watersheds in the lower basin typically are managed by local districts.

I. Discuss how the program or function is coordinating its activities to avoid duplication or conflict with the other programs listed in Question H and with the agency's customers. If applicable, briefly discuss any memorandums of understanding (MOUs), interagency agreements, or interagency contracts.

LCRA is sole provider of raw (untreated) surface water supply and flood management programs on the lower Colorado River below the confluence of Coleman, Brown and McCulloch counties. LCRA's Emergency Management team notifies local emergency officials when floodgates are opened. Local officials – under their jurisdiction – make the

decisions to close roads or evacuate neighborhoods. LCRA updates local emergency officials through briefings over the Emergency Management Radio Network, which uses LCRA's 900-MHz radio system. NOAA Weather Radio All Hazards broadcasts alert the public to flood watches and warnings. LCRA rebroadcasts NOAA radio on AM 1610 near the Highland Lakes and on AM 1670 along the Colorado River downstream of Austin. LCRA staff also assists entities that are leading emergency response efforts. We follow the National Incident Management System, which is a comprehensive, national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines.

J. If the program or function works with local, regional, or federal units of government, include a brief description of these entities and their relationship to the agency.

As mentioned earlier, LCRA manages our water supply according to our state-issued water rights and the TCEQ-approved Water Management Plan that governs operations of lakes Buchanan and Travis, and operates the dams during flood conditions according to Army Corps of Engineers and Federal Emergency Management Agency requirements. Further, LCRA is an active participant in the regional and state water planning process as a member and administrator of the Region K Water Planning Group in cooperation with the Texas Water Development Board. We also participate, when appropriate, in state and federal financing programs for water projects.

Historically, LCRA has collaborated with TCEQ, the Texas Parks and Wildlife Department, and other resources agencies related to the environmental flow needs of the Colorado River and Matagorda Bay.

K. If contracted expenditures are made through this program please provide:

- **A short summary of the general purpose of those contracts overall:**

The general purpose of the contracts is to purchase goods and services to support the needs of LCRA’s Water business unit and departments.

- **The amount of those expenditures in fiscal year 2016:**

Water spending was about $43.6 million in FY 2016.

- **The number of contracts accounting for those expenditures:**

Seventy-six contracts accounted for those expenditures.

- **The method used to procure contracts:**

For purchases for $15,000 or less, LCRA agents are responsible for ensuring they are paying fair and reasonable prices and receiving good value for purchases. Where strong market competition exists, LCRA agents are encouraged to have vendors compete for the transaction.

Purchases exceeding $15,000 require full competition. Under full competition, the purchase is awarded as a result of a competitive process, which may be informal or formal. Formal competition is required for all purchases exceeding $100,000.

- **Top five contracts by dollar amount, including contractor and purpose:**

The top five contracts by the amount LCRA's Water business spent in FY 2016 are listed below. These contracts may not be exclusive to LCRA's Water business.

- Phillips & Jordan Inc. $28,491,000.00 (Lane City Reservoir construction contractor)
- Barnard Construction Company Inc. $3,176,646.37 (Lane City Reservoir construction manager at risk: preconstruction services, mobilization and construction of the test embankment)
- Brace Industries Inc. $2,273,635.15 (scaffolding)
- CH2M Hill Inc. $2,181,726.28 (Lane City Reservoir engineer)
- Freese & Nichols Inc. $1,123,315.90 (dam safety, dam design and water resources engineering)
- **The methods used to ensure accountability for funding and performance:**

LCRA ensures accountability for funding and performance through contract terms and detailed statements of work.

- **A short description of any current contracting problems:**

LCRA has no claims pending on any procurements or procurement contracts.

L. Provide information on any grants awarded by the program.

LCRA's Firm Water Conservation Cost-Share Program provides funding for water efficiency projects and programs established by LCRA's firm water customers. Customers include cities, utilities, industries, irrigation and recreational water users. Projects include converting irrigated areas using raw or potable water to recycled water, and decreasing utility system water loss, such as pressure reductions or leak detection and repair. LCRA also historically has used the Agricultural Water Conservation Fund to support laser leveling of irrigated land as a match for the federal Natural Resources Conservation Service Environmental Quality Incentives Program.

M. Are there any barriers or challenges that impede the program's performance, including any outdated or ineffective state laws? Explain.

None to note.

N. Provide any additional information needed to gain a preliminary understanding of the program or function.

None to note.

O. Regulatory programs relate to the licensing, registration, certification, or permitting of a person, business, or other entity.

HIGHLAND LAKES MARINA ORDINANCE AND SAFETY STANDARDS FOR RESIDENTIAL DOCKS

Marina facilities on the Highland Lakes, including docks used for commercial purposes or marinas that are more than 1,500 square feet, must obtain a permit pursuant to the Highland Lakes Marina Ordinance. Noncommercial residential docks, not more than 1,500 square feet, are not required to obtain a marina permit but shall comply with the Safety Standards for Residential Docks (Safety Standards).

The HLMO and the Safety Standards are needed to:

- Provide for safety at marina facilities and residential docks and the water surface in and around them. The HLMO provides for regulation of measures necessary to maintain the need for safety and navigability on the Highland Lakes as development increases in the area. The Safety Standards include general lighting, anchoring and electrical requirements.
- Provide for water quality protection that may be adversely impacted from development and operation of a marina facility. This includes the regulation and supervision of commercial facilities and fueling stations on the Highland Lakes.
- Promote health and safety and protect public use and access. The HLMO and the Safety Standards protect adjoining property owners by including buffers from adjoining properties and incorporate provisions for safe navigation by regulating how far a marina or residential dock may extend into a channel or open water in the Highland Lakes.
- Provide minimum acceptable standards for development and operation of a marina facility or residential dock.

The HLMO contains detailed public notice, meeting and comment periods as part of its permit application and review process. A permit decision may be appealed to the LCRA Board of Directors by an applicant or an adversely affected party who provided written comments as part of the permit application comment process.

The scope of, and procedures for, inspections or audits of Highland Lakes marinas:
Administration of the HLMO includes permit application review, permit issuance, facility inspection, and assessment of annual permit fees and enforcement. The HLMO applies to all marina facilities on the Highland Lakes, including all commercial facilities, community marina facilities, marine service stations and residential marina facilities.

Follow-up activities conducted when noncompliance with HLMO is identified:
Upon discovery of any violations during an inspection, LCRA staff informs the permittee of the violations and prescribes a definite time to respond to allegations of violation and to correct such violations. Failure to correct such violations within the time period prescribed by the LCRA staff shall subject the permittee to enforcement.

A permit may be revoked pursuant to the HLMO if: (1) the permit was issued on the basis of false or incorrect information; (2) the marina facility is being constructed, modified, expanded, or operated in violation of one or more of the requirements of the HLMO, a condition of the permit, or a final court judgment or decision; (3) the required fees have not been paid; or (4) a term(s) of the permit conflicts with a judgment from a court of competent jurisdiction, and such term cannot be amended to conform to the judgment.

Sanctions available to the LCRA to ensure compliance with HLMO:
Penalties: All penalties provided for in the HLMO are civil penalties and shall be determined by a civil court of competent jurisdiction. Appeals of penalties also must be determined by a court of competent jurisdiction and will not be decided by the LCRA Board. Any person violating or failing to comply with any provision of Section 6.02 of the HLMO (Pollution Control) may be subject to a penalty of not less than $200 nor more than $10,000 for each such violation. Each day the violation continues, from the date the Notice of Violation is posted at the marina facility, shall constitute a separate offense. Any person violating or failing to comply with any performance standard or requirement other than Section 6.02 of the ordinance (Pollution Control) may be subject to a civil penalty not to exceed $5,000. Each day that such a violation continues, from the date the NOV is posted at the marina facility, shall constitute a separate offense. No penalties will be assessed for violations corrected within 15 working days from the date the NOV is posted at the marina facility or where the owner or operator of a marina facility is complying with the terms of any extension of time approved in accordance with the HLMO.

Additional Enforcement Relief. LCRA also may seek and obtain injunctive relief or any other remedy in law or equity at any time against any person allegedly violating the ordinance.

Appeals of Certain Enforcement Actions. LCRA staff decisions that result in the revocation or reformation of a permit are appealable to the LCRA Board of Directors in the same manner as a decision denying a permit.

Procedures for handling consumer/public complaints against Highland Lakes marinas:

Most violations are discovered and resolved through the marina facility inspections process. Occasionally, staff may receive an inquiry or concern and, if appropriate, will respond by commencing the inspection and NOV process described above. Marina facility complaints used to be more commonplace. However, now that the HLMO has been in place for 33 years, the marina owners and operators know what is expected from them, and complaints are rare. Periodic inspections of marina facilities ensure compliance with the HLMO. Most public comments are received during the public notice process for new marinas or substantive changes to existing marinas. These comments are addressed during the application review process.

Lower Colorado River Authority
Highland Lakes Marina Ordinance
Fiscal Years 2015 and 2016

Activity	FY 2015	FY 2016
Total number of regulated Highland Lakes marinas	157	162
Total number of Highland Lake marinas inspected	18	19
Total number of Highland Lake marina pre-permit application meetings	16	22

HIGHLAND LAKES WATERSHED ORDINANCE

Why the Highland Lakes Watershed Ordinance is needed:

The primary objective of the Highland Lakes Watershed Ordinance program is to protect water quality in the Highland Lakes from stormwater runoff from developed sites. The Highland Lakes are the drinking water source for over 1 million people.

Major program activities are to provide technical assistance, issues permits and inspect water quality control measures.

HLWO program activities include:

- Protecting the water quality and the drinking water supply for over 1 million people in the lower Colorado River basin.
- Minimizing lake sedimentation to preserve reservoir volumes and prevent impacts to aquatic ecosystems.

Pollution carried by stormwater runoff represents a threat to the water quality of the Highland Lakes and its tributaries. According to the Environmental Protection Agency, stormwater runoff carrying pollutants from the land is the largest contributor to water quality degradation nationwide. According to data and research from EPA, TCEQ, City of Austin and LCRA, activities that convert woodlands, meadows and ranchland to subdivisions, parking lots, roadways, lawns and industrial facilities result in a threefold increase in nutrients, more than double the total suspended sediment loads, and introduce harmful chemicals, metals and other pollutants to pristine Hill Country watersheds. These activities are referred to as land development activities. Quarry and mine activities have the potential to cause similar runoff effects.

The HLWO is performance-based and implements water quality protection controls that remove at least 70 percent of the total suspended solids, oil and grease, and total phosphorus from the stormwater.

Six water quality measures found in the HLWO are designed to manage up to 90 percent of stormwater pollution generated by development projects and quarry and mine operations. The measures are:

1. Pre-development and pre-quarry/mine planning meetings.
2. Permanent water quality controls to manage post-development runoff quantity and quality.
3. Creek buffer zones to absorb pollutants that escape best management practices and protect the riparian zone.
4. Erosion and sediment controls during construction that mirror TCEQ requirements.
5. Water quality education to developers and residents.
6. Annual maintenance inspection of permanent water quality basins to ensure performance.

Permit and enforcement decisions under the HLWO are appealable to the LCRA Board of Directors.

The scope of, and procedures for, inspections or audits of sites/projects required to comply with the HLWO:

LCRA administers the HLWO by coordinating with developers, engineers, contractors and site operators throughout the life of a project. Larger projects require a meeting early in the project planning process to facilitate an efficient permit process.

Permit requirements depend on the scope and nature of the project. Certain smaller projects and "grandfathered" projects are not required to obtain a permit; however program staff verifies that construction-phase erosion control will be employed through an informal review. Projects requiring a development, quarry/mine or general utility permits undergo a technical review by LCRA staff to verify compliance with the HLWO. LCRA staff seek to share insights into alternative methods to enhance water quality protection while remaining cost-effective. A key benefit of this process is proactive water quality protection since plans are reviewed to assess proposed best management practice performance before a development or utility project begins construction or quarry or mining operations begin.

Follow-up activities conducted when noncompliance with HLWO is identified:

Upon discovery of violation, LCRA may issue a Notice of Violation. The NOV shall be in writing and, if the case of a permitted site, posted at the site. The NOV shall specify the violations and may include a stop-work order stating that no further activity take place until compliance with the HLWO is obtained.

A permit may be revoked if the permitee fails to comply with the terms of the HLWO permit within 10 calendar days from the date of the NOV. The permitee may submit a written appeal to the issuance of an NOV or stop-work order. The LCRA general manager will decide the appeal based on information in the appeal or upon additional information requested from the LCRA staff or the appellant.

Sanctions available to the LCRA to ensure compliance with HLWO:

Any person violating provisions of the HLWO is subject to a civil penalty of not more than $10,000 for each violation. Penalties provided for in the HLWO are civil penalties and shall be determined by a civil court of competent jurisdiction. Appeals of penalties also must be determined by a court of competent jurisdiction and will not be decided by the LCRA Board. Each calendar day a violation exists shall constitute a separate violation. LCRA may also seek compliance with the HLWO through any and all other remedies at law or in equity, including enforcement by injunction.

Procedures for handling consumer/public complaints against sites/projects required to comply with HLWO:

Most violations are discovered and resolved through public complaints and inspections conducted by staff.

Lower Colorado River Authority
Highland Lakes Watershed Ordinance
Information on Permit and Inspection Activity
Fiscal Years 2016 and 2017

Activity	FY 2016	FY 2017
Development permits issued	44	34
Inspections	909	1,552
Annual best management practice inspections	110	76
Complaint inspection/verification	41	58

ON-SITE SEWAGE FACILITY PROGRAM

Why LCRA's On-Site Sewage Facility program is needed:

The primary objective of the On-Site Sewage Facility program is to provide drinking water protection for the Highland Lakes. The OSSF program is LCRA's oldest water quality protection program. TCEQ delegated authority to LCRA to permit, inspect and enforce septic system regulations in September 1971. Since that time, LCRA has regulated the construction and inspected septic systems around the Highland Lakes. LCRA's jurisdictional boundary is 2,200 feet from 1,020 feet msl on Lake Buchanan, 888 feet msl on Inks Lake, 825 feet msl on Lake LBJ and 738 feet msl on Lake Marble Falls. The first 200 feet measured from the mean sea level is referred to as the restricted zone and has a higher level of water quality protection requirements. The next 2,000 feet is referred to as the water quality zone. On Lake Travis, the water quality zone is 2,000 feet from 691 feet msl. In addition, LCRA provides this regulatory service via interlocal agreements throughout the city limits of Jonestown, Lakeway, Lago Vista, Volente, Briarcliff and Granite Shoals. LCRA has permit files for more than 22,970 septic systems within LCRA's jurisdiction. Some of those systems can date back to the late 1950s.

The scope of, and procedures for, inspections or audits of OSSF:

TCEQ conducts compliance audits.

Follow-up activities conducted when noncompliance with OSSF is identified:

LCRA has adopted rules related to the regulation of OSSFs. As an authorized agent of TCEQ, representing the state of Texas, LCRA has adopted and incorporated all applicable rules and penalty provisions related to OSSFs. That includes those provisions found in chapters 341 and 366, Texas Health and Safety Code; chapters 7, 26 and 37, Texas Water Code; and Texas Administrative Code, chapters 30 and 285.

LCRA shall review a proposal for an on-site sewage disposal system and make inspections of the system as necessary to ensure that the OSSF is in substantial compliance with applicable statute and rules. An OSSF may not be used unless it is inspected and approved by LCRA. Permit decisions may be appealed to the LCRA Board of Directors.

LCRA may approve or disapprove the OSSF depending on the results of an inspection. If a system is not approved by LCRA, OSSF system owners are provided opportunities to correct deficiencies before LCRA disapproves the system. The OSSF may not be used until all deficiencies are corrected and the system is reinspected and approved by LCRA.

Procedures for handling consumer/public complaints and enforcement against sites/projects required to comply with OSSF:

Per TCEQ rules, LCRA, as the authorized agent, shall investigate a complaint regarding an OSSF within 30 days after receipt of the complaint, notify the complainant of the findings, and take appropriate and timely action on all documented violations. Appropriate action may include seeking a criminal or civil enforcement action in a court of competent jurisdiction as necessary under the authority of LCRA's order, ordinance or resolution, the Texas Water

Code, chapters 7 and 26, or the Texas Health and Safety Code, chapters 341 and 366. This may include complaints against:

(1) Registered apprentices, maintenance technicians, licensed installers, site evaluators, maintenance providers and designated representatives;

(2) Individuals performing the duties listed above not holding a current commission license or registration or failing to maintain a license or registration, including professional engineers and professional sanitarians;

(3) Owners in violation of the chapter or the authorized agent's order, ordinance, or resolution; or

(4) Owners of malfunctioning OSSFs on the owners' properties.

Upon obtaining a conviction or court judgment of a violation of (1) or (2) above, LCRA shall send a copy of the conviction or court judgment to the executive director of the TCEQ.

LCRA may refer complaints under (1) or (2) above to the appropriate licensing entity, such as TCEQ, the Texas Department of Licensing and Regulation, or the Texas Board of Professional Engineers. If there are unusual circumstances involved, LCRA may refer complaints to the executive director of the TCEQ in writing at any time after a documented investigation of the complaint has been completed.

Sanctions available to LCRA to ensure compliance with OSSF:

Injunction or civil suit: If it appears that a person has violated, is violating or is threatening to violate any LCRA and/or state OSSF rules, permits or other order of the TCEQ issued pursuant to Chapter 366, Texas Health and Safety Code, an authorized agent may bring a civil suit for:

(1) Mandatory or prohibitory injunctive relief, as warranted by the facts;

(2) A civil penalty as provided by applicable law, including an administrative or a civil penalty under Chapter 7, Water Code, for each day that the on-site sewage disposal system remains unrepaired; or

(3) Both injunctive relief and civil penalty.

Lower Colorado River Authority
On-Site Sewage Facilities Program
Information on Permit and Inspection Activity
Fiscal Years 2015 and 2016

Activity	FY 2015	FY 2016
Total number of LCRA OSSF systems permitted since 1971	22,000	22,537
Construction permits issued	425	440
Inspections	2,289	2,361

VIII. Statutory Authority and Recent Legislation

A. Fill in the following charts, listing citations for all state and federal statutes that grant authority to or otherwise significantly impact your agency. Do not include general state statutes that apply to all agencies, such as the Public Information Act, the Open Meetings Act, or the Administrative Procedure Act. Provide information on Attorney General opinions from FY 2011–2015, or earlier significant Attorney General opinions, that affect your agency's operations.

Lower Colorado River Authority
Statutes/Attorney General Opinions

Statutes

Citation/Title	Authority/Impact on Agency
Texas Special District Local Laws Code – Chapter 8503	LCRA enabling legislation sets out basic powers and duties of LCRA
Texas Water Code – chapters 7 and 26	Grant LCRA a wide array of water quality management authority
Texas Water Code – Chapter 11	Primary statute governing administration of water rights; authorizes LCRA to adopt rules relating to water supply
Texas Water Code – Chapter 12	Establishes TCEQ's general oversight authority of LCRA and dam safety responsibilities
Texas Water Code – Chapter 13	Establishes Public Utility Commission of Texas appellate jurisdiction over LCRA water rates
Texas Water Code – Chapter 16, subchapter C	Establishes process for ongoing state and regional water planning
Texas Water Code – Chapter 49	Includes LCRA in the definition of "District," giving LCRA all powers of a District
Texas Water Code – Chapter 51	Authorizes LCRA to adopt reasonable rules to regulate fishing, boating, and all recreational and business privileges on LCRA-controlled lakes
Texas Health and Safety Code – Chapter 366	Grants TCEQ authority to designate LCRA as agent to license and regulate on-site sewage facilities
Texas Parks and Wildlife Code – Section 31.092	Authorizes LCRA to regulate the surface use of the Highland Lakes by placing buoys to mark restricted use areas, and allows LCRA to make rules relating to boating safety

Attorney General Opinions

Attorney General Opinion No.	Impact on Agency
None	N/A

B. Provide a summary of recent legislation regarding your agency by filling in the charts below or attaching information already available in an agency-developed format. Briefly summarize the key provisions. For bills that did not pass, briefly explain the key provisions and issues that resulted in failure of the bill to pass (e.g., opposition to a new fee, or high cost of implementation). Place an asterisk next to bills that could have a major impact on the agency.

Lower Colorado River Authority
85th Legislative Session

Legislation Enacted

Bill Number	Author	Summary of Key Provisions
N/A	N/A	N/A

Legislation Not Passed

Bill Number	Author	Summary of Key Provisions/Reason Bill Did Not Pass
HB 2802	Lyle Larson	Bill would have removed all river authorities from the Sunset Review process. The bill passed the House but never received a hearing in the Senate.

IX. Major Issues

The purpose of this section is to briefly describe any potential issues raised by your agency, the Legislature, or stakeholders that Sunset could help address through changes in statute to improve your agency's operations and service delivery.

Since our inception in 1934, the Texas Legislature has, from time to time, amended our statute. We feel that the current statute provides LCRA with the authority to fulfill our mission.

X. Other Contacts

A. Fill in the following charts with updated information on people with an interest in your agency, and be sure to include the most recent email address.

Lower Colorado River Authority
Contacts

Interest Groups (groups affected by agency actions or that represent others served by or affected by LCRA actions)

Group or Association Name/ Contact Person	Address	Telephone	Email Address
Bastrop Chamber of Commerce/Becki Womble	927 Main St. Bastrop, TX 78602	512-303-0558	bwomble@bastropchamber.com

Group or Association Name/ Contact Person	Address	Telephone	Email Address
Blanco Chamber of Commerce/Libbey Aly	P.O. Box 626 Blanco, TX 78606	830-833-5101	Libbey@blancochamber.com
Burnet Chamber of Commerce/Kim Winkler	101 North Pierce, Ste. 1 Burnet, TX 78611	512-756-4297	Kim@burnetchamber.org
Central Texas Water Coalition/Jo Karr Tedder	P. O. Box 328 Spicewood, TX 78669	512-755-4805	jokarrtedder.ctwc@gmail.com
Colorado Water Issues Committee/Ronald Gertson	4 N. Washington El Campo, TX 77437	979-758-4670	ronaldg59@gmail.com
Columbus Chamber of Commerce/Billy Kahn	425 Spring St. Columbus, TX 78934	979-732-8385	execdir@columbustexas.org
Coastal Conservation Association/David A. Sneed	6919 Portwest, Suite 100 Houston, TX, 77024	713-626-4234	david@ccanc.org
Ducks Unlimited Texas/ Kirby Brown	2500 Niemann Drive Austin, TX 78748-2828	210-213-2805	Kbrown2@ducks.org
Greater Austin Chamber of Commerce/Michael Rollins	535 E. Fifth St. Austin, TX 78701	512-478-9383	mrollins@austinchamber.com
Highland Lakes Firm Water Customer Cooperative/ Earl Foster	1097 Lohmans Crossing Lakeway, TX 78734	512-261-6222 x140	EFoster@LakewayMUD.org
La Grange Chamber of Commerce/Donna Pyle	220 W. Colorado St. La Grange, TX 78945	979-968-5756	chamber@lagrangetx.org
Llano Chamber of Commerce/Briley Mitchell	The Railyard Depot 100 Train Station Drive Llano, TX 78643	325-247-5354	director@llanochamber.org
Lower Colorado River Basin Coalition/ Robby Cook	2500 Niemann Drive Austin, TX 78748-2828	512-797-9925 or 512-478-7899	robbycook@westcapitol.com
Marble Falls-Lake LBJ Chamber of Commerce/ Patti Zinsmeyer	916 Second St. Marble Falls, TX 78654	830-693-2815	patti@marblefalls.org
Matagorda Bay Foundation/ James B. Blackburn Jr.	4709 Austin St. Houston, TX 77004	713-524-1012	jbb@blackburncarter.com
Matagorda County Convention & Visitors Bureau/Mitch Thames	201 7th St. Bay City, TX 77414	877-878-5386	MitchThames@visitbaycity.org
National Wildlife Federation/Myron Hess	505 East Huntland Drive Austin, TX 78752	512-476-9805	Hess@nwf.org
San Saba Chamber of Commerce/Fern Putnam	P. O. Box 484 San Saba, TX 76877	325-372-5141	Executive.Director@SanSabaChamber.com
Sierra Club – Lone Star Chapter/Jennifer Walker	P. O. Box 1931 Austin TX 78767-1931	512-605-6371	jennifer.walker@sierraclub.org
Texas Farm Bureau/ Bob E. Reed	901 Avenue F N. Bay City, TX 77414	979-557-1302	bobr76tfb@yahoo.com

Interagency, State, or National Associations (that serve as an information clearinghouse or regularly interact with LCRA)

Group or Association Name/ Contact Person	Address	Telephone	Email Address
Texas Water Conservation Association (TWCA)	Barton Creek Plaza One 3755 S. Capital of Texas Hwy, Suite 105 Austin, TX 78704	512-472-7216	DRobbins@twca.org (Dean Robbins, General Manager)
National Water Resources Association (NWRA)	4 E. St. SE Washington, D.C. 20003	202-698-0693	ilyle@nwra.org (Ian Lyle, Executive Director)
American Water Works Association (AWWA)	American Water Works Association 6666 W. Quincy Ave. Denver, CO 80235-3098	303-794-7711	service@awwa.org (Customer Service)
National Hydrologic Warning Council	2480 West 26th Ave, Suite 156-B Denver, CO 80211-5304	303-455-6277	
Alliance for Water Efficiency	33 N. LaSalle Street, Suite 2275 Chicago, IL 60602	773-360-5100	maryann@a4we.org
Hill Country Homebuilders Association	1401 Broadway B1, Marble Falls, TX 78654	830.798.2266	
Central Texas Golf Course Superintendents Association	https://ctgcsa.com/	512-215-4612	carolcloud2003@gmail.com
United States Committee on Irrigation and Drainage	1616 17th St., #483, Denver, CO 80202	303-628-5430	stephens@uscid.org
American Society of Civil Engineers-Environmental and Water Resources Institute (ASCE-EWRI)	1801 Alexander Bell Drive Reston, VA 20191	800-548-2723	Brian Parsons, EWRI Director ewri@asce.org
International Erosion Control Association (IECA)	3401 Quebec St, Suite 3500 Denver, CO 80207 USA	800-455-4322	Executive Director, Sharan Wilson sharan@ieca.org
Texas Onsite Wastewater Association (TOWA)	PO Box 885 Bridge City TX 7761	Randy Chelette (Exec. Director); 409-718-0645	
Texas Aquatic Plant Management Society (TAPMS)	http://www.tapms.org/		
Association of Dam Safety Officials	239 South Limestone Lexington, KY 40508	859-550-2788	info@damsafety.org

Liaisons at Other State Agencies (with which LCRA maintains an ongoing relationship)

Agency:	Name:	Title:	Telephone:	Email:
TCEQ	Stephanie Bergeron-Perdue	Deputy Executive Director	512-239-0616	Stephanie.Bergeron_Perdue@tceq.texas.gov
TCEQ	L'Oreal Stepney	Deputy Director of the Office of Water	512-239-1321	loreal.stepney@tceq.texas.gov
TCEQ	Kim Wilson	Director, Water Availability Division	512-239-4644	kim.wilson@tceq.texas.gov
TCEQ	Kelly Mills	Assistant Division Director, Water Availability	512-239-4512	Kelly.mills@tceq.texas.gov
TCEQ	Kathy Alexander	Technical Specialist, Water Availability	512-239-0778	kathy.alexander@tceq.texas.gov
TCEQ	Robin Smith	Attorney	512-239-0463	robin.smith@tceq.texas.gov
TWDB	Jeff Walker	Executive Administrator	512-463-7848	Jeff.Walker@twdb.texas.gov
TWDB	Temple McKinnon	Director of Water Use, Projections, and Planning Division	512-475-2057	Temple.McKinnon@twdb.texas.gov
TWDB	Lann Bookout	Regional Water Planning Department	512-936-9439	Lann.Bookout@twdb.texas.gov
TPWD	Carter Smith	Executive Director	512-389-4802	Carter.smith@tpwd.texas.gov
TPWD	Cindy Loeffler	Branch Chief, Water Resources	512-389-8715	Cindy.loeffler@tpwd.texas.gov
TPWD	Colette Barron-Bradsby	Attorney	512-389-8899	colette.barron@tpwd.texas.gov

XI. Additional Information

A. Texas Government Code, Sec. 325.0075 requires agencies under review to submit a report about their reporting requirements to Sunset with the same due date as the SER. Include a list of each agency-specific report that the agency is required by statute to prepare and an evaluation of the need for each report based on whether factors or conditions have changed since the statutory requirement was put in place. Please do not include general reporting requirements applicable to all agencies, reports that have an expiration date, routine notifications or notices, posting requirements, federally mandated reports, or reports required by G.A.A. rider. If the list is longer than one page, please include it as an attachment.

Section 325.0075 does not apply to LCRA. However, LCRA prepares a number of statutorily required reports related to LCRA's functions as a river authority that are filed with various state and local governments.

Lower Colorado River Authority
Evaluation of Agency Reporting Requirements

Report Title	Legal Authority	Due Date and Frequency	Recipient	Description	Is the Report Still Needed? Why?
Audited financial report	Water Code § 49.194	Annual, 135 days after close of fiscal year	TCEQ	Annual audited financial report	Yes. Provides some oversight of districts.
Annual water use reports	Water Code § 11.031	March 1, Annual	TCEQ	Used to assess water supply conditions and demands	Yes. Important to assessing water availability and need for new water supply.
Water conservation implementation report	Water Code § 11.1271(f)(2)	May 1, every five years (next report due May 1.2019)	TCEQ	Used to monitor water conservation by water rights holders	Yes. Important to assessing water demands.
Water conservation plan reports	Water Code § 16.012(m)	May 1, Annual	TWDB	Data used by TWDB for long-term water supply planning	Yes. Important to assessing conservation efforts.
Annual water use surveys	Water Code § 16.012(m)	May 1, Annual	TWDB	Data used by TWDB for long-term water supply planning	Yes. Important to assessing conservation efforts.
Groundwater use reports filed with groundwater conservation districts	Water Code § 36.111	Typically annually (established by groundwater district rule)	Coastal Bend GCD Lost Pines GCD Central Texas GCD	Groundwater use reports filed with districts	Yes. Provides GCDs with information about groundwater use in their districts.

Report Title	Legal Authority	Due Date and Frequency	Recipient	Description	Is the Report Still Needed? Why?
Dam safety engineering inspection reports	Water Code § 12.052(a)	Within 45 days of report completion (by rule)	TCEQ	Reports on safety of inspected dams	Yes. Allows TCEQ to assess safety of dams statewide.
Dam safety – emergency action plans (confidential)	Water Code § 12.052(a)	Within two years of rule adoption (complete)	TCEQ	Plan followed in event or threat of a dam emergency	Yes. Ensures adequate emergency response planning.

B. Has the agency implemented statutory requirements to ensure the use of "first person respectful language"? Please explain and include any statutory provisions that prohibits these changes.

There are no statutory requirements applicable to LCRA regarding person first language; however, as stated in LCRA's employee policy manual, LCRA strives to provide a work environment that respects individual differences.

C. Fill in the following chart detailing information on complaints regarding your agency. Do not include complaints received against people or entities you regulate. The chart headings may be changed if needed to better reflect your agency's practices.

LCRA receives comments and inquiries from stakeholders routinely. We respond to those inquiries; however, we do not maintain a centralized system for tracking and categorizing those inquiries.

D. Fill in the following charts detailing your agency's Historically Underutilized Business (HUB) purchases.

As LCRA is not a state agency, the HUB statutory requirements do not apply to us; therefore, LCRA does not record HUB purchases. However, LCRA recognizes how important small and diverse businesses are to the community we serve, and we have a small and diverse supplier program, which is a reflection of that support. LCRA as a whole spent about $58 million in the last fiscal year on small and diverse businesses.

E. Does your agency have a HUB policy? How does your agency address performance shortfalls related to the policy? (Texas Government Code, Sec. 2161.003; TAC Title 34, Part 1, rule 20.286c)

See the answer to D above.

F. For agencies with contracts valued at $100,000 or more: Does your agency follow a HUB subcontracting plan to solicit bids, proposals, offers, or other applicable expressions of interest for subcontracting opportunities available for contracts of $100,000 or more? (Texas Government Code, Sec. 2161.252; TAC Title 34, Part 1, rule 20.285)

See the answer to D above.

G. For agencies with biennial appropriations exceeding $10 million, answer the following HUB questions.

1. **Do you have a HUB coordinator? If yes, provide name and contact information. (Texas Government Code, Sec. 2161.062; TAC Title 34, Part 1, rule 20.296)**

See the answer to D above.

2. **Has your agency designed a program of HUB forums in which businesses are invited to deliver presentations that demonstrate their capability to do business with your agency? (Texas Government Code, Sec. 2161.066; TAC Title 34, Part 1, rule 20.297)**

See the answer to D above.

3. **Has your agency developed a mentor-protégé program to foster long-term relationships between prime contractors and HUBs and to increase the ability of HUBs to contract with the state or to receive subcontracts under a state contract? (Texas Government Code, Sec. 2161.065; TAC Title 34, Part 1, rule 20.298)**

See the answer to D above.

H. Fill in the charts below detailing your agency's Equal Employment Opportunity (EEO) statistics.

Lower Colorado River Authority
Equal Employment Opportunity Statistics

2015

Business Unit Function	Total Number of Employees	African-American Statistics		Hispanic Statistics		Female Statistics	
		LCRA Employee Percentage	Workforce Percentage	LCRA Employee Percentage	Workforce Percentage	LCRA Employee Percentage	Workforce Percentage
Water	172	1.7%	16.8%	18.0%	11.4%	21.5%	45.4%
Wholesale Power	358	7.0%	8.1%	9.2%	9.8%	10.3%	23.3%
Transmission	564	3.2%	8.1%	17.9%	9.8%	9.8%	23.3%
Enterprise Support and Community Resources	617	3.9%	6.5%	13.6%	8.2%	38.1%	42.6%

2016

Business Unit Function	Total Number of Employees	African-American Statistics		Hispanic Statistics		Female Statistics	
		LCRA Employee Percentage	Workforce Percentage	LCRA Employee Percentage	Workforce Percentage	LCRA Employee Percentage	Workforce Percentage
Water	173	2.3%	16.9%	18.5%	11.7%	21.4%	45.3%
Wholesale Power	366	6.8%	7.6%	9.8%	9.2%	11.5%	22.1%
Transmission	589	2.9%	7.6%	18.0%	9.2%	9.8%	22.1%
Enterprise Support and Community Resources	632	3.8%	6.5%	13.3%	8.6%	35.6%	42.1%

2017

Business Unit Function	Total Number of Employees	African-American Statistics		Hispanic Statistics		Female Statistics	
		LCRA Employee Percentage	Workforce Percentage	LCRA Employee Percentage	Workforce Percentage	LCRA Employee Percentage	Workforce Percentage
Water	169	2.4%	16.7%	17.2%	12.2%	21.3%	45.1%
Wholesale Power	370	6.8%	10.0%	9.5%	10.4%	10.8%	20.6%
Transmission	615	3.1%	10.0%	17.7%	10.4%	9.4%	20.6%
Enterprise Support and Community Resources	631	3.8%	6.5%	13.2%	8.8%	35.0%	42.2%

I. Does your agency have an equal employment opportunity policy? How does your agency address performance shortfalls related to the policy?

Yes, Policy 301: Employment. LCRA has not experienced any performance shortfalls related to the policy. LCRA complies with applicable federal and state requirements regarding equal employment opportunity and employment practices with respect to terms and conditions of employment. LCRA provides equal employment opportunities to all employees and applicants for employment without regard to race, color, religion, gender identity, national origin, age, disability, sexual orientation, genetic information or veteran status in accordance with applicable federal and state legal requirements governing nondiscrimination in employment.

Human resources thoroughly investigates any claims related to potential issues and partners with legal staff and the business to take any necessary action in accordance with company discipline policies.

XII. Agency Comments

Provide any additional information needed to gain a preliminary understanding of your agency.

An understanding of the state-approved Water Management Plan, which governs our operation of lakes Travis and Buchanan and to which we have referred throughout this self-evaluation, also is needed to gain a preliminary understanding of our agency. To that end, the following pages contain the TCEQ-approved Water Management Plan and the TCEQ order approving the plan in November 2015. The plan and its appendices also are available on our website.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

THE STATE OF TEXAS
COUNTY OF TRAVIS
I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF A TEXAS COMMISSION ON ENVIRONMENTAL QUALITY DOCUMENT, WHICH IS FILED IN THE PERMANENT RECORDS

NOV 20 2015

OF THE COMMISSION. GIVEN UNDER MY HAND AND THE SEAL OF OFFICE ON

Bridget C. Bohac

BRIDGET C. BOHAC, CHIEF CLERK
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

AN ORDER Approving Amendments to Lower Colorado River Authority's Water Management Plan; TCEQ Docket No. 2015-1444-WR

On the 4th day of November 2015, the Texas Commission on Environmental Quality (Commission) considered the Lower Colorado River Authority's (LCRA) application (Application No. 5838A) to amend its Water Management Plan (WMP) and having heard evidence and arguments concerning Application No. 5838A and the proposed order, the Commission makes the following Findings of Fact and Conclusions of Law:

FINDINGS OF FACT

1) LCRA's Application No. 5838A to amend the WMP was received by the Commission on March 12, 2012, and was declared administratively complete on April 19, 2012. Technical review was completed in November 2012 and the application was sent to notice and the comment period ended on May 28, 2013. On June 3, 2013, based on public comment and the ongoing drought conditions, the Executive Director determined that further evaluation of LCRA's application was necessary. In May 2014, after review of more recent severe drought data, the Executive Director's staff issued a draft report with recommendations related to the curtailment of interruptible stored water. On October 31, 2014, LCRA submitted a revised and supplemental application to amend its WMP that was intended to replace the 2012 WMP application. By statute, the technical review must be complete within one year of the administrative complete date. Technical review of LCRA's October 31, 2014 amended application was completed on June 11, 2015.

   LCRA filed another revision to its application on May 21, 2015 to include its Firm Raw Water Drought Contingency Plan (Firm Customer DCP) in the WMP.

2) The WMP for the Lower Colorado River Basin defines LCRA's water management program and policies in accordance with the 1988 Final Judgment and Decree, *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*; the Enabling Act of the Lower Colorado River Authority; general Law of the State of Texas, particularly the Texas Water Code; LCRA's Certificates of Adjudication Nos. 14-5478 and 14-5482, as amended; the Commission's Orders concerning the WMP; and the policies of the Lower Colorado River Authority's Board of Directors. The LCRA's original and amended and supplemental applications were filed as allowed by these authorities.

3) Notices of the original and revised and supplemental applications to amend the WMP were each published in newspapers regularly published and generally circulated in Mason, San Saba, Lampasas, Llano, Burnet, Travis, Bastrop, Gillespie, Williamson, Fayette, Colorado, Wharton and Matagorda Counties, 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.

4) Notices of the original and revised and supplemental applications to amend the WMP were sent by first-class mail to the water right holders of record in the Colorado River Basin as required by law.

5) The Executive Director's technical review of the revised and supplemental application evaluated the impacts of this amendment to the Water Management Plan on existing water rights and the environment. Because this application did not change any authorizations in LCRA's Certificates of Adjudication, a complete technical review under TWC Section 11.134 was not necessary or appropriate. However, the Executive Director's technical review did include examination of LCRA's model simulations, LCRA's water use and demand projections, and LCRA's recalculation of the combined firm yield of Lakes Buchanan and Travis.

6) The Executive Director also determined that the amendments to the WMP requested in the revised and supplemental application do not impair existing water rights, do consider applicable environmental flow standards for the environment, are not detrimental to the public welfare, comply with TCEQ rules regarding water conservation and drought contingency plans; and are consistent with the Regional Water Plan.

7) The January 27, 2010 TCEQ order approving the previous amendment to the WMP required LCRA to file another amendment to address the following:

   a. Interruptible curtailment procedures to ensure LCRA can satisfy projected firm customer demands during intense drought conditions such as those experienced over the past several decades;
   b. Evaluation of the criteria for determining a drought worse than the Drought of Record;
   c. Evaluation of the minimum combined storage in Lake Travis and Buchanan that would be necessary or appropriate to protect firm water customers either during a repeat of the Drought of Record or under worse conditions;
   d. Incorporation of changes to address LCRA's agreements with STP Nuclear Operating Company (STPNOC);
   e. LCRA's 2007 agreement with the City of Austin regarding return flows in the lower Colorado River;
   f. Revisions to LCRA's procedures for providing water for environmental flows using the best scientific data available including provisions to accommodate changing conditions within a year, limiting harmful intra-daily fluctuations in streamflows, and, to the maximum extent reasonable, specification of an overall instream flow regime.

8) LCRA's application to amend its WMP addresses items (a) through (f) in Finding of Fact No. 7.

9) In addition to receiving firm water provided by LCRA under the agreements with STPNOC described in Finding of Fact 7.d, STPNOC has rights to divert water downstream of the Highland Lakes for use at the South Texas Project pursuant to such agreements and certificate of adjudication No. 14-5437, as amended.

10) In the process of incorporating changes to address LCRA's agreements with STPNOC as required by the previous order, LCRA included assumptions about its supply of water to STPNOC, and STPNOC's diversion and use of water. LCRA's actual supply of water to STPNOC, and STPNOC's actual diversion and use of water pursuant to its agreements with LCRA and pursuant to certificate of adjudication No. 14-5437, may vary from the assumptions that LCRA used.

11) LCRA engaged an advisory committee consisting of basin stakeholders prior to its initial application filed in 2012. The advisory committee process was required by the January 27, 2010 order to allow meaningful participation by interested basin stakeholder groups and achieve regional consensus, where possible, during the WMP revision process. Following TCEQ's draft report in May 2014, LCRA held meetings with stakeholders throughout the summer of 2014, prior to filing the revised and supplemental application. The stakeholder input process is documented in materials submitted by LCRA in support of its original and revised and supplemental applications, filed on March 12, 2012 and October 31, 2014.

12) LCRA requested changes to the WMP based on the stakeholder process and the Executive Director's May 2014 draft report. These requested changes are designed to address protection of firm water demands, and to incorporate updated environmental flow studies and LCRA's agreements with STP Nuclear Operating Company and the City of Austin. All of these proposed amendments to the WMP are detailed in submissions filed with the Executive Director by LCRA on October 31, 2014, November 18, 2014, March 5, 2015, April 13, 2015 and May 21, 2015.

13) LCRA's proposed substantive revisions to the WMP under this amendment fall within three areas: 1) Interruptible Stored Water Availability; 2) a new determination of the combined firm yield; and 3) new environmental flow criteria based on the most recent scientific studies and implementation of those criteria.

14) Under the WMP, firm demands take precedence over all other uses; therefore, LCRA's proposed amendment to the WMP requests a reduction in interruptible supplies to compensate for an increase in firm demands. The reduction in interruptible supplies is intended to offset the increase in firm demands.

15) LCRA's projected firm demands used to develop this WMP are approximately 350,086 acre-feet per year and reflect anticipated demands between 2010 and 2020.

16) LCRA's proposed revisions to its curtailment policies and procedures are intended to ensure that LCRA can satisfy current and projected firm demands during drought conditions, and to ensure that, in simulations of this WMP, LCRA's release of interruptible stored water does not result in combined storage dropping to the Drought Worse than Drought of Record

(DWDR) storage trigger (currently 600,000 acre feet). LCRA's curtailment methods have been found to be an acceptable approach in earlier Commission orders. The use of various rule curves and procedures continues to be an acceptable approach for addressing the allocation of interruptible stored water because this approach will allow LCRA to be responsive to changes in water supply conditions throughout the year while protecting firm demands.

17) LCRA proposes to revise the annual interruptible water supply curtailment policy described in Chapter 4 of the WMP. The curtailment policy includes the following:

a. LCRA will determine availability of Interruptible Stored Water for its Gulf Coast, Lakeside operations and Pierce Ranch separately for the first and second (ratoon) crops and apply volumetric limits on the availability of Interruptible Stored Water for each crop season. (WMP Section 4.3.2.)

b. The amounts of Interruptible Stored Water for LCRA's Gulf Coast and Lakeside agricultural operations, and Pierce Ranch will be determined taking into consideration what Water Supply Condition is in effect: "Normal", "Less Severe Drought", or "Extraordinary Drought". (WMP Section 4.3.2.)

c. The Water Supply Condition will be evaluated on March 1 and July 1 (Evaluation Dates), taking into account inflows and the combined storage of Lakes Buchanan and Travis. (WMP Section 4.2.)

d. The Normal condition will be in effect if:

i. Neither the Less Severe Drought condition nor the Extraordinary Drought condition were in effect for the period prior to the Evaluation Date, and, on the Evaluation Date neither the criteria for entering Less Severe Drought or Extraordinary Drought are met; or
ii. The Less Severe Drought or Extraordinary Drought condition was in effect for the period prior to the Evaluation Date and the criteria for lifting Less Severe Drought is met on the Evaluation Date. (WMP Section 4.2.2.)

e. The Less Severe Drought conditions will be in effect if:

i. Combined storage in Lakes Buchanan and Travis is below 1,600,000 acre-feet and cumulative inflows into the lakes for the three months preceding the Evaluation Date are less than 50,000 acre-feet; or
ii. Combined storage in Lakes Buchanan and Travis is below 1,400,000 acre-feet and cumulative inflows into the lakes for the three months preceding the Evaluation Date are less than the 33rd percentile of inflows to the lakes for that three month period. The 33rd percentile will be based on United States Geological Survey streamflow data. (WMP Section 4.2.3.1.)

f. The Less Severe Drought condition is also entered upon exiting the Extraordinary Drought condition, unless, the criteria for exiting Less Severe Drought condition is also met on the Evaluation Date. (WMP Section 4.2.3.1.)

g. The Less Severe Drought condition will no longer be in effect if:

   i. Combined storage in Lakes Buchanan and Travis has been above 1,600,000 acre-feet for one or more days during the period preceding the Evaluation Date and neither of the criteria for entering a Less Severe Drought condition is met on the Evaluation Date: or
   ii. Combined storage in Lakes Buchanan and Travis has been above 1,400,000 acre-feet for one or more days during the period preceding the Evaluation Date, cumulative inflows to the lakes for the preceding three months are at or above the 50^{th} percentile of inflows for that three month period, and neither of the criteria for entering Less Severe Drought are met on the Evaluation Date. The 50^{th} percentile will be based on United States Geological Survey streamflow data. (WMP Section 4.2.3.2.)

h. Extraordinary Drought will be in effect if:

   i. Combined storage in Lakes Buchanan and Travis is below 1,300,000 acre-feet on the Evaluation Date; and
   ii. Drought duration is at least 24 months; and
   iii. The inflow intensity test for a declaration of a Drought Worse than the Drought of Record is met. (WMP Section 4.2.4.1.)

i. Extraordinary Drought remains in effect until:

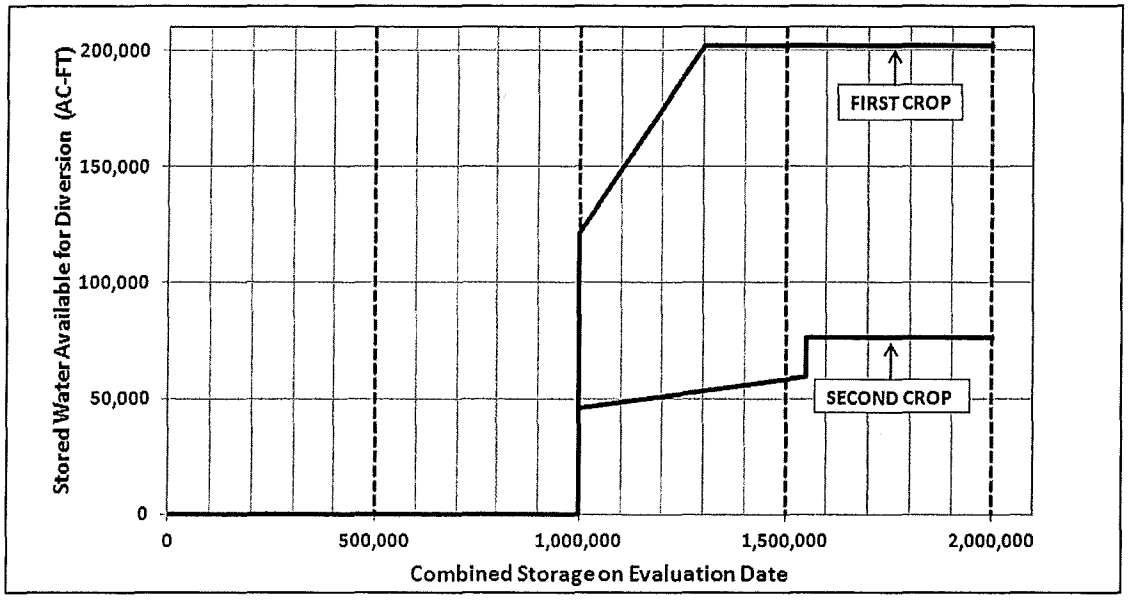
   i. Combined storage in Lakes Buchanan and Travis has been above 1,300,000 acre-feet for one or more days during the period preceding the Evaluation Date; and
   ii. The criteria for entering Extraordinary Drought are not met on the Evaluation Date. (WMP Section 4.2.4.2.)

j. Under Normal conditions, the total amount of interruptible stored water to be made available for diversion at the Gulf Coast, Lakeside and Pierce Ranch irrigation operations is as follows:

   i. First Crop
      a. For combined storage of 1,300,000 acre-feet or more – 202,000 acre-feet;
      b. For combined storage between 1,299,999 and 1,000,000 acre-feet – a sliding scale from 202,000 acre-feet at 1,299,999 acre-feet of combined storage to 121,500 acre-feet at 1,000,000 acre-feet of combined storage; and

c. Below 1,000,000 acre-feet, no water except for Garwood irrigation operation consistent with prior contracts between Garwood and LCRA.

ii. Second Crop
   a. For combined storage of 1,550,000 or more – 76,500 acre-feet;
   b. For combined storage between 1,549,999 acre-feet and 1,000,000 acre-feet – a sliding scale from 59,500 acre-feet at 1,549,999 acre-feet of combined storage to 46,000 acre-feet at 1,000,000 acre-feet of combined storage; and
   c. Below 1,000,000 acre-feet no water except for Garwood irrigation operation consistent with prior contracts between Garwood and LCRA. (WMP Section 4.3.2.1.)



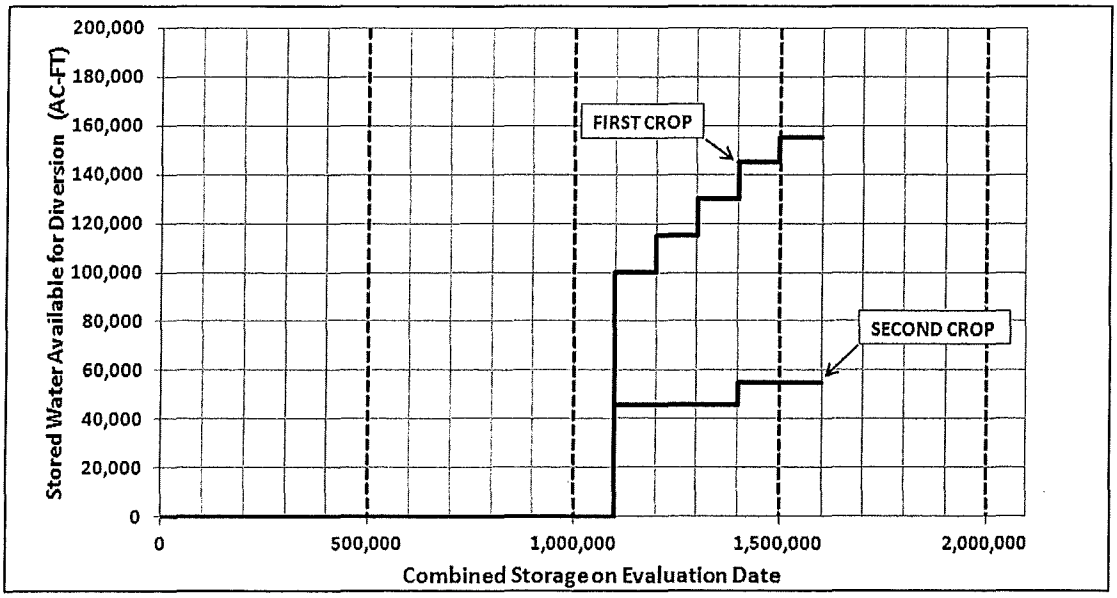
k. During Normal conditions, if the combined storage in Lakes Buchanan and Travis falls below 900,000 acre-feet at any time during either the first or second crop season, all releases of Interruptible Stored Water to Gulf Coast, Lakeside and Pierce Ranch will be cut off for the remainder of the crop season. (WMP Section 4.2.3.1.)

l. Under Less Severe conditions, the total amount of interruptible stored water to be made available for diversion at the Gulf Coast, Lakeside and Pierce Ranch irrigation operations is as follows:

i. First Crop
   a. For combined storage of 1,500,000 to 1,599,999 acre-feet– 155,000 acre-feet;
   b. For combined storage between 1,400,000 and 1,499,999 acre-feet – 145,000 acre-feet;
   c. For combined storage between 1,300,000 and 1,399,999 acre-feet – 130,000 acre-feet;

d. For combined storage between 1,200,000 and 1,299,999 acre-feet – 115,000 acre-feet;
e. For combined storage between 1,100,000 and 1,199,999 acre-feet – 100,000 acre-feet; and
f. Below 1,100,000 acre-feet, no water except for Garwood irrigation operation consistent with prior contracts between Garwood and LCRA.

ii. Second Crop
a. For combined storage of 1,400,000 to 1,599,999 acre-feet – 55,000 acre-feet;
b. For combined storage between 1,100,000 acre-feet and 1,399,999 acre-feet – 46,000; and
c. Below 1,100,000 acre-feet no water except for Garwood irrigation operation consistent with prior contracts between Garwood and LCRA. (WMP Section 4.3.2.2.)



m. During Less Severe Drought conditions, if the combined storage in Lakes Buchanan and Travis falls below 950,000 acre-feet at any time during either the first or second crop season, all releases of Interruptible Stored Water to Gulf Coast, Lakeside and Pierce Ranch will be cut off for the remainder of the crop season. (WMP Section 4.3.2.2.)

n. If releases of Interruptible Stored Water to Gulf Coast, Lakeside and Pierce Ranch are cut off in the middle of a crop season, LCRA will not provide any pass-through run-of-river water that originates upstream of Lake Travis under LCRA's water rights that were historically associated with the Gulf Coast, Lakeside, and Pierce Ranch operations unless and until the combined storage in Lakes Buchanan and Travis is above 1,300,000 acre-feet. If combined storage remains above 1,300,000 acre-feet during the remainder of the crop season, LCRA will make these Pass-Through run-of-

river supplies available limited to the amount needed to finish the crop. (WMP Sections 4.3.2.1 and 4.3.2.2.)

o. If releases of Interruptible Stored Water to Gulf Coast, Lakeside and Pierce Ranch for the first crop are cut off for the entire season, releases of interruptible stored water are also cut off for the second crop season. (WMP Sections 4.3.2.1 and 4.3.2.2.)

p. If all available Interruptible Stored Water for Gulf Coast, Lakeside and Pierce Ranch has been diverted for the first crop season, but Interruptible Stored Water for these operations is available for the second crop season, all or part of the Interruptible Stored Water available for the second crop season can be used to finish the first crop season. (WMP Sections 4.3.2.1 and 4.3.2.2.)

q. If Extraordinary Drought conditions are in effect, no Interruptible Stored Water or Pass-Through run-of-river water under LCRA's water rights historically associated with the Gulf Coast, Lakeside and Pierce Ranch operations will be made available for diversion within those operations. (WMP Section 4.3.2.3.)

r. Interruptible stored water may be available in the Garwood irrigation operation for storage levels lower than indicated in the curtailment curves based on prior contracts between Garwood and LCRA. (WMP Sections 4.3.2.1, 4.3.2.2 and 4.3.2.3.)

s. The amount of water available for Gulf Coast, Lakeside and Pierce Ranch will be based on the water supply condition combined with a Look-Ahead test. If the LCRA Board determines, under the Look-Ahead test, that the release of Interruptible Stored Water under either the Normal condition or Less Severe Drought condition (whichever is in effect) in the upcoming crop season would result in the combined storage in Lakes Buchanan and Travis falling below 600,000 acre-feet in the next twelve months or below 900,000 acre-feet in the upcoming crop season then no Interruptible Stored Water or Pass-Through run-of-river water will be released for Gulf Coast, Lakeside and Pierce Ranch for the upcoming crop season. (WMP Section 4.3.2.4.)

t. In making its determination under the Look-Ahead Test, the LCRA Board will consider antecedent conditions, current storage and forecasted conditions. LCRA shall use the 99 percent exceedance probability, unless a different trend for inflows and combined storage is being observed. However, in no case shall LCRA's determination rely on less than a 95 percent exceedance probability. Exceedance probability refers to the likelihood that a future outcome will be better than the specified value. (WMP Section 4.3.2.4.)

u. A Drought Worse than Drought of Record is a drought condition identified by the LCRA Board of Directors pursuant to criteria in the Water Management Plan where an ongoing drought has a real likelihood of becoming a new Drought of Record. A DWDR declaration would trigger action to cut off Interruptible Stored Water and implement mandatory pro rata curtailment of Firm Water demands. The Drought of Record is defined as the worst hydrologic drought for which streamflow records are available and is considered to be the period of time during recorded history with

natural hydrologic conditions provided the least amount of water supply. For the Water Management Plan, the Drought of Record is the drought of the 1940s and 50s. (WMP Sections ES-G and 4.7.)

v. The amount of water to be allocated to the individual downstream interruptible agricultural operations and to individual customers within the operations will be determined in accordance with LCRA's Drought Contingency Plan for interruptible water (Interruptible DCP) and applicable agreements and contracts.

18) If LCRA operates Lakes Buchanan and Travis in accordance with the basic goals and guidelines included in Section 1.2 of the WMP, there should be no impact to water rights in the Colorado River Basin as a result of LCRA's requested amendments to its WMP greater than if the water rights for Lakes Buchanan and Travis were fully exercised.

19) The modeled simulations of the proposed curtailment procedures demonstrate that firm customer demands can be met through a repeat of the entire period of record, 1940-2013, including through a repeat of the Drought of Record, which is defined as the drought of the 1940s and 50s for this WMP and combined storage in Lakes Travis and Buchanan is maintained above 600,000 acre feet.

20) In 2011, 2013, 2014 and 2015, LCRA applied for, and TCEQ granted, emergency orders allowing LCRA to deviate from the existing WMP with respect to curtailment procedures for interruptible stored water as a result of severe drought conditions. Further, in 2014 and 2015, LCRA applied for, and TCEQ granted, emergency orders allowing LCRA to deviate from the existing WMP with respect to providing stored water for environmental flows. This WMP amendment includes additional protections for LCRA's firm water customers and changed curtailment procedures for supplying interruptible stored water, which should mitigate the impacts of future severe conditions. If severe dry weather conditions occur in the future, beyond those considered in this WMP that cannot be addressed through curtailment procedures in the WMP (WMP Section 4.3 and Section 4.4), LCRA can apply for an Emergency Order to allow deviations from the WMP curtailment procedures for interruptible stored water or environmental flow conditions.

21) This WMP amendment reduces the amount of interruptible stored water available for customers outside of the four downstream irrigation operations, and eliminates provision of water to such customers after 2018. (WMP Section 4.5.)

22) Based on updated modeling using a modified version of the TCEQ's water availability model (WAM) for the Colorado River Basin, the combined firm yield of Lakes Travis and Buchanan is reduced from 535,812 acre-feet (which includes 90,546 acre-feet of water associated with O.H. Ivie Reservoir) to 434,154 acre-feet (which does not include an amount for O.H. Ivie Reservoir). The combined firm yield was determined based on the average annual amount of water supplied during the critical period. The calculation of this firm yield is reasonable and consistent with that used for the previous estimate of the combined firm yield recognized in the commission's 1989 order. The new combined firm yield is a net reduction of 11,112 acre-feet from the

previously calculated combined firm yield. The combined firm yield is subject to change in future WMP revisions. (WMP Section 3.2.)

23) LCRA's amendment to the WMP includes a change in the procedure for supplying water to help meet instream flow needs at certain locations downstream of Lady Bird Lake and incorporates specific instream flow values based on the most recent scientific studies, and summarized as follows (and included in WMP Section 4.4.2):

a. Three levels of instream flows: 1) subsistence; 2) base-dry; and 3) base-average.
b. The amount of water provided for instream flows, i.e. whether subsistence, base-dry, or base-average flow levels would apply, will be determined based on combined storage on March 1st and July 1st.
c. The specific trigger levels for determining which instream flow levels apply on each Evaluation Date are:
    i. When the combined storage in Lakes Travis and Buchanan is above 1,960,000 acre-feet, base-average conditions apply;
    ii. When the combined storage in Lakes Travis and Buchanan is between 1,900,000 and 1,960,000 acre-feet, base-dry conditions apply; and
    iii. When the combined storage in Lakes Travis and Buchanan is less than 1,900,000 acre-feet, subsistence conditions apply.

d. LCRA will make releases from Lakes Buchanan and Travis limited to the daily storable inflows to help meet base-average and base-dry instream flows. In addition to storable inflows, previously stored water will be released as necessary to maintain Subsistence flows at the four streamflow gauging locations identified in Table 4-3 of the WMP.
e. In the event of a pro rata curtailment of firm supplies, the applicable instream flow criteria will be subject to the same percentage curtailment as imposed on LCRA's firm water customers.
f. For purposes of this amendment to the WMP, the subsistence and base flow criteria for gauges other than the Austin gauge, are daily (or daily average) flow values. The subsistence criteria at Austin represent minimum (or instantaneous) flow requirements.

g. LCRA's ability to meet the instream flow requirements set forth in the WMP may, in rare instances, 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, unforeseen or unscheduled operations at Longhorn Dam, and adjustments to the ratings of the applicable gages.

h. For the Bastrop gauge, the following minimum flow requirements apply:

    i. During those times when base-average criteria are in effect, the minimum (or instantaneous) flow requirements, subject to availability of storable inflows, shall be 70 percent of the base-average criteria for the given month.

ii. During those times when base-dry criteria are in effect, the minimum (or instantaneous) flow requirements, subject to availability of storable inflows, shall be 70 percent of the base-dry criteria for the given month.
iii. During those times that subsistence criteria are in effect, releases shall be scheduled such that the minimum flow does not drop below:
    1. 90 percent of the subsistence criteria when the combined storage in Lakes Travis and Buchanan is equal to or greater than 1,400,000 acre-feet; or
    2. 80 percent of the subsistence criteria when the combined storage in Lakes Travis and Buchanan is less than 1,400,000 acre-feet.

24) LCRA is not required to manage water in the lower Colorado River to specifically provide for pulse flows under this amendment to the WMP. However, LCRA will monitor pulse flows during the time period that this amendment to the WMP is in effect to assess whether pulse flows are occurring at the frequency recommended in the 2008 instream flow study of the lower Colorado River. (WMP Section 4.4.2.)

25) LCRA's amendment to the WMP includes a change in the procedures for supplying water to help meet freshwater inflow needs and the freshwater inflow criteria are based on the most recent scientific studies. (WMP Section 4.4.3.)

a. The freshwater inflow criteria are based upon recent studies as described in Section 2.4.2 of the WMP.
b. The WMP freshwater inflow criteria include five levels of inflow to help meet freshwater inflow needs and, with the exception of threshold criteria, are defined using two-month operational criteria, as described in Table 4-6 of the WMP.
c. At the end of each month, to the extent storable inflows are available, LCRA will provide storable inflows, if available, as necessary to meet the two-month operational criteria.
d. In May and June, LCRA will determine if the three month spring freshet requirement as described in Table 4-5 of the WMP has been met within the spring period, and, if so, the two-month operational criteria will be reduced to the corresponding amount for the intervening period.
e. In September and October, LCRA will determine if the three month fall freshet requirement as described in Table 4-5 of the WMP has been met within the fall period, and, if so, the two-month operational criteria will be reduced to the corresponding amount for the intervening period.
f. In all months, LCRA will release storable inflows to help meet the Threshold level of 15,000 acre-feet per month, to the extent of storable inflows.
g. The combined storage trigger at which specific freshwater inflow levels apply can be found in Table 4-7 of the WMP.
h. In the event of a pro rata curtailment of firm supplies, the applicable freshwater inflow criteria will be subject to the same percentage curtailment as imposed on LCRA's firm water customers.
i. Except as provided in Finding of Fact 25.j., any time releases of Interruptible Stored Water for Gulf Coast, Lakeside and Pierce Ranch are cut off, only the Threshold requirement will be in effect.

j. If releases for Gulf Coast, Lakeside and Pierce Ranch are cut off for the second crop but combined storage in Lakes Buchanan and Travis are above 1,300,000 acre-feet on July 1st, the two-month operational criteria shall be in effect; however, LCRA's releases of storable inflows to meet the operational criteria will be limited to no more than 50% of the storable inflows remaining after the release of storable inflows for instream flows or Threshold inflow levels, with a maximum release in a single month of 82,000 acre-feet.
k. If combined storage in Lakes Buchanan and Travis falls below 1,000,000 acre-feet at any time, the only criteria in effect from that month through the next Evaluation Date is Threshold.
l. If combined storage in Lakes Buchanan and Travis is below 1,300,000 acre-feet at the end of a month, the maximum release of storable inflows to help meet freshwater inflow criteria is 25,000 acre-feet.
m. When Less Severe Drought conditions are in effect, releases of storable inflows to meet the operational criteria are limited to no more than 50% of the storable inflows remaining after the release of storable inflows for instream flows or Threshold inflow levels, with a maximum release in a single month of 82,000 acre-feet if storage is above 1,300,000 acre-feet at the end of the month and a maximum release for all freshwater inflow criteria of 25,000 acre-feet if storage is below 1,300,000 acre-feet.
n. In certain instances, up to 5,000 acre-feet of storable inflows that are not released in a given month will be carried forward to help meet the Threshold criteria in the immediately following month.

26) The amount of water available to help meet environmental flow needs is subject to limits to ensure that the actual amounts made available do not exceed the amounts simulated in the development of the 2014 WMP revision for periods when combined storage in Lakes Buchanan and Travis was below 1,300,000 acre-feet on the Evaluation Date. The WMP includes annual and multi-year caps on water for environmental flows in Section 4.4.4 of the WMP.

27) These instream flow and freshwater inflow criteria, exclusive of pulse flows and attainment frequencies, are consistent with those recommended by the Colorado-Lavaca Senate Bill 3 science team and stakeholder groups that were adopted as environmental flow standards by TCEQ on August 8, 2012.

28) LCRA committed 33,440 acre-feet of firm water to environmental needs under the 2010 WMP. That amount is not changed in this amendment.

29) If LCRA operates Lakes Buchanan and Travis in accordance with Section 4.4 of the WMP, there should be no impact to the instream flows of the lower Colorado River or freshwater inflows to Matagorda Bay greater than if the water rights for Lakes Buchanan and Travis were fully exercised.

30) LCRA's amendment to the WMP includes changes to the criteria and procedures for the declaration and cancellation of a Drought Worse than the Drought of Record as specified in Section 4.7 of the WMP.

31) LCRA's 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 June 2010. In December of 2011, the commission approved LCRA's Water Curtailment Plan for its firm customers. Under current commission rules, the DCP must be reviewed and updated as necessary every five years. Consistent with the requirements of Chapter 288, in February 2012 and May 2015, the LCRA Board approved modifications to the DCP including changes in drought response measures for firm water customers and changes in the allocation procedures for interruptible water customers. Changes to the LCRA Firm Customer DCP adopted by the Board in May 2015 and included in Appendix F of the WMP are incorporated into Chapter 4 of the WMP by reference for all purposes as if set forth in Chapter 4 in full and will become effective upon adoption of this WMP. Further revisions to the Interruptible DCP will be needed to ensure consistency with the amended WMP and prior to LCRA supplying interruptible stored water under the amended WMP. LCRA intends to publish its Interruptible DCP as a stand-alone document, once revised.

32) The WMP contains six appendices: 1)Appendix A, which includes technical papers addressing projections of demands, assumptions of water availability models (WAMs), methodology of drought identification, and development of the combined firm yields of Lakes Buchanan and Travis, and WAMs; 2)Appendix B, which contains flood control regulation information; 3) Appendix C, which includes previous amendments and orders related to the WMP; 4) Appendix D, which includes the 1988 Final Judgment and Decree; 5)Appendix E, which contains relevant LCRA Board policies, and 6) Appendix F, which contains LCRA's Firm Customer Drought Contingency Plan.

33) The naturalized flows in the Colorado WAM were updated through 2013 for this WMP. At this time Lakes Buchanan and Travis have not refilled. Updating the WAMs to include additional years of naturalized flows could result in the calculation of different trigger levels and curtailment curves than those included in the 2014 WMP amendment or of a different combined firm yield of Lakes Buchanan and Travis.

34) The models used to support LCRA's 2014 WMP include certain assumptions about LCRA's use of its downstream water rights that, if changed, could result in the calculation of different trigger levels or curtailment curves than those included in the 2014 WMP amendment.

35) Actual water use by firm customers could increase in the future above the levels considered in the models used to support LCRA's 2014 WMP amendment in a way that could result in the calculation of different trigger levels or curtailment curves.

36) LCRA and Garwood Irrigation Company are parties to a 1987 Agreement and a 1998 Purchase Agreement, which agreements relate to the supply of water by LCRA in the Garwood irrigation division.

37) Because accounting for environmental flows under the 2010 Water Management Plan and the Water Management Plan approved by this Order is month to month, it is reasonable that provisions of the Water Management Plan approved by this Order relating to environmental flow requirements be effective at the beginning of the month after this Order is issued. March 1, 2016 is the first date under the Water Management Plan approved by this Order that the

storage and inflow conditions will be used to determine the supply of interruptible water for agricultural customers and the criteria in effect to help meet environmental flow needs. Therefore, in order to transition between the Water Management Plans, the applicable Water Management Plan environmental flow criteria for the time between the effective date of this Order and February 29, 2016 should be described in the Ordering Provisions of this Order.

38) The amendment will not increase the amount of water authorized to be diverted.

39) The amendment will not increase the authorized rate of diversion.

40) The amendment will not cause adverse impacts on other water right holders.

41) The amendment will not cause adverse impacts on the environment on the stream of greater magnitude than under circumstances in which the authorization sought to be amended was fully exercised according to its terms and conditions as they existed before the requested amendment.

42) The amendment meets all other applicable requirements of Texas Water Code Chapter 11.

43) Having satisfied all of the conditions in Texas Water Code § 11.122(b), the Commission shall authorize the requested amendment.

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; the 1988 Final Judgment and Decree, *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*; the Enabling Act of the Lower Colorado River Authority; LCRA's Certificates of Adjudication Nos. 14-5478 and 14-5482, as amended; the Commission's Orders concerning the WMP; and the policies of the Lower Colorado River Authority's Board of Directors.

2) By entering this order, the Commission is not construing in any way either the 1987 Agreement or the 1998 Purchase Agreement between LCRA and Garwood Irrigation Company. Nothing in this Order or the WMP approved by this Order shall be considered or construed in any way to support one construction or another of the 1987 Agreement and the 1988 Purchase Agreement between LCRA and Garwood Irrigation Company. Garwood Operations will be provided Interruptible Stored Water consistent with the Garwood Purchase Agreement. Proposed Water Management Plan, p. 4-8.

3) This order does not alter or construe LCRA's obligation to provide water to STPNOC, to the extent required by their agreements, or STPNOC's right to divert and use water pursuant to certificate of adjudication No. 14-5437, as amended. Nothing in this order or the Water

Management Plan shall be considered to support one construction or another of such obligations and rights.

4) The commission has jurisdiction to consider and take action on LCRA's application to amend the WMP.

5) In accordance with Texas Water Code § 11.122(b), the Commission finds that the amendment:

   a. Will not increase the amount of water authorized to be diverted;
   b. Will not increase the authorized rate of diversion;
   c. Will not cause adverse impact on other water rights holders;
   d. Will not cause adverse impact on the environment on the stream of greater magnitude than under circumstances in which the authorization sought to be amended was fully exercised according to its terms and conditions as they existed before the requested amendment; and
   e. Meets all other applicable requirements of Texas Water Code Chapter 11.

6) All conditions in Texas Water Code § 11.122(b) are fully satisfied and the Commission authorizes the amendment to LCRA's WMP.

EXPLANATION OF CHANGES

On November 4, 2015, the Commission considered LCRA's application to amend its WMP, Water Use Permit No. 5838. The Commission determined that their consideration of the matter was governed by Texas Water Code § 11.122(b) in that if the amendment application meets all five criteria required by Texas Water Code § 11.122(b), then the Commission shall authorize the amendment.

The Commission stated that the five criteria to be considered are:

1. Whether there is an increase in the amount of water authorized to be diverted;
2. Whether there is an increase in the authorized rate of diversion;
3. Whether there will be an adverse impact on other water right holders;
4. Whether there will be an adverse impact on the environment on the stream of greater magnitude than under circumstances in which the permit that is sought to be amended was fully exercised according to its terms and conditions as they existed before the requested amendment; and
5. Whether the application meets all other applicable requirements of Texas Water Code Chapter 11.

The Commission stated that Texas Water Code § 11.122(b) was enacted by the Legislature in an effort to streamline the water right amendment process. If the Commission determined that an amendment meets the five Texas Water Code § 11.122(b) criteria, the Texas Legislature has required that the Commission issue the amendment. The Commission stated that, consistent with *City of*

Marshall v. City of Uncertain, 206 S.W.3d 97 (Tex. 2006), the Commission must evaluate an application to determine whether or not it meets the five criteria.

The Commissioners agreed that all five criteria of Texas Water Code § 11.122(b) had been met, and that they were, therefore, required to authorize the amendment. More specifically, the Commission determined that the amendment does not increase the amount or rate of diversion, does not adversely impact other water right holders or the environment, and meets all other applicable requirements of Texas Water Code Chapter 11. As such, the Commission denied all hearing requests; issued the amendment to LCRA's WMP, Water Use Permit No. 5838A; adopted the Executive Director's Response to Comments; and adopted the Executive Director's Proposed Order but modified to include six additional Findings of Fact, two additional Conclusions of Law, and one additional Ordering Provision.

The Commission revised the Executive Director's Proposed Order by adding the following Findings of Fact:

1. Finding of Fact No. 38, "The amendment will not increase the amount of water authorized to be diverted."
2. Finding of Fact No. 39, "The amendment will not increase the authorized rate of diversion."
3. Finding of Fact No. 40, "The amendment will not cause adverse impacts on other water right holders."
4. Finding of Fact No. 41, "The amendment will not cause adverse impacts on the environment on the stream of greater magnitude than under circumstances in which the authorization sought to be amended was fully exercised according to its terms and conditions as they existed before the requested amendment."
5. Finding of Fact No. 42, "The amendment meets all other applicable requirements of Texas Water Code Chapter 11."
6. Finding of Fact No. 43, "Having satisfied all of the conditions in Texas Water Code § 11.122(b), the Commission shall authorize the requested amendment."

The Commission also revised the Executive Director's Proposed Order by adding the following Conclusions of Law:

1. Conclusion of Law No. 5, "In accordance with Texas Water Code § 11.122(b), the Commission finds that the amendment:
    a. Will not increase the amount of water authorized to be diverted;
    b. Will not increase the authorized rate of diversion;
    c. Will not cause adverse impacts on other water right holders;
    d. Will not cause adverse impacts on the environment on the stream of greater magnitude than under circumstances in which the authorization sought to be amended was fully exercised according to its terms and conditions as they existed before the requested amendment; and
    e. Meets all other applicable requirements of Texas Water Code Chapter 11."

2. Conclusion of Law No. 6, "All conditions in Texas Water Code § 11.122(b) are fully satisfied and the Commission authorized the amendment to LCRA's WMP."

Finally, the Commission revised the Executive Director's Proposed Order by adding Ordering Provision No. 6, which reads, "This Order is effective on the date that it is final or on January 1, 2016, whichever is earlier."

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 Orders dated September 20, 1989, December 23, 1991, December 18, 1992, March 1, 1999, and January 27, 2010 approving and amending the WMP, to the extent not inconsistent with this order.

b. LCRA's amended Drought Management Plan including LCRA's amended Drought Contingency Plan is subject to all findings, conclusions, and conditions, contained in the Commission's September 20, 1989, December 23, 1991, December 18, 1992, March 1, 1999, and January 27, 2010 Orders and the LCRA's December 7, 2011 Commission approved Water Curtailment Plan, to the extent not inconsistent with this order.

c. 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.

d. LCRA shall conform the text of the Water Management Plan to be consistent with the provisions of this Order, specifically to conform to Findings of Fact numbers 16., 17.s., 17.t., 19., 23.b., and 31. The Findings of Fact provide a summary of many of the provisions in LCRA's revised and supplemental WMP application. The Findings of Fact provide a summary of many of the provisions in the WMP document in LCRA's revised and supplemental WMP application. With the exception of the Findings of Fact noted above, in the event of a conflict between the more general language in the Findings of Fact and the specific language in the WMP document text in LCRA's application, the document text in LCRA's application controls.

e. Consistent with 30 Texas Administrative Code Chapter 288, LCRA shall review and update, as appropriate, in accordance with the schedule required by such rules, those portions of its Drought Contingency Plan (for firm and interruptible customers) that do not change the triggers, amount of curtailment of interruptible stored water supply, or the triggers or criteria related to bay and estuary inflows or instream flows. Such changes do not constitute an amendment to the WMP requiring notice and opportunity for contested case hearing, but must otherwise comply with the public notice requirements of Chapter 288 of the Commission's rules.

f. LCRA shall initiate a process to update the Water Management Plan on the earlier of January 1, 2018, or one year from any of the following occurrences:

i. The March 1, when water use reports are filed, following the calendar year in which Lakes Travis and Buchanan reach a combined capacity of 98%;

ii. Firm water use, as reported in LCRA's annual water use reports and annual Water Management Plan report filed with the TCEQ, reaches a level that is 90% or greater of the demands considered in the modeling for the 2014 WMP amendment for a period of two consecutive years;

iii. LCRA has begun operating the off-channel reservoir authorized under Certificate of Adjudication No. 14-5476C;

iv. LCRA has begun using one or more of its downstream water rights based on non-temporary amendments to those rights obtained after the effective date of this Order, unless LCRA has demonstrated, and the Executive Director agrees, that modeling of such operations in combination with this Water Management Plan does not result in combined storage dropping below 600,000 acre-feet in a repeat of the hydrology considered in this WMP.

g. LCRA shall submit an application to amend its WMP no later than two years from the date it initiates a process to update the WMP under Ordering Provision 1.f. If one or more of the events described in Ordering Provision 1.f occurs after a revision process has been initiated, and upon written request by LCRA, the time period to submit an application may be extended by a maximum of six months per occurrence by the Executive Director to allow those changed circumstances to be included in the revision process.

h. LCRA's application to amend the WMP required by this Order must include naturalized streamflow data as follows:

i. an update initiated prior to January 1, 2018 shall use data updated through 2015; or

ii. an update initiated on January 1, 2018 shall use data updated through 2016.

2) For the period between the effective date of this Order and the next Evaluation Date under the Water Management Plan for environmental flow criteria (March 1, 2016), the following environmental flow criteria shall apply:

i. For the period from the effective date of this Order to the end of the month in which this order is issued, LCRA shall comply with the environmental flow criteria in the Water Management Plan as approved on January 27, 2010.

ii. For the period from the first day of the month following issuance of this order until February 29, 2016, the environmental flow criteria shall be determined consistent with the revised Water Management Plan approved by this order, relying on the July 1, 2015 combined storage in lakes Buchanan and Travis, and in accordance with item 1 on page 4-17, Section 4.4.3, of LCRA's proposed Water Management Plan document submitted in May 2015, which provides:

Any time releases of Interruptible Stored Water for agricultural operations in Gulf Coast, Lakeside, and Pierce Ranch are cut off, the only freshwater inflow criteria in effect is Threshold. However, if releases of Interruptible Stored Water for agricultural operations in Gulf Coast, Lakeside, and Pierce Ranch are cut off from the Second Crop Season but Combined Storage is greater than 1.3 million acre-feet on July 1, the Operational Criteria shall be in effect pursuant to Table 4-6. In that instance, LCRA's releases of Storable Inflows to meet the Operational Criteria will be limited to no more than 50 percent of the Storable Inflows for the month remaining after the release of Storable Inflows for instream flow criteria and/or Threshold inflow needs, with a maximum release for the Operational Criteria in a single month of 82,000 acre-feet. (LCRA's releases of Storable Inflows to Meet Threshold will not be subject to this limitation).

3) The Chief Clerk of the Texas Commission on Environmental Quality shall forward a copy of this Order to all parties.

4) If any part of this Order is held to be invalid, the invalidity of any portion shall not affect the validity of the remainder of the Order.

5) 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.

6) This Order is effective on the date that it is final or on January 1, 2016, whichever is earlier.

TEXAS COMMISSION ON
ENVIRONMENTAL QUALITY

Bryan W. Shaw

Bryan W. Shaw, Ph.D., P.E., Chairman

11-18-15

Date Signed

LAKES BUCHANAN AND TRAVIS

WATER MANAGEMENT PLAN

AND

DROUGHT CONTINGENCY PLANS

SUBMITTED TO:

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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Conformed to TCEQ Nov. 2015 Order

Lower Colorado River Authority

TABLE OF CONTENTS

Chapter 5 RIVER OPERATIONS

Tables

Figures

Appendix A – Technical Papers

Appendix B - Flood Control Regulations

Appendix C – WMP Orders

LAKES BUCHANAN AND TRAVIS
WATER MANAGEMENT PLAN

EXECUTIVE SUMMARY

A. BACKGROUND

LCRA's operation of lakes Buchanan and Travis is subject to the water rights for these lakes,[1] special conditions and criteria set forth by the court order (the "1988 Adjudication Order") that adjudicated these and other water rights in the lower Colorado River basin,[2] and the state statutes and regulations that generally govern use of state water. LCRA's exercise of its water rights pursuant to these requirements is subject to continuing jurisdiction of the Texas Commission of Environmental Quality (TCEQ), the state agency with primary authority over surface water rights in Texas.

The 1988 Adjudication Order specifically required LCRA to submit a reservoir operations plan for lakes Buchanan and Travis,[3] and this requirement is also incorporated into the water rights for these lakes.[4] Certificates of Adjudication 14-5478 and 14-5482 state that "LCRA shall interrupt or curtail the supply of water . . . pursuant to commitments that are specifically subject to interruption or curtailment, to the extent necessary to allow LCRA to satisfy all demand for water under such certificates pursuant to all firm, uninterruptible water commitments."[5] The Water Management Plan (WMP), which is subject to review and approval of the TCEQ, is LCRA's required reservoir operations plan and provides the framework by which LCRA implements this requirement and sets forth the procedures by which LCRA makes water available from these lakes to help meet "firm" water customer needs, downstream "interruptible" agricultural demands, and environmental flow needs of the lower Colorado River and Matagorda Bay within LCRA's service area. The WMP also sets forth criteria for declaring a Drought Worse than Drought of Record (DWDR)[6] and includes a calculation of the Combined Firm Yield of Lakes Buchanan and Travis, which is the amount of water that can be supplied annually from lakes Buchanan and Travis through a repeat of the Drought of Record.[7]

The WMP is not a static document. LCRA's first WMP was developed by LCRA, approved by its Board of Directors, and approved by the Texas Water Commission, predecessor to the TCEQ, in 1989. The WMP is revised periodically to address changing conditions such as increased demands from Firm Water customers and updated science related to environmental flows. As the

actual water demands from lakes Buchanan and Travis for Firm Water users continue to increase, the amount of Interruptible Stored Water available from the lakes is expected to continue to decrease. Revisions to the WMP have been approved by the TCEQ (or its predecessors) in 1991, 1992, 1999 and 2010.

As in previous WMP revisions, an advisory committee consisting of members representing the diverse interests that depend on lakes Buchanan and Travis provided input to LCRA related to key areas in the plan. Committee members represented municipal and industrial customers, lake area businesses and residents, farmers and the environment. The advisory committee began its work in July 2010 and continued through the Fall of 2011. Near consensus among stakeholders was reached on many issues and, on the heels of the worst one-year drought in recorded history in 2011, the LCRA Board voted to move forward with an application to amend the WMP, which was filed in March 2012 and later supplemented in May 2012. As the drought persisted, and LCRA operated pursuant to emergency orders in 2012, 2013, and 2014, it became evident that further changes to the WMP were needed beyond those originally requested by LCRA in March 2012. Further revisions were evaluated by LCRA staff during the summer of 2014 based on input from the TCEQ Executive Director received in May 2014. In August 2014, the LCRA Board directed staff to once again meet with interested stakeholders, and after several open stakeholder meetings and further analyses, the LCRA Board approved further amendments to LCRA's application as embodied in this document. Although LCRA did not reconvene the advisory committee for a consensus vote, the stakeholders who addressed the LCRA Board in September 2014 were generally supportive of the staff proposal. LCRA provided additional changes in May 2015. Finally, edits were made in November 2015 to conform this document to the TCEQ order approving the plan.

More information about the history of the WMP and amendment process is provided in Chapter 1 of this WMP.

B. CHANGES FROM THE 2010 WATER MANAGEMENT PLAN

In many respects, this WMP implements the most significant changes since the inception of the WMP and is designed to respond to recent and dramatic drought conditions that have rivaled the Drought of Record. Further, the WMP implements a more sophisticated approach to helping meet environmental flow needs of the lower Colorado River and Matagorda Bay system based on the most recent and best available scientific studies. The following is a list of some of the key changes:

Interruptible Stored Water Availability:

- LCRA will determine availability of Interruptible Stored Water for LCRA's Gulf Coast and Lakeside operations and Pierce Ranch separately for First and Second Crop and apply strict volumetric limits (or caps) on availability of Interruptible Stored Water in each Crop Season;
- The amounts of Interruptible Stored Water for LCRA's Gulf Coast and Lakeside agricultural operations, and Pierce Ranch will be determined taking into consideration

what Water Supply Condition is in effect: "Normal," "Less Severe Drought," or "Extraordinary Drought," combined with the implementation of a look-ahead test;
- Under the look-ahead test, under either the Normal Condition or Less Severe Drought Condition (whichever is in effect), LCRA will not begin releasing water for the non-Garwood operations for a Crop Season if the LCRA Board determines that the Combined Storage would drop below 900,000 acre-feet in the upcoming Crop Season or below 600,000 acre-feet within 12 months; and
- LCRA will stop releasing Interruptible Stored Water for the Gulf Coast, Lakeside and Pierce Ranch agricultural operations in the middle of a Crop Season when Combined Storage drops below certain levels, whether or not the LCRA Board has declared a Drought Worse than Drought of Record.

Environmental Flows:
- LCRA used the most recent scientific studies to identify the environmental flow needs and to develop environmental flow criteria;
- LCRA will determine applicable environmental flow criteria on two dates for different periods of the year; and
- The water available to help meet environmental flow needs may be adjusted based upon changes in storage during the crop season.

Other Key Changes:
- The Combined Firm Yield of Lakes Buchanan and Travis has been recalculated, and reflects a reduction from 445,266 acre-feet per year to 434,154 acre-feet per 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 continues to maintain its reservation of 50,000 acre-feet of the Combined Firm Yield;
- Revised criteria for declaration and cancellation of a Drought Worse than Drought of Record are included;
- LCRA has revised its Firm Raw Water Drought Contingency Plan (Firm DCP) and included the Firm DCP as Appendix F. The Firm DCP is incorporated into Chapter 4 of the WMP by reference for all purposes as if set forth in Chapter 4 in full. This updated Firm DCP will become effective upon final TCEQ approval of this amended WMP. The Interruptible Water DCP for LCRA's downstream agricultural operations is not included, but will be updated upon final TCEQ approval of this amended WMP; and
- The plan includes a revised definition of "emergency shortage of electricity" to better align with new ERCOT protocols.

C. DEMANDS

Demands on the Highland Lakes and the lower Colorado River system are many, varied and often competing. Cities, communities, industrial facilities and farmers throughout the lower Colorado River basin depend on water from the Highland Lakes and Colorado River. In addition, hydroelectric facilities, lake area businesses, commercial fisheries along the coast, recreation-

related businesses along the river and Matagorda Bay, recreation interests for the upper river area and lakes all the way to the coast, and the environment rely on the water. These demands are dynamic and will continue to evolve as the region's population grows and other factors change. This could include changes in agricultural programs, implementation of new water supply strategies, improvements in conservation, and new scientific studies that further enhance our understanding of the environment's water needs.

As discussed in detail in Chapter 2, for purposes of this WMP, LCRA used Interim Demands for surface water that generally correspond to expected dry year demands. For Firm Water customers, this WMP uses a level of demand about halfway between year 2010 and year 2020 projected demands. Interim Demands for the downstream agricultural operations are based on year 2010 demands.

LCRA supplies two general categories of water from lakes Buchanan and Travis: Firm Water and Interruptible Stored Water.

- **Firm Water** is water that can be supplied on a consistent (or "firm") basis from lakes Buchanan and Travis through a repeat of the worst drought in recorded history for the lower Colorado River basin, which is the drought of the 1940s and 50s, while honoring all downstream water rights. This drought is known as the Drought of Record. Firm Water is primarily made available through contracts with cities and industries within LCRA's service area, but is also used in more limited cases for irrigation, recreation, domestic use, and environmental needs.

- **Interruptible Stored Water** is water from lakes Buchanan and Travis that must be cut back or cut off during drought or times of shortage to ensure that LCRA can meet Firm Water customer demands. Currently, Interruptible Stored Water is used almost entirely for agricultural purposes in the downstream agricultural operations (LCRA's Garwood, Gulf Coast and Lakeside agricultural divisions, and Pierce Ranch), and to help meet environmental flow needs below the Highland Lakes. A small amount is made available for other purposes as described in Chapter 4.

The Firm Water demands used in this WMP revision are based on the LCRA Water Supply Resource Plan (WSRP) approved by the LCRA Board of Directors in October 2010 and are described in detail in Section 2.2 (Firm Water). The WSRP includes demand projections through year 2100. This WMP revision, however, is designed to meet projected demands over the next several years, as shown below.

WMP Firm Water Demands in 2010 WMP and this WMP
(acre-feet/year)

	2010 WMP	Current WMP
City of Austin Municipal[2]	182,788	193,334
LCRA Power Plants	25,866	25,500
City of Austin Power Plants[2]	13,500	19,000
Other Municipal & Industrial[3]	46,452	92,252
Other (conveyance and emergency release)	20,000	20,000
Total Firm Water Demand	288,606	350,086
STPNOC Firm Water Back-up	20,000	20,000
Other Major Run-of-River Diverters		
Garwood - Corpus Christi	-	35,000
STPNOC/LCRA	102,000	102,000

Notes:
1. Future projections of water demands based on LCRA Water Supply Resource Plan & Region K.
2. By contract, these customers depend on independent run-of-river water rights with back-up (firm) water supplies from LCRA. The projected numbers reflect the total of the run-of-river water rights and the amount of contracted back-up water supplies needed from LCRA.
3. Municipal and industrial includes other Firm Water demands such as recreation and irrigation Also included is domestic use around the Highland Lakes.

Agricultural use represents the largest demand of any user category on the lower Colorado River system and accounted for, on average, about 70 percent of LCRA's total annual water use from 2000 to 2011. The demand for agricultural water varies from year to year based on the number of acres irrigated and weather conditions. From 2000 to 2011, agricultural diversions at the four agricultural operations ranged from a maximum of about 464,000 acre-feet in 2011 to a minimum of 199,000 acre-feet in 2007. In 2012, 2013 and 2014, Interruptible Stored Water for agriculture was curtailed pursuant to emergency orders issued by the Commission and total agricultural diversions were significantly reduced.

The supply used to meet agricultural demands at the four agricultural operations is made up of Interruptible Stored Water from lakes Buchanan and Travis and LCRA's run-of-river water rights. To the extent that LCRA is able to make water available under its run-of-river rights, LCRA does not have to release water from storage. However, the timing and availability of run-of-river water (whether originating above or below the Highland Lakes) is often insufficient to meet all agricultural needs.

The Texas Water Development Board (TWDB) forecasts that agricultural diversions by the downstream agricultural operations will decrease over time. The 2010 WMP similarly forecast future reductions in demand. For this WMP revision, the projected agricultural demands were based on the Lower Colorado Regional Planning Group's (Region K) 2006 Regional Water Plan. However, recent water use exceeded the Regional Water Plan's projection for 2010, particularly

in the Gulf Coast operation. This WMP thus incorporates some adjustments to demands for the Gulf Coast operation based on recent water use. The adjusted projected year 2010 diversions are reflective of the current ("Interim") demands and were used to develop the curtailment procedures for this WMP. These demands are expected to be exceeded only about 10 percent of the time for the period of historic record and therefore represent agricultural demands during drought conditions. LCRA also developed procedures to address variability in demand due to weather.

Projected Diversions by Agricultural Operation
(acre-feet/year)

	Agricultural Operation				
Year	Garwood	Lakeside	Gulf Coast	Pierce Ranch	Total
Current WMP	92,400	139,700	178,700*	27,700	438,500
Notes: *Adjusted upward from WSRP and TWDB year 2010 projections to the 2008 and 2009 average use					

The waters of the lower Colorado River basin help support a diverse and healthy aquatic habitat along the Colorado River downstream of Austin and in Matagorda Bay. Under the WMP, water is made available to help meet varying environmental flow levels based upon the Combined Storage in lakes Buchanan and Travis. The environmental flow needs are described in more detail in Chapter 2 and reflect the best available science as required by the January 2010 TCEQ Order approving the 2010 WMP ("TCEQ 2010 Order").[8]

D. WATER AVAILABILITY MODELING

LCRA developed specific Water Availability Models for this WMP revision. A Water Availability Model, or WAM, is a computer model that simulates how much water is available under different or alternative management scenarios through a repeated period of hydrology. The models use historic streamflow and evaporation data to calculate the supply of available surface water. Separate models were created to: 1) develop and evaluate the curtailment procedures in this WMP revision; and 2) determine the Combined Firm Yield of Lakes Buchanan and Travis.

During the last WMP revision process, LCRA used a model that simulated the operations of lakes Buchanan and Travis and major water rights downstream of the lakes using hydrologic data from 1941-1965. That model used inflows to the lakes derived from some of the first WAMs developed by the predecessor agencies of the TCEQ in the 1970s and 1980s.

For this WMP revision process, LCRA modified the most current version of TCEQ's WAM to include the most recent available historic hydrologic data, including the recent intense droughts experienced in 1999-2013 period. The hydrologic period of record in the WAM used for this WMP is 1940-2013. These models are discussed in detail in Technical Papers A-3 through A-6.

E. DETERMINATION OF INTERRUPTIBLE STORED WATER AVAILABILITY AND WATER FOR ENVIRONMENTAL FLOW NEEDS

One of the fundamental aspects of the WMP is to determine when and how to cut back the available supply of Interruptible Stored Water as needed to protect Firm Water demands through a repeat of the Drought of Record. This WMP contains a number of distinct trigger levels and conditions that are associated with determining the amount of Interruptible Stored Water available from lakes Buchanan and Travis to try to help meet:

- Agricultural demands in the downstream agricultural operations;
- A range of freshwater inflows goals for Matagorda Bay;
- A range of instream flows goals for the Colorado River downstream of the Highland Lakes;
- Demands for a small category of Interruptible Stored Water users, other than the downstream agricultural operations, when the Combined Storage in lakes Buchanan and Travis is above 1.9 million acre-feet (MAF).

Demands for Interruptible Stored Water to supplement available run-of-river water supplies for agricultural purposes can be particularly high during drier conditions. Moreover, recent and dramatic drought conditions that have rivaled the Drought of Record demonstrate the need to impose greater limitations on the availability of Interruptible Stored Water. These types of conditions, combined with a significant growth and projected growth in Firm Water demands, increase the likelihood of significant shortages of Interruptible Stored Water. Thus, this WMP revision includes significant changes to the Interruptible Stored Water curtailment policies from prior Water Management Plans, which are described in detail in Chapter 4 of this WMP.

When determining available Interruptible Stored Water supplies, it is essential that Firm Water demands be protected during a repeat of the historic 1950s Drought of Record (DOR).[9] This drought is the worst recorded to date on the lower Colorado River. The curtailment procedures in this WMP revision have been designed to ensure supply is available to meet Firm Water demands as described in Chapter 2, through a DOR condition and through the short-term intense droughts that this region has experienced in recent decades, as required by the TCEQ 2010 Order. Specifically, this WMP revision has been simulated for a repeat of historic hydrology from 1940 to 2013.

The TCEQ 2010 Order also required an evaluation of the minimum Combined Storage in lakes Buchanan and Travis necessary or appropriate to protect Firm Water customers through a DOR condition, or under conditions worse than the Drought of Record. Since the evaluation of expected hydrologic and water demand conditions can only be simulated based on projected information, which is subject to some uncertainty, in all of its prior WMPs LCRA has determined it prudent to designate some minimum Combined Storage level. This served as a safety factor to address model uncertainties and provide for hydrologic conditions other than those simulated. This WMP establishes a minimum Combined Storage goal of 600,000 acre-feet (the storage trigger for a declaration of Drought Worse than Drought of Record) and the model

simulations for this WMP revision maintained storage at or above this goal. This safety factor avoids the triggering of a Drought Worse than Drought of Record declaration as a result of releasing interruptible stored water in the event of a repeat of historic hydrology, including recent and dramatic drought conditions that have rivaled the Drought of Record. This approach is consistent with input received from TCEQ in May 2014 and the emergency orders issued by TCEQ for the 2012, 2013, and 2014 irrigation seasons.

This WMP revision includes a number of significant changes in procedures used to determine the availability of Interruptible Stored Water for agricultural use in the four downstream agricultural operations and to other customers, and in the criteria used to determine the availability of water to help meet the environmental flow needs of the Colorado River and Matagorda Bay. These changes allow LCRA to be more responsive to changes in water supply conditions. A list of key changes can be found in Section B of this executive summary and discussion of some of the key changes that deal with Interruptible Stored Water follows. As with recent WMPs, evaluation of demands and the curtailment of Interruptible Stored Water for Garwood and Pierce Ranch under this WMP revision will also be accomplished pursuant to the terms of specific agreements related to the supply of interruptible water to those operations.

Determination of Water Supply Condition

Previous versions of the WMP determined how much Interruptible Stored Water was available based on Combined Storage on January 1 of each year. This WMP evaluates not only Combined Storage, but also inflow conditions to determine the amounts of Interruptible Stored Water available for the downstream agricultural operations in Lakeside, Gulf Coast, and Pierce Ranch and the criteria in effect to help meet environmental flow needs. The Water Supply Condition will be evaluated on each March 1 and July 1.

Separate limits and procedures for First and Second Crop

LCRA will determine which Water Supply Condition is in effect for purposes of this WMP (Normal, Less Severe Drought, or Extraordinary Drought) on March 1 and July 1. For the upcoming Crop Season, LCRA will implement the curtailment procedures and provide specific volumes of Interruptible Stored Water as prescribed by the Water Supply Condition in place, unless the LCRA Board determines that Combined Storage would drop below 600,000 acre-feet in the next 12 months or below 900,000 acre-feet in the upcoming crop season. If releases of Interruptible Stored Water for the First Crop Season are cut off for the entire season, then releases of Interruptible Stored Water are also cut off for the Second Crop Season.

Helping meet environmental flow needs

Under this WMP, as in past WMPs, LCRA provides a combination of Firm Water and Interruptible Stored Water to help meet environmental flow needs. This WMP retains LCRA's commitment of 33,440 acre-feet per year of Firm Water supply from lakes Buchanan and Travis for environmental flow purposes.

This WMP reflects improvements to the operational procedures that will be used to help meet environmental flow needs based on more recent scientific studies and also includes an increase in the total average annual combination of Firm Water and Interruptible Stored Water supplied to help meet environmental flows needs compared to the 2010 WMP. The applicable environmental flow criteria under this WMP can change during the year, similar to the determination of agricultural water based on separate dates for First Crop and for Second Crop. The environmental flow criteria in place from March through June are based on the Combined Storage on March 1, and the environmental flow criteria in place from July through the following February are based on the Combined Storage on July 1. (This represents a change from prior WMPs in which the environmental flow criteria for the entire year were based on January 1 Combined Storage.) Environmental flow criteria also take into account the availability of Interruptible Stored Water for agriculture.

F. RIVER OPERATIONS

Chapter 5 of this WMP describes how LCRA operates the Colorado River and the Highland Lakes as a system to efficiently manage water supply and mitigate flood damage. To accomplish these goals, LCRA uses a number of tools and practices that it regularly updates. To manage its river operations, LCRA develops and maintains data acquisition systems, decision support models and standard operating guidelines and procedures. Chapter 5 provides a general description of river operations as of September 2014. LCRA's operations are updated as needed to respond to actual conditions and in a manner intended to minimize or avoid the risk of injury to life and property, and to conserve and protect water supply whenever reasonably possible.

G. GLOSSARY

To understand the Water Management Plan, 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, particularly where capitalized, should be considered specific to LCRA's WMP.

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

1988 Adjudication Order – the court order adjudicating water rights in the Lower Colorado River segment of the Colorado River basin, cited as *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*, No. 115, 414-A-1 (264th Dist. Ct., Bell County, Tex. April 20, 1988).

agricultural – any of the following uses or activities involving agriculture, including irrigation:

- cultivating the soil to produce crops for human food, animal feed, or planting seed or for the production of fibers;

- the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or nonsoil media by a nursery grower;
- raising, feeding, or keeping animals for breeding purposes or for the production of food or fiber, leather, pelts, or other tangible products having a commercial value;
- raising or keeping equine animals;
- wildlife management;
- planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure; and
- aquaculture.

attenuation – the reduction in the peak of a hydrograph, as water moves downstream, resulting in a more broad, flat hydrograph**.**

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.

Combined Firm Yield of Lakes Buchanan and Travis – the calculated firm yield of lakes Buchanan and Travis when operated as a system, incorporating LCRA's agreements and operating assumptions regarding calls on the upper basin. The Combined Firm Yield is based on the 1940s to 1950s historic Drought of Record. *See* "firm yield" definition below.

Combined Storage – the total volume of water stored in lakes Buchanan and Travis at a given point in time. For purposes of making various determinations under this WMP, the Combined Storage means the total of the daily average volume of water in Lake Buchanan and the daily average volume of water in Lake Travis, when excluding any water in Lake Buchanan above elevation 1,018 ft mean sea level (msl) and any water in Lake Travis above elevation 681 ft msl. A determination that relies on Combined Storage will not be based on a single reading during the day, but instead is the average for the day.

Crop Season – the period of time in which water is supplied either for first crop or second crop. S*ee* "First or Main Crop Season" and "Second or Ratoon Crop Season."

curtail or cutback (water) – to reduce the amount of water supply being provided.

cutoff (water) – to discontinue, or to terminate completely, the supply of water that would otherwise be provided.

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, release, evaporation, or other losses.

drought – a period of below average rainfall and/or runoff that impacts streamflow and has the potential to impact water supplies.

drought contingency plan (DCP) – a plan required by state law and rules of the Texas Commission on Environmental Quality that outlines drought response measures to be taken in response to specific drought conditions. (*See* Tex. Water Code § 11.1272 and 30 Tex. Admin. Code ch. 288).

Drought of Record (DOR) – the worst hydrologic drought for which streamflow records are available and is considered to be the period of time during recorded history when natural hydrological conditions provided the least amount of water supply. For the WMP, the Drought of Record is the drought of the 1940s and 50s.

Drought Worse than Drought of Record (DWDR) – a drought condition identified by the LCRA Board of Directors where an ongoing drought has a real likelihood of becoming a new Drought of Record. A DWDR declaration would trigger action to cut off interruptible stored water and implement mandatory pro rata curtailment of Firm Water demands. (*See* Sec. 4.7.)

Evaluation Date – the date, either March 1 or July 1, on which LCRA will determine the Water Supply Condition, Interruptible Stored Water available for agriculture and effective environmental flow criteria, as more fully described in Chapter 4.

Firm Water – water that can be supplied on a consistent (or "firm") basis from lakes Buchanan and Travis through a repeat of the worst drought in recorded history for the lower Colorado River basin, which is the drought of the 1940s and 50s, while honoring all downstream water rights. This drought is known as the Drought of Record.

firm yield – that amount of water, that the reservoir could have produced annually if it had been in place during the worst drought of record. In performing this simulation, naturalized streamflows will be modified as appropriate to account for the full exercise of upstream senior water rights is assumed as well as the passage of sufficient water to satisfy all downstream senior water rights valued at their full authorized amounts and conditions as well as the passage of flows needed to meet all applicable permit conditions relating to instream and freshwater inflow requirements. (*See* 30 Tex. Admin Code § 297.1(20).)

First or Main Crop Season – refers to the first part of the irrigation season when LCRA may be providing water to the downstream agricultural operations for agricultural purposes; this part of the irrigation season normally runs from March through about July and is coincident with growing of the first or main crop of rice. During the First or Main Crop Season, rice, row crop, turf, hay, pasture and wildlife management are types of agricultural uses that may be supplied

with water.

freshwater inflow – the flows from a stream into a bay and estuary system that help support the health and productivity of that ecosystem.

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

hydrograph – a graphical representation of stage, flow, velocity, or other characteristics of water at a given point with respect to time.

Inflows into Lakes Buchanan and Travis – the total inflows into lakes Buchanan and Travis based upon flow readings at certain gauges upstream of lakes Buchanan and Travis (without any adjustment for the Pass-Through of water to meet downstream demands associated with senior water rights).

instream flow – an amount of streamflow in a stream or river to support aquatic life, minimize pollution, or for recreational use.

Interim Demands – for Firm Water demands, a level of demand about halfway between year 2010 and year 2020 projected demands. Interim Demands for Firm Water are not an exact average of year 2010 and 2020 demands; rather they take into account the timing in which certain demands are anticipated to occur. Interim Demands for the downstream agricultural operations are based on year 2010 demands.

Interruptible Stored Water – water from lakes Buchanan and Travis that must be cut back or cut off during drought or times of shortage to ensure that LCRA can meet Firm Water customer demands.

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.

LCRA General Manager (or General Manager) – the General Manager of the Lower Colorado River Authority or his or her designee.

Pass-Through – the amount of inflows into the Highland Lakes that is being passed through the lakes to meet demands of senior water right holders downstream.

run-of-river flows – the flow in the river that is available under law at a given point on the river at a given point in time to honor a water right with a given priority date. 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.

Second or Ratoon Crop Season – refers to the second part of the irrigation season when LCRA may be providing water to the downstream agricultural operations for agricultural purposes; this part of the irrigation season normally runs from about August through about mid-October and is coincident with growing of the second or "ratoon" crop of rice. The ratoon crop is the crop of rice that re-grows from the rice plant's root system following harvest of the main or first crop of rice. The ratoon crop matures more quickly than the main crop since it is supported by an established root system. During the Second Crop Season, rice, turf, row crop, hay, pasture and wildlife management are types of agricultural uses that may be supplied with water.

Storable Inflows – For purposes of making the determination of water available from lakes Buchanan and Travis to help meet certain environmental flows, the term "Storable Inflows" means the Inflows into lakes Buchanan and Travis based upon flow readings at certain gauges upstream of lakes Buchanan and Travis minus any required Pass-Through of inflows

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.

TCEQ 2010 Order – the order issued by the Texas Commission on Environmental Quality approving amendments to the LCRA Water Management Plan in January 2010, citied as TEX. COMM'N ENVTL. QUAL., *Agreed Order Approving Amendments to Lower Colorado River Authority's Water Management Plan* (Jan. 27, 2010).

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.

Water Supply Condition – a condition based upon Combined Storage and Inflows into Lakes Buchanan and Travis that is used to determine availability of Interruptible Stored Water and environmental flow criteria. The three Water Supply Conditions are: Normal, Less Severe Drought and Extraordinary Drought.

Acronyms:

AF	acre-feet
B&E	bay and estuary
CFS	cubic feet per second
DCP	Drought Contingency Plan
FEMA	Federal Emergency Management Agency

LCRA	Lower Colorado River Authority
MAF	million acre-feet
MBHE	Matagorda Bay Health Evaluation
msl	mean sea level (or above mean sea level)
STPNOC	STP Nuclear Operating Company
TCEQ	Texas Commission on Environmental Quality
TWDB	Texas Water Development Board
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
WAM	Water Availability Model
WMP	Water Management Plan

1. Certificates of Adjudication 14-5478, as amended, and 14-5482, as amended.
2. *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*, No. 115, 414-A-1 (264th Dist. Ct., Bell County, Tex. April 20, 1988) ("1988 Adjudication Order"), Lake Buchanan Conclusion of Law 4 and Lake Travis Conclusion of Law 6.
3. 1988 Adjudication Order, Lake Buchanan Conclusion of Law 4 and Lake Travis Conclusion of Law 6.
4. Certificate of Adjudication 14-5478 ¶ 2.B.(1); and Certificate of Adjudication 14-5482 ¶ 2.B.(1).
5. Certificate of Adjudication 14-5478 ¶ 2.B.(7); Certificate of Adjudication 14-5482 ¶ 2.B.(7).
6. TEX. COMM'N ENVTL. QUAL., *Order Approving Lower Colorado River Authority's Drought Management Plan*, Ordering Provision 1(f) (Dec. 18, 1991).
7. *See* 1988 Adjudication Order, Lake Buchanan: Conclusion 4(a), Lake Travis: Conclusion 6(a) (requiring that LCRA determine the Combined Firm Yield of Lake Travis and Buchanan).
8. *See* TEX. COMM'N ENVTL. QUAL., *Agreed Order Approving Amendments to Lower Colorado River Authority's Water Management Plan*, Ordering Provision 1.f. (Jan. 27, 2010). Section 1.3 of this WMP provides a list of items to be addressed pursuant to the January 2010 TCEQ Order.
9. Pursuant to the certificates of adjudication for Lakes Buchanan and Travis, LCRA shall curtail the supply of interruptible water under such water rights to the extent necessary to allow LCRA to satisfy all firm demands. (Certificates of Adjudication Nos. 14-5478, ¶ 2.B.(7) and 14-5482, ¶ 2.B.(7)).

CHAPTER 1
INTRODUCTION TO THE WATER MANAGEMENT PLAN

1.1 BACKGROUND

LCRA's operation of lakes Buchanan and Travis is subject to the water rights for these lakes,[1] special conditions, and criteria set forth by the court order (the "1988 Adjudication Order") that adjudicated these and other water rights in the lower Colorado River basin,[2] and the state statutes and regulations that generally govern use of state water. LCRA's exercise of its water rights pursuant to these requirements is subject to the continuing jurisdiction of the Texas Commission of Environmental Quality (TCEQ), the state agency with primary authority over state water rights.

The 1988 Adjudication Order specifically required LCRA to submit a reservoir operations plan for lakes Buchanan and Travis,[3] and this requirement is also incorporated into the water rights for these lakes.[4] Certificates of Adjudication 14-5478 and 14-5482 state that "LCRA shall interrupt or curtail the supply of water . . . pursuant to commitments that are specifically subject to interruption or curtailment, to the extent necessary to allow LCRA to satisfy all demand for water under such certificates pursuant to all firm, uninterruptible water commitments."[5] The Water Management Plan (WMP), which is subject to review and approval of the TCEQ, is LCRA's required reservoir operations plan and provides the framework by which LCRA implements this requirement and sets forth the procedures by which LCRA makes water available from these lakes to help meet "firm" water customer needs, downstream interruptible agricultural demands, and environmental flow needs of the lower Colorado River and Matagorda Bay within LCRA's service area. (*See* Figure 1-1.) The WMP also sets forth criteria for declaring a Drought Worse than the Drought of Record (DWDR)[6] and includes a calculation of the Combined Firm Yield of Lakes Buchanan and Travis, which is the amount of water that can be supplied annually from lakes Buchanan and Travis through a repeat of the Drought of Record (DOR).[7]

- **Firm Water** is water that can be supplied on a consistent (or "firm") basis from lakes Buchanan and Travis through a repeat of the worst drought in recorded history for the lower Colorado River basin, which is the drought of the 1940s and 50s, while honoring

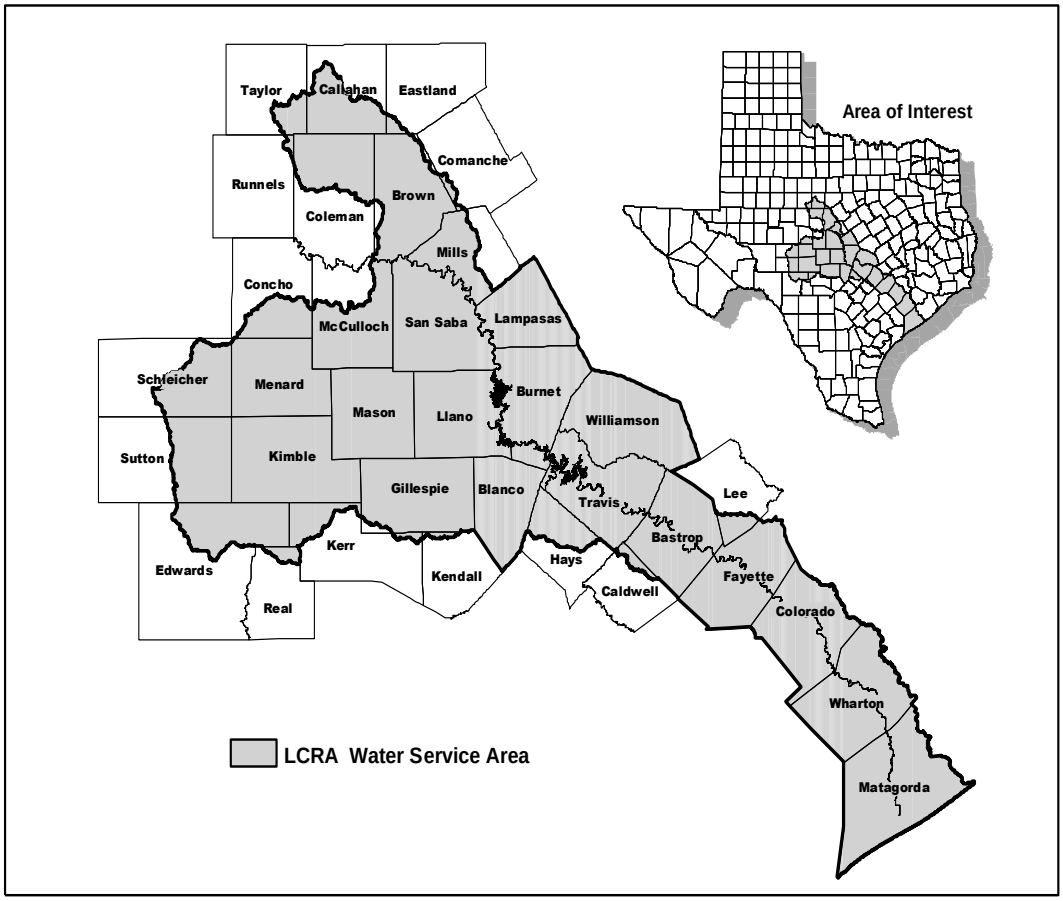
all downstream water rights. This drought is known as the Drought of Record. Firm Water is primarily made available through contracts with cities and industries within LCRA's service area, but is also used in more limited cases for irrigation, recreation, domestic use, and environmental needs.

- **Interruptible Stored Water** is water from lakes Buchanan and Travis that must be cut back or cut off during drought or times of shortage to ensure that LCRA can meet Firm Water customer demands. Currently, Interruptible Stored Water is used almost entirely for agricultural purposes in the downstream agricultural operations (LCRA's Garwood, Gulf Coast and Lakeside agricultural divisions, and Pierce Ranch), and to help meet environmental flow needs below the Highland Lakes. A small amount is made available for other purposes as described in Chapter 4.

LCRA's first WMP was developed by LCRA, approved by its Board of Directors, and approved by the Texas Water Commission (predecessor to the TCEQ) in 1989. The WMP is revised periodically to address changing conditions, such as increased demands from Firm Water customers and updated science related to environmental flows. As the actual water demands from lakes Buchanan and Travis for Firm Water users continue to increase, the amount of Interruptible Stored Water available from the lakes is expected to continue to decrease. Revisions to the WMP have been approved by the TCEQ (or its predecessors) in 1991, 1992, 1999 and 2010.

In many respects, this WMP implements the most significant changes since the inception of the WMP and is designed to respond to recent and dramatic drought conditions that have rivaled the Drought of Record. Further, the WMP implements a more sophisticated approach to helping meet environmental flow needs of the lower Colorado River and Matagorda Bay system based on the most recent and best available scientific studies.

Figure 1-1. LCRA Water Service Area as of Oct. 2014.



1.2 BASIC GOALS AND GUIDELINES FOR MANAGING LAKES BUCHANAN AND TRAVIS

The initial WMP and various revisions have been developed using the following major goals, as provided in the 1988 Adjudication Order:

- Lakes Buchanan and Travis and the Colorado River will be managed together as a single system for water supply purposes;
- LCRA will manage the system to maximize the beneficial use of water derived from inflows below the Highland Lakes; and
- LCRA will manage the system to stretch and conserve the water stored in lakes Buchanan and Travis.[8]

To achieve the goals stated above, LCRA manages the system according to the following guidelines from the 1988 Adjudication Order:[9]

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. Water should be released from storage in lakes Buchanan and Travis to satisfy downstream demands only to the extent that such demands cannot be satisfied pursuant to run-of-river water rights;
4. Firm commitments from lakes Buchanan and Travis shall not exceed the Combined Firm Yield of Lakes Buchanan and Travis;
5. Water from lakes Buchanan and Travis may be available on an interruptible basis at any time that the actual demand for stored water under firm commitments is less than the Combined Firm Yield. To the extent that a demand for water may exist on an interruptible basis, such stored water should be made available;
6. The water from lakes Buchanan and Travis available on an interruptible basis should be interrupted or curtailed to the extent necessary to allow LCRA to satisfy all existing and projected demands pursuant to firm commitments; and
7. 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 not impair LCRA's ability to satisfy all existing and projected demands for stored water for firm and nonfirm, interruptible commitments.[10]

The amount of Interruptible Stored Water that can be made available while honoring Firm Water demands has also been determined historically according to the following guidelines:

1. Water may be available on an interruptible basis at any time that the actual demand for firm water is less than the firm yield. Interruptible stored water should be made available to the extent that demands for such water exist;[11]
2. The extent to which interruptible stored water will be available in any year can be defined pursuant to an operational rule curve or other analysis that guarantees the supply of water for firm demands and identifies an amount of water for interruptible purposes;[12] and
3. The use of an operational rule curve is an acceptable approach to insure utilization of the lakes' storage while guaranteeing that firm demands will be met dependably.[13]

Further, in response to the exceptional drought conditions in the lower Colorado River basin that prompted three years of emergency orders superseding the 2010 WMP,[14] and based on input from the TCEQ Executive Director, the LCRA Board adopted a four-point framework that underlies this WMP:

1. Combined Storage is maintained above 600,000 acre-feet through a repeat of historic hydrology.
2. The WMP was developed based on hydrology through year 2013.
3. Demands associated with Corpus Christi's Garwood water right were included in the analysis.
4. The WMP includes a three-tier regime for interruptible agricultural curtailment that considers Combined Storage and inflow conditions, plus the use of a look-ahead test (as further explained in Chapter 4).

1.3 INTERESTS AFFECTED BY WATER MANAGEMENT PLAN

Lakes Buchanan and Travis are operated as a single water supply system and are designed to supply water and address varied interests within LCRA's service area, as described more fully below.

1.3.1 Municipal and Industrial Customers

The bulk of LCRA's Firm supply is provided to cities and industries within LCRA's service area. LCRA's municipal customers together supply water for over 1 million people in one of the fastest growing regions in the country. LCRA also supplies water on a firm basis to a number of industrial customers, including several power plants.

1.3.2 Agricultural Users

The waters of the Colorado River have served the agricultural and rice farming industry of the Texas Gulf Coast counties of Colorado, Wharton and Matagorda since 1885, when the first rice crops were planted near Eagle Lake, Texas. In the 1930s, not long after LCRA was created, it entered into contracts to provide a combination of stored water and run-of-river water to help meet the needs of irrigators within the Garwood, Gulf Coast and Lakeside irrigation companies' service areas.

LCRA has a handful of Firm Water customers who purchase water for agricultural use, but most of the water provided by LCRA for agricultural use is purchased on an interruptible basis. The Water Management Plan is the mechanism that determines how much interruptible water is available for this and other purposes. Historically, under the WMP, agricultural customers within the LCRA's agricultural operations have had first claim to available interruptible supply over other interruptible users.[15] LCRA contracts to provide a very limited supply of interruptible water for agricultural use outside these four operations when the lakes are nearly full.

1.3.3 Other Water Customers

LCRA also supplies water, primarily on a firm basis, for other beneficial uses, such as golf course and landscape irrigation and household use.

1.3.4 Environmental & Water Quality Interests

The waters of the lower Colorado River basin help support a diverse and healthy aquatic habitat along the Colorado River downstream of Austin and in Matagorda Bay. LCRA makes water available from lakes Travis and Buchanan under the WMP from a combination of Firm and Interruptible Stored Water supply to help meet varying environmental flow needs for both the health of the lower Colorado River and Matagorda Bay. Water that LCRA provides for instream flows also helps protect water quality, particularly when combined with other LCRA programs to monitor and protect water quality in the river and the Highland Lakes.

1.3.4.1 Freshwater Inflows

The Colorado River, along with other area rivers and streams, provides freshwater inflows into the Matagorda Bay system. In the early 1990s, the Colorado River was re-routed to increase the freshwater inflows into West Matagorda Bay, and now contributes approximately 40 percent of the total inflow on an average annual basis. The Matagorda Bay system is the second largest estuary on the Texas Gulf Coast. The abundant production of finfish and shellfish make this environmentally sensitive area an important ecological resource and a source of economically significant commercial and sport fisheries.

1.3.4.2. Instream Flows and Water Quality

The aquatic environment of the lower Colorado River downstream of Austin can be affected by the quality, quantity and timing of water flowing through the ecosystem. Streamflow is a key variable that influences riverine habitat, biology, geomorphology and water quality. As discussed more fully in Chapter 2, a range of flow conditions is necessary to maintain healthy ecosystems.

Protecting water quality in the Highland Lakes and the Colorado River is an important part of LCRA's mission. The primary threats to water quality are: stormwater runoff that carries pollutants and contaminants (nonpoint source pollution); soil erosion; discharges from industry and wastewater treatment plants (point source pollution); reservoir sedimentation; and dissolved oxygen problems.

While the WMP is designed to manage lakes Buchanan and Travis to provide Firm and Interruptible Stored Water supply and help meet environmental needs, the instream flow recommendations also provide for water quality protection. Currently, there are several LCRA programs in place to protect and enhance river and lake water quality. In fact, LCRA is actively involved in the Colorado River Watch Network and Texas Clean Rivers Program, has developed water quality models for the Highland Lakes, and administers a permitting program to address threats to water quality from septic systems and stormwater runoff near the Highland Lakes.

1.3.5 Lake/River Recreation and Economic Interests

In many areas, recreational uses of the river and lakes are steadily increasing. The entire lower Colorado River basin, from Lake Buchanan to Lady Bird Lake, and the river downstream to Matagorda Bay and the Gulf of Mexico, receives a great deal of recreational use from fishermen, boaters, park visitors and swimmers from all over Texas. Furthermore, significant economies have developed around these areas, particularly around the Highland Lakes. Because the reservoirs were built for flood management and water supply and not constructed to maximize recreational use on the lakes, the demands for higher lake levels can be difficult to accommodate. Similarly, providing water specifically to maintain river recreation below Austin would also impact the available water supply. The WMP nonetheless addresses these interests, in part, by only making available a small amount of Interruptible Stored Water on a temporary basis to areas outside of the four agricultural operations under conditions that require the lakes to be nearly full.

1.4 DEVELOPMENT OF CURRENT WATER MANAGEMENT PLAN

1.4.1 Texas Commission on Environmental Quality January 2010 Order

On Jan. 27, 2010, TCEQ approved the 2010 WMP. Consistent with the order approving the revised WMP (found in Appendix C-6), LCRA began the WMP revision process in the summer of 2010. The order requires LCRA to address, at a minimum, the following issues:

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 the Drought of Record;
3. An evaluation of the minimum Combined Storage 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 the Drought of Record;
4. Incorporation of appropriate changes to reflect LCRA's agreements and obligations to STP Nuclear Operating Company (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; and
6. Revisions to provisions governing the manner in which LCRA provides water from lakes Buchanan and Travis to address environmental flow needs using the best available scientific information, and shall provide water for such needs to the maximum extent reasonable and practicable when considering all public interests. 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.[16]

1.4.2. Advisory Committee & Stakeholder Processes

LCRA has used input from an advisory committee to develop every WMP. The TCEQ 2010 WMP Order specifically required LCRA to use a revision process designed to allow meaningful participation by interested basin stakeholder groups and achieve regional consensus, where possible. For this WMP revision, LCRA again established an advisory committee to provide input to LCRA on the WMP update. A list of the advisory committee members, which included members from each of the major interests that depend on the lower Colorado River, is included in Exhibit F-4.

From July 2010 through the Fall of 2011, LCRA hosted 20 formal advisory group meetings, (which were often all-day meetings) as well as several more informal meetings with smaller contingents of the advisory committee. Attendance was greater than 90 percent throughout the advisory committee process.

The advisory committee spent several months addressing key issues, such as the availability of interruptible water for irrigated agriculture and associated curtailment triggers and procedures. Much time was spent evaluating many computer simulations to get an understanding of how various changes in curtailment triggers and procedures would change key results or affect their interests. Throughout the process, LCRA staff worked diligently to provide the committee with the best available information on the issues as members worked toward consensus. From the beginning of the process, consensus was defined as:

> All agree that their major interests have been considered and factored in a manner that they can generally support even if all their interests have not been fully satisfied.

Although near consensus was reached at the close of the advisory committee process in the Fall of 2011, this effort was overshadowed by the worst one-year drought in recorded history in 2011. As the drought persisted, and LCRA operated pursuant to emergency orders in 2012, 2013, and 2014, it became evident that further changes to the WMP were needed beyond those considered by the advisory committee.

Further revisions were evaluated by LCRA staff during the summer of 2014 based on input from the TCEQ Executive Director and the four-point framework discussed in Section 1.2 above. In August 2014, the LCRA Board directed staff to meet with interested stakeholders in an expedited process and to return to the Board the following month with a proposal. To that end, LCRA staff

held open stakeholder meetings on three separate occasions, met with county judges and their representatives, and conducted further analysis based on requests and input from stakeholders and brought a proposal for the Board's consideration in September 2014, which is embodied in this WMP. Although LCRA did not reconvene the advisory committee for a consensus vote, the stakeholders who addressed the LCRA Board in September 2014 were generally supportive of the staff proposal.

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1. Certificates of Adjudication 14-5478, as amended, and 14-5482, as amended.
2. *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*, No. 115, 414-A-1 (264th Dist. Ct., Bell County, Tex. April 20, 1988) ("1988 Adjudication Order"), Lake Buchanan Conclusion of Law 4, Lake Travis Conclusion of Law 6.
3. *Id.*
4. Certificate of Adjudication 14-5478 ¶ 2.B.(1); Certificate of Adjudication 14-5482 ¶ 2.B.(1).
5. Certificate of Adjudication 14-5478 ¶ 2.B.(7); Certificate of Adjudication 14-5482 ¶ 2.B.(7).
6. TEX. COMM'N ENVTL. QUAL., *Order Approving Lower Colorado River Authority's Drought Management Plan*, Ordering Provision 1(f) (Dec. 18, 1991).
7. *See* 1988 Adjudication Order, Lake Buchanan: Conclusion 4(a), Lake Travis: Conclusion 6(a) (requiring that LCRA determine the Combined Firm Yield of Lake Travis and Buchanan).
8. 1988 Adjudication Order, Lake Buchanan: Finding 19, Lake Travis: Finding 26.
9. *Id.*
10. *Id.*
11. *Id.* Lake Buchanan: Finding 19(e), Lake Travis: Finding 26(e).
12. *Id.* Lake Buchanan: Finding 24; Lake Travis: Finding 31; TEX. COMM'N ENVTL. QUAL., *Order Approving Lower Colorado River Authority's Water Management Plan and Amending Certificates of Adjudication Nos. 14-5478 and 14-5482*, Finding of Fact 51 (Sept. 7, 1989) ("1989 WMP Order").
13. 1989 WMP Order, Finding of Fact 90.
14. TEX. COMM'N ENVTL. QUAL., Docket No. 2014-1044-WR, *Order Affirming an Order Granted by the Executive Director that Grants an Emergency Order Requested by the Lower Colorado River Authority* (Aug. 15, 2014); TEX. COMM'N ENVTL. QUAL., Docket No. 2014-0124-WR, *Order Affirming an Order issued by the Executive Director that grants a renewal of the Emergency Order issued to the Lower Colorado River Authority* (June 17, 2014); TEX. COMM'N ENVTL. QUAL., Docket No. 2014-0124-WR, *Order Affirming in Part, and Modifying in Part, the Executive Director's Emergency Order Authorizing the Lower Colorado River Authority to Amend its Water Management Plan* (Feb. 27, 2014); TEX. COMM'N ENVTL. QUAL., Docket No. 2013-0225-WR, *Order Granting an Emergency Authorization to the Lower Colorado River Authority* (July 26, 2013); TEX. COMM'N ENVTL. QUAL., Docket No. 2013-0225-WR, *Order Affirming, with Modification, an Emergency Order Granted by the Executive Director to the Lower Colorado River Authority* (June 10, 2013); TEX. COMM'N ENVTL. QUAL., Docket No.

2013-0225-WR, *Order Affirming, with Modification, an Emergency Order Granted by the Executive Director to the Lower Colorado River Authority* (Feb. 19, 2013); TEX. COMM'N ENVTL. QUAL., Docket No. 2011-2096-WR, *Order Affirming an Emergency Order Granted by the Executive Director to the Lower Colorado River Authority* (Dec. 12, 2011).

15. TEX. COMM'N ENVTL. QUAL., Docket No. 1995-1317-WR, *Order Overruling Objections to LCRA's System of Priorities Set Forth in its Water Management Plan* (June 3, 2003).
16. TEX. COMM'N ENVTL. QUAL., *Agreed Order Approving Amendments to Lower Colorado River Authority's Water Management Plan*, Ordering Provision 1.f. (Jan. 27, 2010).

CHAPTER 2
DEMANDS

2.1 BACKGROUND

Demands on the Highland Lakes and the lower Colorado River system are many, varied and often competing. Cities, communities, industrial facilities and farmers throughout the lower Colorado River basin depend on water from the Highland Lakes and Colorado River. In addition, hydroelectric facilities, lake area businesses, commercial fisheries along the coast, recreation-related businesses along the river and Matagorda Bay, recreation interests for the upper river area and lakes all the way to the coast, and the environment rely on the water. These demands are dynamic and will continue to evolve as the region's population grows and other factors change. This could include changes in agricultural programs, implementation of new water supply strategies, improvements in conservation, and new scientific studies that further enhance our understanding of the environment's water needs.

As discussed further in this Chapter, for purposes of this WMP, LCRA used Interim Demands for surface water that generally correspond to dry year demands. For Firm Water customers, this WMP uses a level of demand about halfway between year 2010 and year 2020 projected demands. Interim Demands for the downstream agricultural operations are based on year 2010 demands.

2.2 FIRM WATER

2.2.1 Demands

Firm Water demands primarily consist of municipal and industrial demands that are to be met without shortage through a repeat of the historic 1950s Drought of Record. A small portion of Firm Water is also used for irrigation, mining, domestic and recreational purposes, and LCRA has set aside a portion of its Firm Water supply to help meet environmental flow needs.

Municipal use includes water used by cities, municipalities, water districts, commercial establishments, industries and institutions to the extent that such uses are included in the definition of municipal use in the rules of the Texas Commission on Environmental Quality (TCEQ).

For the purposes of the WMP, the demands of individual households that pump water directly from the lakes (domestic use) were included with municipal demands. As of October 2014, LCRA has included existing and projected domestic water use in the demands for this WMP revision as it did in the 2010 WMP. LCRA has issued a significant number of Firm Water contracts for domestic use. Absent a contract, most if not all of diverters around the lakes who take water for domestic use have no legal claim to the water they are diverting. In recent years, LCRA has been working to bring these diverters into compliance.

Industrial demands include water for manufacturing, construction and cooling for electric generation by means other than hydrogeneration. Most of the lower Colorado River basin's industrial users today are located downstream of the Highland Lakes.

The Firm Water demands for LCRA's customers used in the WMP are based on the LCRA Water Supply Resource Plan[1] (WSRP) approved by the LCRA Board of Directors in October 2010. That plan includes demand projections through year 2100, however the WMP is only designed for near-term demands. The WSRP demand projections were based on work by the Texas Water Development Board and the Lower Colorado Regional Water Planning Group (Region K). Where appropriate, the demands were updated based on more recent growth trends and discussions with local municipal and industrial entities. Specific assumptions related to Firm Water demand projections were:

1. Demands for municipal, industrial, electric power production and other needs were calculated based on the amount of water that would be needed during the Drought of Record to ensure that ample supplies would be available during a similar drought;
2. Communities and utilities that rely on groundwater, and areas where Region K projections indicate sufficient groundwater will be available through the planning period, would not require water from LCRA;
3. Water availability analyses included conservation and reuse for the City of Austin, consistent with Region K and the provisions of the 2007 Settlement Agreement between LCRA and the City of Austin;
4. Demands include the water to be provided by contract (up to 25,000 acre-feet per year) to Williamson County under the provisions of House Bill 1437;
5. Municipal demands were developed using substantiated, revised population estimates based on recent growth patterns to estimate future growth. Demands were calculated using the same per capita water use approach used in the 2006 Region K plan;
6. New and pending contracts for municipal demand were included;
7. Projected demands for domestic use on the Highland Lakes were added;
8. Region K industrial demand, and new and pending contracts for industrial use were included;
9. Conveyance losses from the point of release of water from the Highland Lakes to the point of delivery for existing contracts were added; and
10. Other demands such as emergency hydrogeneration were included.

The projected 2020 and 2030 Firm Water demands are summarized in Table 2-1. The projected 2020 and 2030 demands are provided to show future potential growth in Firm Water demands. However, procedures to cut back Interruptible Stored Water as the Combined Storage of lakes Travis and Buchanan decreases, known as curtailment procedures, have not been developed for the 2020 and 2030 demands as part of this WMP revision.

Firm Water demands representing a scenario roughly halfway between year 2010 and 2020 were developed and used for the development of curtailment procedures under this WMP. In developing these "Interim" demands, LCRA took into account the actual water use at power plants in 2011 (a recent high demand year), the surface water demand reduction due to groundwater supplies available at the Lost Pines Power Park, and the expected use by Corpus Christi of its Garwood water right beginning in 2015. These demands are also summarized in Table 2-1.

Table 2-1. WMP Firm Water Demand Projections (acre-feet/year)

	WMP	WMP Future Projections[1]		
	2010	Interim	2020	2030
Firm Demands:				
City of Austin Municipal[2]	182,788	193,334	203,880	232,923
LCRA Power Plants	25,866	25,500	25,866	25,866
City of Austin Power Plants[2]	13,500	19,000	28,202	31,502
Other Municipal & Industrial[3]	46,452	92,252	138,052	183,843
Other (conveyance and emergency release)	20,000	20,000	20,000	20,000
Total Firm Water Demand	288,606	350,086	416,000	494,134
STPNOC Firm Water Back-up	20,000	20,000	40,000	40,000
Other Major Run-of-River Diverters:				
City of Corpus Christi	-	35,000	35,000	35,000
STPNOC/LCRA	102,000	102,000	102,000	102,000

Notes:
1. Future projections of water demands based on LCRA Water Supply Resource Plan & 2006 Region K plan.
2. By contract, these customers depend on independent run-of-river water rights with back-up (Firm) water supplies from LCRA. The projected numbers reflect the total of the run-of-river water rights and the amount of contracted back-up water supplies needed from LCRA.
3. Municipal includes other Firm Water demands such as recreation and irrigation. Also included is domestic use around the Highland Lakes.

2.2.2 Board Reservation

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

2.3 AGRICULTURAL DEMANDS IN THE DOWNSTREAM IRRIGATION OPERATIONS

Rice is the major crop irrigated in the most downstream three counties in the LCRA Service Area. While some rice producers in the region irrigate their crops with groundwater, the major source of water for irrigation has been from the waters of the Colorado River, either under LCRA's run-of-river water rights, or from releases of Interruptible Stored Water from lakes Buchanan and Travis.

Currently the majority of LCRA's Interruptible Stored Water is used for agricultural purposes downstream of the Highland Lakes in four irrigation operations: Garwood, Gulf Coast, Lakeside and Pierce Ranch. The water is primarily used for rice farming, although turf grass, row crops, hay, pasture, aquaculture and wildlife management also use Interruptible Stored Water within these operations.[2]

Agricultural use represents the largest demand of any user category on the lower Colorado River system and accounted for, on average, about 70 percent of LCRA's total annual water use from 2000 to 2011. The demand for agricultural water varies from year to year based on the number of acres irrigated and weather conditions. From 2000 to 2011, agricultural diversions at the four irrigation operations ranged from a maximum of about 464,000 acre-feet in 2011 to a minimum of 199,000 acre-feet in 2007. In 2012, 2013 and 2014, Interruptible Stored Water supply for agriculture was curtailed pursuant to emergency orders issued by TCEQ[3] and total agricultural diversions were significantly reduced.

The supply used to meet agricultural demands at the four irrigation operations is made up of Interruptible Stored Water from lakes Buchanan and Travis and LCRA's run-of-river water rights.[4] To the extent that LCRA is able to make water available under its run-of-river rights, LCRA does not have to release water from storage. However, the timing and availability of run-of-river water (whether originating above or below the Highland Lakes) is often insufficient to meet all agricultural needs.[5] For example, in recent dry years such as 2009 and 2011, the percent of diversions originating from stored water was about 68 and 79 percent, respectively. In 2010, a wetter year, the percent of diversions originating from stored water was about 31 percent, with the majority of diversions, about 69 percent, originating from run-of-river supplies.

The Texas Water Development Board (TWDB) forecasts that agricultural diversions by the downstream irrigation operations will decrease over time.[6] The 2010 Water Management Plan similarly forecast future reductions in demand. For this WMP revision, the projected agricultural demands were primarily based on the Lower Colorado Regional Planning Group's (Region K) 2006 Regional Water Plan. However, recent water use exceeded the Regional Water Plan's projection for 2010, particularly in the Gulf Coast operation. The agricultural demands shown in Table 2-2 reflect the Regional Water Plan's forecasted irrigation demands with adjustments for the Gulf Coast operation based on recent water use. The adjusted projected year 2010 diversions are reflective of the current (Interim) demands and were used to develop the curtailment procedures for this WMP. The year 2020 and 2030 demands are presented in Table 2-2 for reference purposes.

Table 2-2 represents demands that are expected to be exceeded only about 10 percent of the time for the period of historic record and therefore represent irrigation demands during drought

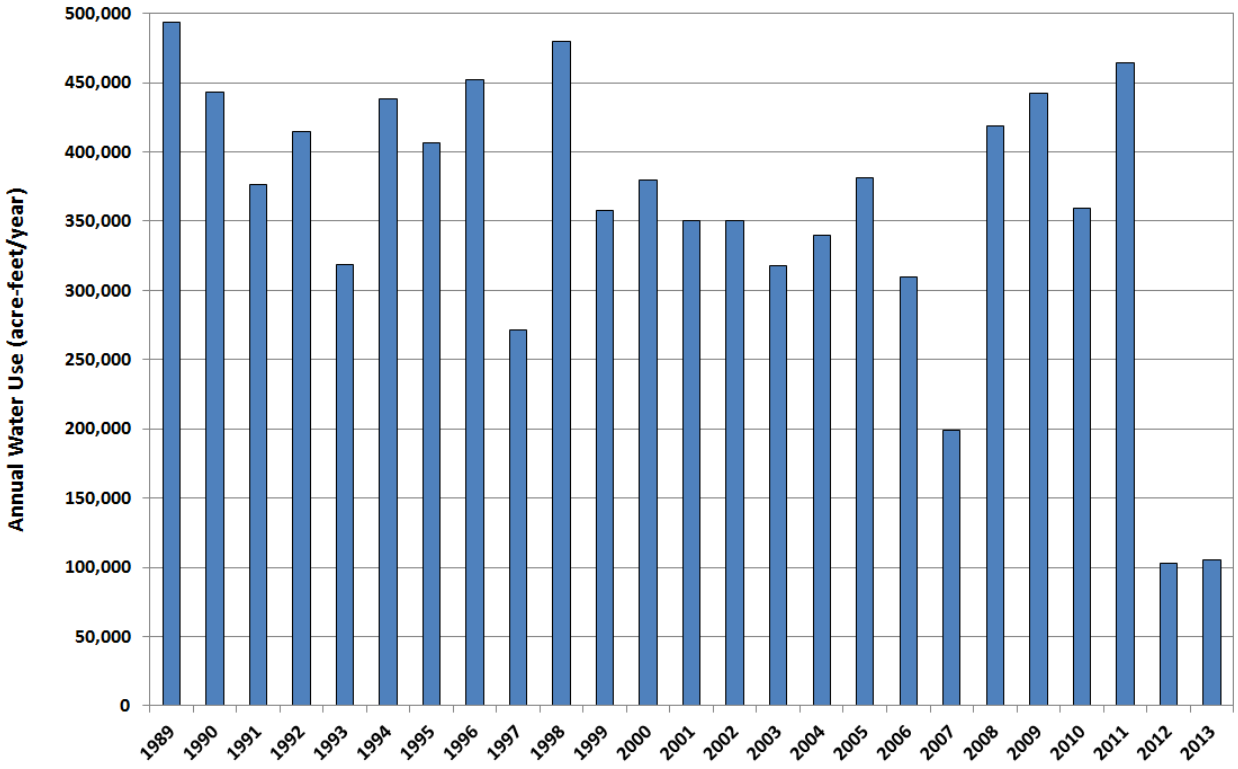
conditions. The period of 1940-2013 was used for modeling this WMP revision. There was significant weather variability during this period, which resulted in variability in agricultural demands. For example, *see* Figure 2-1, which illustrates the irrigation water demand variability since 1989 based upon the annual LCRA Water Use Reports. Thus, as has been done in previous revisions to the WMP, weather-varied water demands have been used for model simulations. *See* Appendix A, Technical Paper A-2 for a more detailed description of how these weather-varied water demands for agriculture were determined.

Table 2-2. Projected Diversions by Irrigation Operation (acre-feet/year)

Year	Irrigation Operation				
	Garwood	Lakeside	Gulf Coast	Pierce Ranch	Total
2010	92,400	139,700	178,700*	27,700	438,500
Interim	92,400	139,700	178,700*	27,700	438,500
2020	89,700	135,500	147,400**	27,000	399,600
2030	87,100	131,300	116,100	26,200	360,700

Notes:
*Adjusted upward from WSRP and TWDB projections to the average of 2008 and 2009 use.
**Adjusted to the average of the adjusted 2010 value and the 2020 value.

Figure 2-1. Historic Water Diversions by the Four Downstream Irrigation Operations



Note: Diversions in 2012 and 2013 were reduced as a result of curtailment of supplies.

2.4 ENVIRONMENTAL NEEDS FOR INSTREAM FLOWS AND BAY AND ESTUARY INFLOWS

The waters of the lower Colorado River basin help support a diverse and healthy aquatic habitat along the Colorado River and in Matagorda Bay. Under the WMP, water is made available to help meet varying environmental flow levels downstream of Austin based upon the Combined Storage in lakes Buchanan and Travis consistent with the 2010 TCEQ Order. The environmental flow needs are described in the following subsections.

2.4.1 Instream Flows

The aquatic environment of the lower Colorado River downstream of Austin can be affected by the quality, quantity and timing of water flowing through the ecosystem. Streamflow is a key variable that influences riverine habitat, biology, geomorphology and water quality. A range of flow conditions is necessary to maintain healthy ecosystems.

A comprehensive instream flow study was completed in 2008 that investigated the flow relationships to aquatic habitat and the state-threatened blue sucker fish.[7] The study approach was consistent with the Texas Instream Flow Program methodology designed to support "a sound ecological environment," which is described as "…a functioning ecosystem characterized by intact, natural processes, resilience, and a balanced, integrated, and adaptive community of organisms comparable to that of the natural habitat of the region." The study collected extensive biological and physical data to develop hydraulic, habitat, water quality and sediment transport models. These models were used to support the development of the subsistence and base flow recommendations.[8]

- The subsistence flow recommendations represent minimum conditions at which water quality is maintained at acceptable levels and aquatic habitats are expected to be consistent with those found in natural settings during drought conditions. The study recommendations provide a goal of maintaining flows at or above subsistence levels all the time. Dissolved oxygen is expected to be maintained at 5.0 mg/L, or above, at all sites. This level of dissolved oxygen supports a healthy aquatic community. Special consideration for the state-threatened blue sucker is reflected in the February and March recommendations for instream flows at the Bastrop and Columbus gauges. Subsistence recommendations for these months and these sites were adjusted to help ensure that 90 percent of the spawning habitat is maintained during these key spawning times.

- The base flow recommendations provide habitat conditions and year-to-year variability sufficient to maintain a sound ecological environment. Although the study recommendations acknowledge that the frequency of achievement may need to be adjusted to reflect various considerations, those study recommendations call for achieving compliance, on a long-term basis, with Base-Dry recommendations about 80% of the time and with Base-Average recommendations about 60% of the time. A comprehensive evaluation of the habitat model results, duration curves, exceedance tables, and water quality and sediment transport modeling led to the development of two base flow recommendations called Base-Dry and Base-Average. These recommendations are designed to provide the variability in habitat type, amount and distribution needed to support a sound ecological environment.

Subsistence and base flow recommendations for each month are presented in Table 2-3.

Table 2-3. Subsistence and Base Flow Recommendations by Gauge (cubic feet per second)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Austin												
Subsistence	50	50	50	50	50	50	50	50	50	50	50	50
Bastrop												
Subsistence	208	274	274	184	275	202	137	123	123	127	180	186
Base-Dry	313	317	274	287	579	418	347	194	236	245	283	311
Base-Average	433	497	497	635	824	733	610	381	423	433	424	450
Columbus												
Subsistence	340	375	375	299	425	534	342	190	279	190	202	301
Base-Dry	487	590	525	554	966	967	570	310	405	356	480	464
Base-Average	828	895	1,020	977	1,316	1,440	895	516	610	741	755	737
Wharton												
Subsistence	315	303	204	270	304	371	212	107	188	147	173	202
Base-Dry	492	597	531	561	985	984	577	314	410	360	486	470
Base-Average	838	906	1,036	1,011	1,397	1,512	906	522	617	749	764	746

2.4.2 Bay and Estuary Inflows

Many factors, including freshwater inflows, contribute to the high natural productivity of Matagorda Bay and estuary. The seasonality of these freshwater flows is also important to the health and productivity of the bay.

The Matagorda Bay Health Evaluation (MBHE) used the latest data and science to assess the relationship between various factors and bay conditions.[9] Several measures of bay health were investigated, including salinity, habitat condition, species abundance, nutrient supply and benthic condition. The computer models and data analysis in the study were used to develop inflow criteria for the Colorado River. Salinity, habitat and benthic modeling were used to develop criteria for most levels, but additional measures of bay health were used wherever possible.

The recommended Colorado River inflows from the MBHE study were designed to cover the full range of inflow conditions into Matagorda Bay, with a regime that incorporates five levels of inflow, each with an associated desired achievement guideline. The lowest level, "Threshold," is a fixed monthly value to provide refuge conditions that would ideally be achieved 100% of the time. The remaining levels, MBHE-1 through MBHE-4, represent different inflow targets that were recommended to be achieved with the following frequencies: MBHE-1, 90%; MBHE-2, 75%; MBHE-3, 60%; and MBHE-4, 35%. The levels all include seasonal variability and incorporate influxes of fresh water into the Bay in the spring and fall that reflect the natural pattern of inflows into the bay. The MBHE freshwater inflow categories and descriptions are summarized in Table 2-4. The inflow values associated with these inflow levels are presented in Table 2-5.

Table 2-4. Summary of Matagorda Bay Health Evaluation Inflow Levels

Inflow Level	Descriptions
Threshold	Refuge conditions for all species and habitat
MBHE-1	Maintain tolerable oyster reef health, benthic character, and habitat conditions
MBHE-2	Provide inflow variability and sustain oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat
MBHE-3	Provide inflow variability and support quality oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat
MBHE-4	Provide inflow variability and support high levels of primary productivity, and high quality oyster reef health, benthic condition, low estuarine marsh, and shellfish and forage fish habitat

Table 2-5. Matagorda Bay Health Inflow Values (acre-feet)

Inflow Category	Spring (3 month total)	Fall (3 month total)	Intervening (6 month total)	Monthly
Threshold	-	-	-	15,000
MBHE-1	114,000	81,000	105,000	-
MBHE-2	168,700	119,900	155,400	-
MBHE-3	246,200	175,000	226,800	-
MBHE-4	433,200	307,800	399,000	-

For purposes of this WMP revision, "Operational Criteria" have been developed to help meet the range of freshwater inflow needs associated with MBHE levels 1 through 4. To help meet MBHE inflow levels, the MBHE three-month "spring" and "fall" and six-month "intervening" flow totals for a given inflow category are converted into equivalent two-month Operational Criteria as shown in Table 2-6. These running two-month values are applied in seasonal periods representing spring, fall and intervening. The spring Operational Criteria apply for the two-month periods ending in March, April, May and June. The fall Operational Criteria apply for the two-month periods ending in July, August, September and October. Finally, the intervening Operational Crtieria apply for the two-month periods ending in November, December, January, and Februrary. For example, the MBHE-1 spring three-month total of 114,000 acre-feet is converted into a two-month Operational Criteria of 76,000 acre-feet. To determine whether the criteria was met at the end of March, LCRA will look at total inflows from February 1 through March 31. The monthly Threshold bay inflow need applies in every month, regardless of the season or inflow level sought to be achieved. While Table 2-5 represents the general criteria for attempting to meet MBHE inflows, Chapter 4 includes the full suite of criteria applied to determine how much stored water will be made available from lakes Buchanan and Travis for environmental flows, including some limitations on the amounts of water that would be made available to meet the Operational Criteria.

Table 2-6. Operational Criteria for Matagorda Bay Inflows

Inflow Category	Two-Month Operational Criteria (acre-feet)		
	Spring March-June	Fall July-Oct	Intervening Nov-Feb
OP-1	76,000	54,000	35,000
OP-2	112,000	80,000	52,000
OP-3	164,000	117,000	76,000
OP-4	289,000	205,000	133,000

2.5. HYDROELECTRIC POWER GENERATION

Hydroelectric power plants are located at each of the dams owned and operated by LCRA and total approximately 294 megawatts of capacity as shown in Table 2-7. Until the 1960s, the hydroelectric plants represented LCRA's total capability for generating electric energy. LCRA's Enabling Act and its water rights (as well as those of the City of Austin for Tom Miller Dam) include provisions that largely subordinate the right to generate hydropower. In essence, this subordination[10] recognizes the competing needs for the stored water in the reservoirs, and hydrogeneration is allowed only when LCRA needs to release water to meet other water demands, when hydrogeneration will not impair LCRA's ability to satisfy all water demands, or when there is an "emergency shortage of electricity." To the maximum extent possible, releases of water are made in a manner to take maximum advantage of the energy produced by those releases. Because water released for hydrogeneration but retained in or above Lake Austin is still available to meet a water supply demand, these limitations generally apply only to water released for hydrogeneration that leaves Tom Miller Dam that cannot be used to meet a downstream water demand.

Table 2-7. Hydroelectric Capacities

Lake	Dam	Generation Capacity (megawatts)	Discharge Capacity (cfs)
Buchanan	Buchanan	54	5,941
Inks	Inks	14	3,217
LBJ	Wirtz	60	10,134
Marble Falls	Starke	42	10,372
Travis	Mansfield	108	7,578
Austin	Miller	16	3,415

To conform to current ERCOT protocols and LCRA operations, LCRA employs a definition of "emergency shortage of electricity" that allows LCRA to release water for hydroelectric generation absent a downstream water demand when such releases are:

1. made while ERCOT is in an Energy Emergency Alert (EEA) for a short supply condition;
2. in response to an ERCOT-issued Reliability Directive or other emergency order;
3. required to comply with ERCOT's Responsive Reserve Service release and dispatch orders; or
4. required to comply with a Security-Constrained Economic Dispatch (SCED) dispatch instruction to generation at the ERCOT's current System Wide Offer Cap (SWOC), which indicates a market-based shortage of supply.

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1. LCRA, WATER SUPPLY RESOURCE PLAN, and supporting spreadsheets (October 2010).
2. PARSONS CORP., FINAL REPORT: FUTURE IRRIGATION WATER DIVERSIONS, 2010-2090, Prepared for LCRA and SAWS (Sept. 1, 2006).
3. *See* Chapter 1, Note 14.
4. LCRA, AN UPDATE TO IRRIGATION WATER USE PREDICTIONS FOR THE FOUR AGRICULTURAL WATER OPERATIONS IN THE LOWER COLORADO RIVER SERVICE AREA (June 14, 2010).
5. LCRA, WATER SUPPLY STRATEGIES FOR AGRICULTURE (June 2011).
6. TEX. WATER DEV. BD. & LOWER COLORADO REG'L PLANNING GRP., 2001 ADOPTED REGIONAL WATER PLAN (Dec.2000); TEX. WATER DEV. BD. & LOWER COLORADO REG'L PLANNING GRP., 2006 ADOPTED REGIONAL WATER PLAN (Jan. 2006).
7. BIO-WEST, Inc., FINAL REPORT: COLORADO RIVER FLOW RELATIONSHIPS TO AQUATIC HABITAT AND STATE THREATENED SPECIES: BLUE SUCKER, Prepared for LCRA and SAWS (2008).
8. TEX. COMM'N ON ENVTL. QUAL., TEX. PARKS & WILDLIFE DEPT., & TEX. WATER DEV. BD., TEXAS INSTREAM FLOW PROGRAM STUDIES: TECHNICAL OVERVIEW REPORT 369 (May 2008).
9. FINAL REPORT: MATAGORDA BAY INFLOW CRITERIA (COLORADO RIVER), MATAGORDA BAY HEALTH EVALUATION, Prepared for LCRA and SAWS (Dec. 2008).
10. The only water accounted for in the WMP model specifically for hydrogeneration is for emergency shortages of electricity, consistent with the special conditions in LCRA's water rights. The WMP model does not otherwise reflect the "subordination" of its hydrogeneration rights required by LCRA's water rights because any non-emergency hydrogeneration is a byproduct of releases that LCRA makes for other downstream demands. The special conditions affecting LCRA's exercise of its hydrogenation rights are identical in all of its rights for the Highland Lakes. *See*, *e.g.*, Certificate of Adjudication No. 14-5478 (Lake Buchanan), ¶ 2.D (Use) at 6.

CHAPTER 3
FIRM YIELD OF LAKES BUCHANAN AND TRAVIS

3.1 INTRODUCTION

The 1988 Adjudication Order adjudicating LCRA's Highland Lakes water rights requires that LCRA calculate the Combined Firm Yield of Lakes Travis and Buchanan (Combined Firm Yield).[1] TCEQ rules define firm yield as follows:

> That amount of water, that the reservoir could have produced annually if it had been in place during the worst drought of record. In performing this simulation, naturalized streamflows will be modified as appropriate to account for the full exercise of upstream senior water rights is assumed as well as the passage of sufficient water to satisfy all downstream senior water rights valued at their full authorized amounts and conditions as well as the passage of flows needed to meet all applicable permit conditions relating to instream and freshwater inflow requirements.[2]

As part of this WMP revision, LCRA has recalculated the Combined Firm Yield. For purposes of this WMP, the Combined Firm Yield of Lakes Buchanan and Travis is the firm yield of those lakes when operated as a system, incorporating LCRA's agreements and operating assumptions as discussed below. Further, consistent with the 1988 Decree, the Combined Firm Yield represents the maximum amount of water that LCRA can commit from lakes Buchanan and Travis for Firm Water supply.

The concept of firm yield of a reservoir or system of reservoirs is fundamental to water supply planning. For lakes Buchanan and Travis, it defines a reliable level of supply that can be reasonably expected to be available in the future should a drought occur that is as severe as the historic 1950s Drought of Record. It is also possible for a drought more severe than the historic Drought of Record to occur in the future, in which case the full firm yield amount would not be available.

3.2 COMBINED FIRM YIELD COMPUTATION

A water availability model (WAM) was used to calculate the Combined Firm Yield of Lakes Buchanan and Travis. The computer model accounts for all surface water rights in the Colorado River basin and uses historical streamflow data, hydrology and climatic conditions to simulate the supply of surface water available on a monthly basis. This model's parameters and assumptions relate to the legal representation of all water rights in the basin and assume all other rights in the Colorado Basin exercise the full legal amounts authorized by their associated water rights, regardless of what these water rights' demands actually are or are anticipated to be. This model incorporates LCRA's agreements regarding O.H. Ivie Reservoir and certain other upstream water rights whereby LCRA would not make a call on such water rights. This model

also incorporates the settlement agreement between LCRA and the City of Austin[3] regarding treatment of return flows discharged by the City of Austin as it impacts the Combined Firm Yield of Lakes Buchanan and Travis. Key model assumptions are summarized in Table 3.1. The model assumptions are addressed in detail in Appendix A, Technical Paper A-5.

Table 3-1. Firm Yield Model – Key Assumptions

Model Parameter	Firm Yield Model
Period of record	1940-2013
Reservoir sedimentation conditions	Year 2010
Priority "cutoff" assumption[1]	Ivie and Brownwood
Municipal and industrial demands	Authorized Amount
Downstream water rights	Authorized Amount
City of Austin return flows included	Yes
Environmental flows represented	No

Note:
1. All water rights upstream of the reservoirs noted are represented as being able to divert and store water with priority over all water rights downstream of these upstream reservoirs regardless of the actual priority date stated in their water rights. This assumption is appropriate at and above Ivie and Brownwood reservoirs because several of the large water rights at the Highland Lakes and downstream have "no call" agreements in place with numerous entities upstream of these reservoirs.

Although this basin has experienced exceptional drought conditions in recent years, for the period of record from 1940 to 2013, the model results indicated that the critical period for determining the Combined Firm Yield remains the historic 1950s Drought of Record. The Combined Firm Yield of Lakes Buchanan and Travis as calculated in this WMP revision is 434,154 acre-feet per year. This replaces the value of 445,266[4] acre-feet per year calculated in the original WMP as documented in the 1989 Order approving that WMP and referenced in Certificates of Adjudication Nos. 14-5478A and 14-5482A.[5] A more detailed explanation of the Combined Firm Yield calculation can be found in Appendix A, Technical Paper A-5.

1. *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*, No. 115, 414-A-1 (264th Dist. Ct., Bell County, Tex. April 20, 1988) ("1988 Adjudication Order"),
2. 30 TEX. ADMIN. CODE § 297.1(20).
3. *Settlement Agreement by and between the City of Austin and the Lower Colorado River Authority Regarding Joint Water Resource Management and the Resolution of Certain Regulatory Matters Pending at the Texas Commission on Environmental Quality*, § VIII.C. (June 18, 2007).
4. The initial and prior WMPs also reported as part of the Combined Firm Yield an additional 90,546 acre-feet per year associated with O.H. Ivie Reservoir for a total of 535,812 acre-feet per year.
5. TEX. COMM'N ENVTL. QUAL., *Order Approving Lower Colorado River Authority's Water Management Plan and Amending Certificates of Adjudication Nos. 14-5478 and 14-5482*,

Finding of Fact 51 (Sept. 7, 1989) Finding of Fact 47 & Ordering Paragraph 1(m) (specifically noting that the firm yield "is subject to adjustment and refinement from time to time as additional studies and simulations are developed that more accurately reflect assumption s and operations required by law.") Certificates of Adjudication 14-5478A, ¶ 1(b) and 14-5482A ¶ 1(b), which were issued at the same time as the 1989 Order, also expressly state that this calculation may be modified from time to time. The revised calculation reflects recent sedimentation survey data that shows a reduction in the total Combined Storage capacity in the lakes, which is important to reflect for operational purposes. However, LCRA is not requesting any amendments to the authorizations contained in the underlying water rights for lakes Travis and Buchanan.

CHAPTER 4

DETERMINATION OF INTERRUPTIBLE STORED WATER AVAILABILITY AND WATER FOR ENVIRONMENTAL FLOW NEEDS

4.1. INTRODUCTION

This Water Management Plan (WMP) contains a number of distinct trigger levels and conditions that are associated with determining the amount of Interruptible Stored Water available from lakes Buchanan and Travis to try to help meet:

- Agricultural demands in the downstream agricultural operations;
- A range of freshwater inflow goals for Matagorda Bay;
- A range of instream flow goals downstream of the Highland Lakes; and
- Demands for a small category of Interruptible Stored Water users, other than the downstream agricultural operations, when the Combined Storage in lakes Buchanan and Travis is above 1.9 million acre-feet (MAF).

Demands for Interruptible Stored Water to supplement available run-of-river water supplies for agricultural purposes can be particularly high during dry conditions. Moreover, recent and dramatic drought conditions that have rivaled the Drought of Record demonstrate the need to impose greater limitations on the availability of Interruptible Stored Water to ensure that LCRA can meet Firm Water demands if such conditions persist. These types of conditions, combined with a significant growth in Firm Water demands, increase the likelihood of significant shortages of Interruptible Stored Water. Thus, this WMP revision includes significant changes to the Interruptible Stored Water curtailment policies from prior Water Management Plans.

When determining available Interruptible Stored Water supplies, it is essential that Firm Water demands be protected during a repeat of the historic 1950s Drought of Record (DOR).[1] This drought is the worst recorded to date on the lower Colorado River. The curtailment procedures in this WMP revision have been designed to ensure supply is available to meet Firm Water demands as described in Chapter 2, through a DOR condition and through the short-term intense droughts that this region has experienced in recent decades, as required by the January 2010 TCEQ Order approving the 2010 WMP ("TCEQ 2010 Order").[2] Specifically, this WMP revision has been simulated for a repeat of historic hydrology from 1940 to 2013.

The TCEQ 2010 Order also required an evaluation of the minimum Combined Storage in lakes Buchanan and Travis necessary or appropriate to protect Firm Water customers through a DOR condition, or under conditions worse than the Drought of Record. Since the evaluation of expected hydrologic and water demand conditions can only be simulated based on projected information, which is subject to some uncertainty, LCRA has designated some minimum Combined Storage level in all of its prior WMPs. This served as a safety factor to address model uncertainties and provide for hydrologic conditions other than those simulated.

This WMP includes revisions to curtailment policies and procedures intended to ensure that LCRA can satisfy current and projected firm demands during drought conditions, and to ensure that, in simulations of this WMP, LCRA's release of interruptible stored water does not result in combined storage dropping to the Drought Worse than Drought of Record (DWDR) storage trigger (currently 600,000 acre feet). This is consistent with input received from TCEQ in May

2014 and the emergency orders issued by TCEQ for the 2012, 2013, and 2014 irrigation seasons.[3]

As discussed in Chapter 2, demands of LCRA's Firm Water customers have increased and are projected to continue to increase. To meet those demands without shortage through a repeat of historic hydrology, this WMP revision includes decreases in the amount of Interruptible Stored Water provided as compared to the 2010 WMP.

This WMP revision includes a number of significant changes to the methods used to determine the availability of Interruptible Stored Water from lakes Buchanan and Travis for agricultural use in the Gulf Coast, Lakeside, and Pierce Ranch operations and for other users. It also includes changes to the environmental criteria used to provide instream flow below Longhorn Dam and freshwater inflow into Matagorda Bay. These changes allow LCRA to be more responsive to changes in water supply conditions. Specifically, these changes include:

Interruptible Stored Water Availability

- LCRA will determine availability of Interruptible Stored Water for LCRA's Gulf Coast and Lakeside operations and Pierce Ranch separately for the First and Second Crop Seasons and apply strict volumetric limits (or caps) on availability of Interruptible Stored Water in each Crop Season;
- The amounts of Interruptible Stored Water for LCRA's Gulf Coast and Lakeside agricultural operations, and Pierce Ranch will be determined taking into consideration what Water Supply Condition is in effect: "Normal," "Less Severe Drought," or "Extraordinary Drought," combined with the implementation of a look-ahead test;
- Under the look-ahead test, LCRA will not begin releasing water for the non-Garwood operations for a Crop Season if the LCRA Board determines that the Combined Storage of lakes Buchanan and Travis would drop below 900,000 acre-feet in the upcoming Crop Season or below 600,000 acre-feet within 12 months; and
- LCRA will stop releasing Interruptible Stored Water for the Gulf Coast, Lakeside and Pierce Ranch agricultural operations in the middle of a Crop Season when the Combined Storage of lakes Buchanan and Travis drops below certain levels, whether or not the LCRA Board has declared of Drought Worse than Drought of Record.

Environmental Flows:

- LCRA used the most recent scientific studies to identify the environmental flow needs and to develop environmental flow criteria;
- LCRA will determine applicable environmental flow criteria at two dates during the year for different periods of the year; and
- The water available to help meet environmental flow needs may be adjusted based upon changes in the Combined Storage during the Crop Season.

LCRA's Drought Contingency Plans for both firm and interruptible customers take into account and build from elements of the WMP. Pursuant to Texas Water Code § 11.1272 and TCEQ's

rules (30 Tex. Admin. Code Ch. 288), LCRA has revised its Firm Raw Water Drought Contingency Plan (Firm DCP) and included the Firm DCP as Appendix F. The Firm DCP is incorporated into Chapter 4 of the WMP by reference for all purposes as if set forth in Chapter 4 in full. This updated Firm DCP will become effective upon final TCEQ approval of this amended WMP. LCRA will update its Interruptible Water DCP for its downstream agricultural operations upon final TCEQ approval of this amended WMP.

The following terms are used throughout this chapter:

- **Combined Storage** – The total volume of water stored in lakes Buchanan and Travis at a given point in time. For purposes of making various determinations under this WMP, the "Combined Storage" means the total of the daily average volume of water in Lake Buchanan and the daily average volume of water in Lake Travis, when excluding any water in Lake Buchanan above elevation 1,018 ft mean sea level (msl) and any water in Lake Travis above elevation 681 ft msl. A determination that relies on Combined Storage will not be based on a single reading during the day, but instead is the average for the day.

- **Inflows into Lakes Buchanan and Travis** – For purposes of making the determination of the Water Supply Condition or evaluating drought intensity, "Inflows into Lakes Buchanan and Travis" means the total inflows into lakes Buchanan and Travis based upon flow readings at certain gauges upstream of lakes Buchanan and Travis (without any adjustment for the Pass-Through of water to meet downstream demands associated with senior water rights).

- **Storable Inflows** – For purposes of making the determination of water available from lakes Buchanan and Travis to help meet certain environmental flows, the term "Storable Inflows" means the Inflows into lakes Buchanan and Travis based upon flow readings at certain gauges upstream of lakes Buchanan and Travis minus any required Pass-Through of inflows.

4.2. DETERMINATION OF WATER SUPPLY CONDITION

4.2.1. Introduction

This Section 4.2 presents the Water Supply Conditions that are used to determine the amounts of Interruptible Stored Water available for the downstream agricultural operations in Lakeside, Gulf Coast, and Pierce Ranch and the criteria in effect to help meet environmental flow needs. The Water Supply Condition will be evaluated on each March 1 and July 1 (the "Evaluation Date"), taking into account inflows into and the Combined Storage of Lakes Buchanan and Travis as presented below. That Water Supply Condition will be considered in the determination of Interruptible Stored Water and environmental flow criteria on that Evaluation Date. The Water Supply Condition remains in effect until criteria for entering a new Water Supply Condition or for exiting the Water Supply Condition are met on a subsequent Evaluation Date.

4.2.2. Normal Condition

The Normal condition is in effect under either of the following two conditions:

1. Condition 1:
   (a) for the period prior to the Evaluation Date, neither the Less Severe Drought nor the Extraordinary Drought condition was in effect, and
   (b) on the Evaluation Date, neither the criteria for entering Less Severe Drought nor the criteria for entering Extraordinary Drought are met.
2. Condition 2:
   (a) for the period prior to the Evaluation Date, the Less Severe Drought or Extraordinary Drought condition was in effect, and
   (b) on the Evaluation Date, the criteria for lifting Less Severe Drought are met.

4.2.3. Less Severe Drought Condition

The Less Severe Drought condition can be entered or exited from either a Normal condition or an Extraordinary Drought condition, as discussed below. The Less Severe Drought condition remains in effect until either the criteria for entering the Extraordinary Drought condition (*see* Section 4.2.4.1) are met or the criteria for exiting the Less Severe Drought condition and returning to the Normal condition are met, as determined on the Evaluation Date (*see* Section 4.2.3.2).

4.2.3.1. Entering Less Severe Drought Condition

To enter the Less Severe Drought condition from a Normal condition, one of the following two criteria must be met on the Evaluation Date:

1. Combined Storage is below 1.6 million acre-feet and cumulative Inflows into Lakes Buchanan and Travis for the preceding three months (i.e. for the March 1 Evaluation Date, the inflows for December, January and February) are less than 50,000 acre-feet; or
2. Combined Storage is below 1.4 million acre-feet and cumulative Inflows into Lakes Buchanan and Travis for the preceding three months are less than the 33rd percentile of Inflows into Lakes Buchanan and Travis for that three-month period. The 33rd percentile will be based upon stream flow data that the United States Geological Survey (USGS) has approved for publication as of the Evaluation Date.

The Less Severe Drought condition is also entered upon exiting the Extraordinary Drought condition unless, on the Evaluation Date, the criteria for exiting Less Severe Drought (described below) are also met.

4.2.3.2. Exiting Less Severe Drought Condition

To exit the Less Severe Drought condition and return to the Normal condition, the following criteria must be met on the Evaluation Date:

1. Combined Storage has been above 1.6 million acre-feet for one or more days during the period preceding the Evaluation Date (i.e. for a July 1 evaluation, the period preceding the Evaluation Date is March 1 to June 30) and neither of the criteria for entering the Less Severe Drought condition are met on the Evaluation Date; or
2. Combined Storage has been above 1.4 million acre-feet for one or more days during the period preceding the Evaluation Date and cumulative inflows for the preceding three months are equal to or above the 50^{th} percentile of inflows for that three-month period and neither of the criteria for entering the Less Severe Drought condition are met on the Evaluation Date. The 50^{th} percentile of inflows will be based stream flow data that USGS has approved for publication as of the Evaluation Date.

4.2.4. Extraordinary Drought

4.2.4.1. Entering Extraordinary Drought Condition

To enter the Extraordinary Drought condition, the following criteria must be met on the Evaluation Date:

1. Combined Storage is below 1.3 million acre-feet;
2. the drought duration (as described in Section 4.7) is at least 24 months; and
3. the inflow intensity test for a declaration of a Drought Worse than a Drought of Record (as described in Section 4.7) is met.

4.2.4.2. Exiting Extraordinary Drought Condition

The Extraordinary Drought condition remains in effect until the following criteria for exiting Extraordinary Drought have been met:

1. Combined Storage has been above 1.3 million acre-feet for one or more days during the period preceding the Evaluation Date; and
2. The criteria for entering the Extraordinary Drought condition are not met on the Evaluation Date.

If the criteria for exiting the Extraordinary Drought condition are met, the Less Severe Drought condition takes effect, unless the criteria for exiting Less Severe Drought is also met, in which case the Normal condition takes effect.

4.3. CURTAILMENT PROCEDURES FOR AGRICULTURAL OPERATIONS AT GULF COAST, LAKESIDE, AND PIERCE RANCH

4.3.1. Introduction

Section 4.3 presents the curtailment procedures that apply to releases of Interruptible Stored Water for agricultural uses in LCRA's Gulf Coast and Lakeside divisions and Pierce Ranch. Interruptible Stored Water may be available for these operations for a variety of agricultural purposes, including rice, turf grass, row crops, hay, pasture, aquaculture and wildlife management.

Throughout this chapter, references are made to "first" and "second" crop or to the First or Second Crop Season. These references are to the splitting of the full irrigation season (for which LCRA supplies water for agricultural use in the four agricultural operations) into two parts that are coincident with the two watering seasons for rice production, i.e. the First Crop Season and the Second Crop Season. The second or ratoon crop is the crop of rice that re-grows from the rice plant's root system following harvest of the main or first crop of rice. The ratoon crop matures more quickly than the main crop since it is supported by an established root system. The First Crop Season normally covers the March through July timeframe and the Second Crop Season normally covers the August through mid-October timeframe. Weather conditions, type of crops grown and location affect the timing of these seasons within the agricultural operations. Although the First and Second Crop Seasons are, in general, references to the rice growing seasons, during these timeframes and subject to availability under contracts for such purposes of use, water may also be available in the agricultural operations for other agricultural purposes such as turf grass, row crops, hay, pasture, aquaculture, and wildlife management.

4.3.2. Determination of Interruptible Stored Water Available for Agricultural Operations at Gulf Coast, Lakeside, and Pierce Ranch

The procedures for determining the total amount of Interruptible Stored Water available for the agricultural operations at Gulf Coast, Lakeside, and Pierce Ranch include various elements and limitations as described in the following subsections. As with recent WMPs, evaluation of demands and the curtailment of Interruptible Stored Water for Garwood and Pierce Ranch under this section will be accomplished pursuant to the terms of specific agreements related to the supply of interruptible water to those operations. Because LCRA's agreement to provide interruptible water to Pierce Ranch is subject to the WMP, as it may be amended from time to time, the curtailment procedures set forth in this WMP apply to Pierce Ranch.

The Interruptible Stored Water available for the Gulf Coast, Lakeside and Pierce Ranch agricultural operations will be determined separately for the First Crop Season and the Second Crop Season. On each Evaluation Date, LCRA will determine which Water Supply Condition is in effect for purposes of this WMP (Normal, Less Severe Drought, or Extraordinary Drought) in accordance with Section 4.2, above. The curtailment procedures for that Water Supply Condition will be followed for the upcoming Crop Season unless the LCRA Board determines that Combined Storage would drop below 600,000 acre-feet in the next 12 months or below 900,000 acre-feet in the upcoming Crop Season. If releases of Interruptible Stored Water for the First

Crop Season are cut off for the entire First Crop Season, then releases of Interruptible Stored Water are also cut off for the Second Crop Season.

4.3.2.1. Curtailment Procedures for Normal Conditions

If the Normal condition is in effect, LCRA will make available for diversion the total amounts shown in Table 4-1 and Figure 4-1 at the Gulf Coast, Lakeside and Pierce Ranch agricultural operations. These amounts are limits on the total supply of Interruptible Stored Water available for diversion during the Crop Season. If the total diversions of Interruptible Stored Water in a Crop Season for Gulf Coast, Lakeside and Pierce Ranch agricultural operations reach the total available amount, no additional Interruptible Stored Water will be made available for diversion for those operations. However, if all available Interruptible Stored Water has been diverted in the First Crop Season, but there will be Interruptible Stored Water available for the Second Crop Season, then all or part of the Interruptible Stored Water available for the Second Crop Season can be used to finish the First Crop Season.

If Combined Storage falls below 900,000 acre-feet at any time during the either the First Crop or the Second Crop Season, all releases of Interruptible Stored Water to Gulf Coast, Lakeside and Pierce Ranch will be cut off for the remainder of the Crop Season. If releases of Interruptible Stored Water are cut off in the middle of a Crop Season (due to either the diversions reaching the total Interruptible Stored Water available or Combined Storage falling to the cutoff level), LCRA will not provide any Pass-Through run-of-river water under LCRA's water rights historically associated with the Gulf Coast, Lakeside and Pierce Ranch operations that originates upstream of Lake Travis unless and until Combined Storage is above 1.3 million acre-feet. During the remainder of the Crop Season, if Combined Storage exceeds 1.3 million acre-feet, LCRA will make these Pass-Through run-of-river supplies available, limited to the amounts needed to finish the crop. If releases of Interruptible Stored Water for the First Crop Season are cut off for the entire season, then releases of Interruptible Stored Water are also cut off for the Second Crop Season. Garwood operations will be provided Interruptible Stored Water consistent with the Garwood Purchase Agreement.

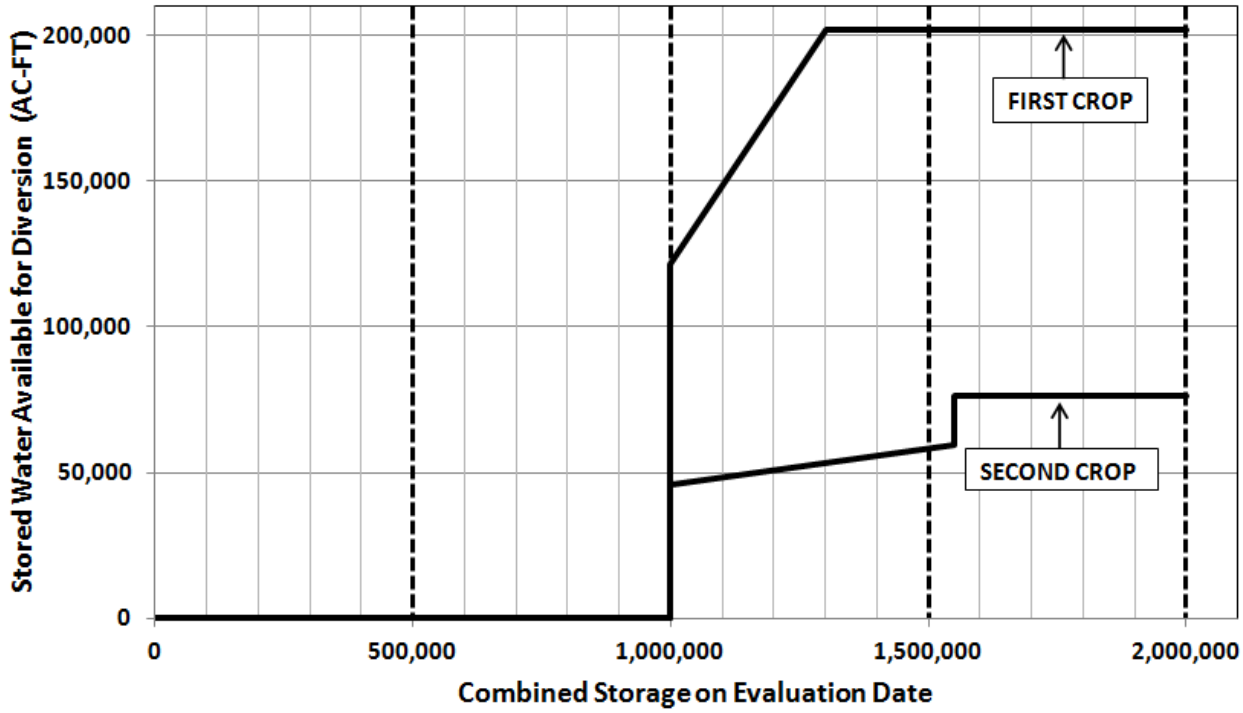
Table 4-1. Total Interruptible Stored Water available for diversion in Gulf Coast, Lakeside and Pierce Ranch agricultural operations under Normal Water Supply Condition

First Crop Season		**Second Crop Season**	
Combined Storage on March 1 (million acre-feet)	Interruptible Stored Water (acre-feet)*	Combined Storage on July 1	Interruptible Stored Water (acre-feet)*
Below 1.0 MAF	0	Below 1.0 MAF	0
1.0 to 1.3 MAF	121,500 to 202,000**	1.0 to 1.55 MAF	46,000 to 59,500**
1.3 MAF or above	202,000	1.55 MAF or above	76,500
Anytime cutoff* if Combined Storage drops to or below 900,000 acre-feet		Anytime cutoff* if Combined Storage drops to or below 900,000 acre-feet	

* Non-Garwood

** For Combined Storage within the specified ranges, the Interruptible Stored Water supply available follows a linear scale between the values shown.

Figure 4-1. Total Interruptible Stored Water available for Gulf Coast, Lakeside and Pierce Ranch agricultural operations under Normal Water Supply Condition



4.3.2.2. Curtailment Procedures for Less Severe Drought Condition

If the Less Severe Drought condition is in effect, LCRA will make available for diversion the total amounts shown in Table 4-2 and Figure 4-2 at the Gulf Coast, Lakeside and Pierce Ranch agricultural operations. These amounts are limits on the Interruptible Stored Water available for diversion during the Crop Season. If the total diversions of Interruptible Stored Water in a Crop Season for Gulf Coast, Lakeside and Pierce Ranch agricultural operations reach the total available amount, no additional Interruptible Stored Water will be made available for diversion in those operations. However, if all available Interruptible Stored Water has been diverted in the First Crop Season, but there will be Interruptible Stored Water available for the Second Crop Season, then all or part of the interruptible stored water available for the Second Crop Season can be used to finish the First Crop Season.

If Combined Storage falls below 950,000 acre-feet at any time during the Crop Season, then all releases of Interruptible Stored Water to Gulf Coast, Lakeside and Pierce Ranch will be cut off for the remainder of the Crop Season. If releases of Interruptible Stored Water are cut off in the middle of a Crop Season (due to either the diversions reaching the volumetric limit or Combined Storage falling to the cutoff level), then LCRA will not provide any Pass-Through run-of-river water under LCRA's water rights historically associated with the Gulf Coast, Lakeside and

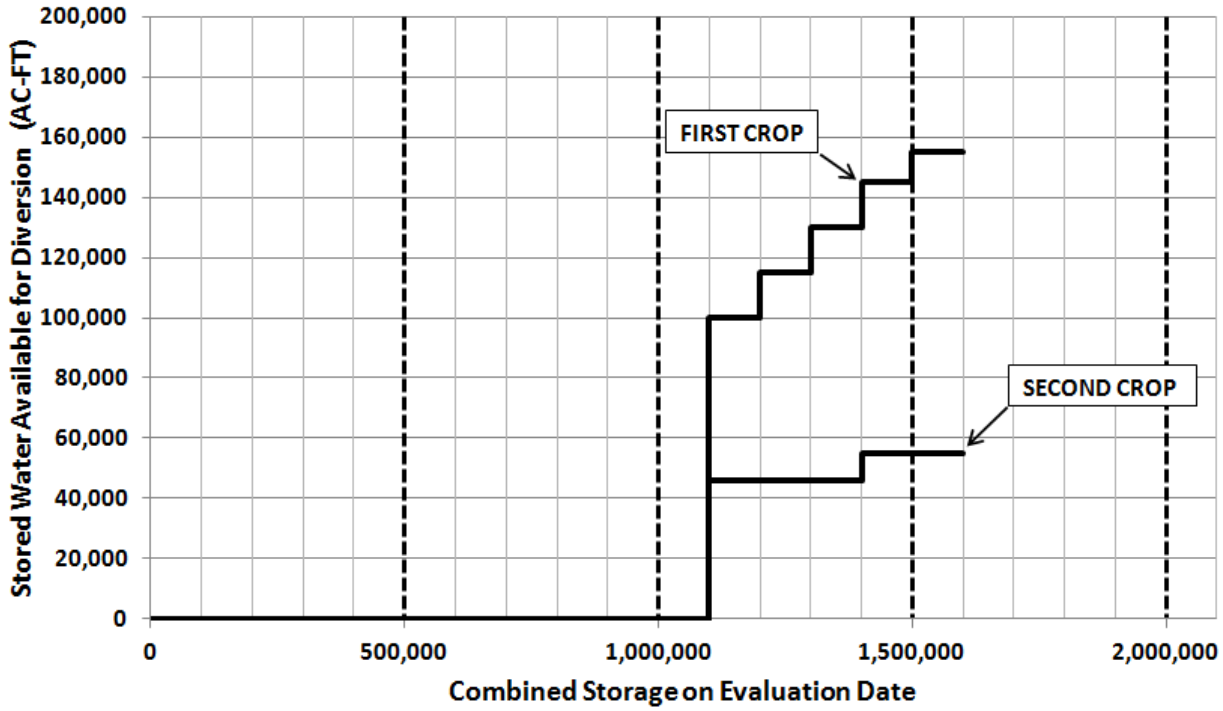
Pierce Ranch operations that originates upstream of Lake Travis unless and until Combined Storage is above 1.3 million acre-feet. During the remainder of the Crop Season, if Combined Storage exceeds 1.3 million acre-feet, LCRA will make these Pass-Through run-of-river supplies available, limited to the amounts needed to finish the crop. If releases of Interruptible Stored Water for the First Crop Season are cut off for the entire season, then releases of Interruptible Stored Water are also cut off for the Second Crop Season. Garwood operations will be provided Interruptible Stored Water consistent with the Garwood Purchase Agreement.

Table 4-2. Total Interruptible Stored Water available for diversion in Gulf Coast, Lakeside and Pierce Ranch agricultural operations under Less Severe Drought condition

First Crop Season		**Second Crop Season**	
Combined Storage on March 1 (million acre-feet)	Interruptible Stored Water (acre-feet)*	Combined Storage on July 1	Interruptible Stored Water (acre-feet)*
Below 1.1 MAF	0	Below 1.1 MAF	0
1.1 to 1.199 MAF	100,000	1.1 to 1.399 MAF	46,000
1.2 to 1.299 MAF	115,000	1.4 to 1.599 MAF	55,000
1.3 to 1.399 MAF	130,000		
1.4 to 1.499 MAF	145,000		
1.5 to 1.599 MAF	155,000		
Anytime cutoff* if storage drops to or below 950,000 acre-feet		Anytime cutoff* if storage drops to or below 950,000 acre-feet	

* Non-Garwood

Figure 4-2. Total Interruptible Stored Water available for diversion in Gulf Coast, Lakeside and Pierce Ranch agricultural operations under Less Severe Drought condition



4.3.2.3. Curtailment Procedures for Extraordinary Drought Condition

If the Extraordinary Drought condition is in effect, no Interruptible Stored Water or Pass-Through run-of-river water under LCRA's water rights historically associated with the Gulf Coast, Lakeside and Pierce Ranch operations will be made available for diversion in the Gulf Coast, Lakeside and Pierce Ranch operations during the Crop Season. However, LCRA will provide Interruptible Stored Water for the Garwood operation, consistent with the Garwood Purchase Agreement.

4.3.2.4. Curtailment Procedures under the Look-Ahead Test

If the LCRA Board determines, considering antecedent conditions, current storage, and forecasted conditions, that the release of Interruptible Stored Water under either the Normal condition or the Less Severe Drought condition (whichever is in effect) in the upcoming Crop Season would result in Combined Storage dropping below 600,000 acre-feet in the next twelve months or below 900,000 acre-feet in the upcoming Crop Season, then no Interruptible Stored Water or Pass-Through run-of-river water under LCRA's water rights historically associated with the Gulf Coast, Lakeside and Pierce Ranch operations will be released for diversion in the Gulf Coast, Lakeside or Pierce Ranch operations for the upcoming Crop Season. However, LCRA will provide Interruptible Stored Water for the Garwood operation, consistent with the Garwood Purchase Agreement.

In making its determination under the Look-Ahead Test, the LCRA Board will consider antecedent conditions, current storage and forecasted conditions. LCRA shall use the 99 percent exceedance probability, unless a different trend for inflows and combined storage is being observed. However, in no case shall LCRA's determination rely on less than a 95 percent exceedance probability. Exceedance probability refers to the likelihood that a future outcome will be better than the specified value.

4.4. CURTAILMENT PROCEDURES FOR ENVIRONMENTAL FLOWS IN THE LOWER COLORADO RIVER BASIN

4.4.1. Providing Stored Water for Environmental Flow Needs

Under this WMP, as in past WMPs, LCRA provides a combination of Firm and Interruptible Stored Water to help meet environmental flow needs. This WMP retains LCRA's commitment of 33,440 acre-feet per year of Firm Water supply from lakes Buchanan and Travis for environmental flow purposes. In the event of a pro rata curtailment of Firm Water supplies, the applicable instream flow and bay and estuary freshwater inflow criteria will be subject to the same percentage reduction as is imposed on LCRA's Firm Water customers.

This WMP reflects improvements to the operational procedures that will be used to help meet environmental flow needs based on more recent scientific studies and also includes an increase in the total average annual combination of Firm and Interruptible Stored Water supplied to help meet environmental flow needs compared to the 2010 WMP. The applicable environmental flow criteria under this WMP can change during the year, similar to the determination of agricultural water based on separate dates for the First Crop Season and for the Second Crop Season. The environmental flow criteria in place from March through June are based on Combined Storage on March 1, and the environmental flow criteria in place from July through the following February are based on the Combined Storage on July 1. (This represents a change from prior WMPs in which the environmental flow criteria for the entire year were based on January 1 storage levels.) The manner in which water for environmental purposes is provided and tracked are set forth below.

4.4.2. Curtailment of Water for Instream Flows

This WMP revision includes three levels of instream flow criteria, located at four streamflow gauging station locations (Austin, Bastrop, Columbus and Wharton), as first presented in Chapter 2 and repeated here as Table 4-3. Compared to prior WMPs, this WMP adds an additional location (the Wharton gauge), This WMP has also replaced the "critical" and "target" levels with new levels ("Subsistence," "Base-Dry" and "Base-Average") that are based on the most recent instream flow studies,[4] which are generally consistent with the environmental flow standards adopted by TCEQ for the lower Colorado River basin.

This WMP limits LCRA's obligation to help meet instream flows at the Base-Average and Base-Dry levels to releasing no more than the Storable Inflows to lakes Buchanan and Travis.

Table 4-4 presents the applicable instream flow criteria for this WMP. In the event of a pro rata curtailment of Firm Water supplies, the applicable instream flow criteria will be subject to the same percentage reduction as imposed on LCRA's Firm Water customers.

Table 4-3. Subsistence and Base Flow Criteria by Gauge (cubic feet per second)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Austin												
Subsistence	50	50	50	50	50	50	50	50	50	50	50	50
Bastrop												
Subsistence	208	274	274	184	275	202	137	123	123	127	180	186
Base-Dry	313	317	274	287	579	418	347	194	236	245	283	311
Base- Average	433	497	497	635	824	733	610	381	423	433	424	450
Columbus												
Subsistence	340	375	375	299	425	534	342	190	279	190	202	301
Base-Dry	487	590	525	554	966	967	570	310	405	356	480	464
Base-Average	828	895	1,020	977	1,316	1,440	895	516	610	741	755	737
Wharton												
Subsistence	315	303	204	270	304	371	212	107	188	147	173	202
Base-Dry	492	597	531	561	985	984	577	314	410	360	486	470
Base-Average	838	906	1,036	1,011	1,397	1,512	906	522	617	749	764	746

Table 4-4. Instream Flow Triggers and Flow Levels

When Combined Storage is…	On this date…	Instream Flow Level
Above 1.96 MAF	March 1 or July 1	Base-Average
Between 1.90 and 1.96 MAF	March 1 or July 1	Base-Dry
Less than 1.90 MAF	March 1 or July 1	Subsistence

For purposes of this WMP revision, the Subsistence, Base-Dry and Base-Average criteria for gauges other than the Austin gauge, are daily (or daily average) flow values. The Subsistence criteria at Austin represent minimum (or instantaneous) flow requirements. Furthermore, for the Bastrop gauge only, the following minimum flow requirements apply:

1. During those times when Base-Average criteria are in effect, the minimum flow requirements, subject to availability of Storable Inflows, shall be 70 percent of the Base-Average criteria for the given month.
2. During those times when Base-Dry criteria are in effect, the minimum flow requirements, subject to availability of Storable Inflows shall be 70 percent of the

Base-Dry criteria for the given month.

3. During those times that Subsistence criteria are in effect, releases shall be scheduled such that the minimum flow does not drop below:
    a. 90 percent of Subsistence criteria when Combined Storage is equal to or greater than 1.4 million acre-feet; or
    b. 80 percent of Subsistence criteria when Combined Storage is less than 1.4 million acre-feet.

To help meet the instream flow criteria in the lower Colorado River, LCRA will schedule releases in amounts sufficient to meet the applicable criteria, to the extent of Storable Inflows or, for Subsistence, using previously stored water in addition to Storable Inflows. In scheduling releases, LCRA will rely on best available data sources, including but not limited to: measurements of rainfall and water levels in streams and reservoirs; flow ratings for streams, canals, hydroelectric turbines, spillways, floodgates, and pumps; elevation/area/capacity ratings for reservoirs; model results for predicted storm runoff and ungauged gains or losses of flow along the Colorado River; simulated routing and attenuation of flows along channels and through reservoirs; effluent discharge as reported by wastewater treatment plant operators; and, scheduled and actual pumping as reported by major diverters.

By scheduling releases in this manner, LCRA will meet its obligation under this WMP. In rare instances, LCRA's ability to meet the flow criteria, despite reasonable efforts to do so, may be impaired by unavoidable constraints such as unforeseen diversions, unforeseen changes in flow conditions downstream, unforeseen or unscheduled operations at Longhorn Dam, and adjustments to gauges or flow ratings. LCRA shall operate in such a manner that flows at any applicable gauge do not deviate below the applicable criteria for that gauge on more than 18 days in any calendar year. Furthermore, to the extent that a deviation event is a result of inaccuracies in LCRA's estimates of downstream diversions by LCRA operations, downstream contributing inflows, downstream return flows, or the effects of routing as releases pass downstream, the collective impact of such constraints may not be relied upon to excuse a deviation of more than 15 percent below applicable criteria on any individual day.

The following events shall not count towards the number of calendar days in which a deviation occurred, nor be subject to the 15 percent limitation:

1. Events in which the initial flow data indicated a deviation, but after inspection of relevant data and/or the gauge, LCRA determines that the initial flow data were inaccurate and the actual flow rate was at or above the applicable flow requirement;
2. Events in which the deviation was caused by events outside of LCRA's reasonable control such as operations at Longhorn Dam, ERCOT requirements, a change in rating at a gauge, or diversions by others that could not reasonably have been predicted by LCRA;
3. Events in which the applicable criteria had increased at the start of a new month and the initial release for the higher criteria is attenuated or arrives at the gauge in a 24-hour period other than midnight to midnight; and

4. Events in which LCRA passes through Storable Inflows to meet a Base-Dry or Base-Average criteria and the effects of attenuation or the timing of the arrival of the release at the downstream gauge is such that the released water reaches the gauge spread across two or more days.

In the event of an impairment on an individual day or days, LCRA will schedule releases over the subsequent days to ensure that the average flow for any consecutive 10-day period that begins with the day of any such impairment does not fall below the applicable instream flow criterion, subject to the availability of Storable Inflows, or for Subsistence, the availability of a combination of Storable Inflows and previously stored water, if that impairment is identified at the start of that 10-day period.

Although LCRA will not manage water in the lower basin to specifically provide for pulse flows as part of this WMP, LCRA will monitor pulse flows in the lower river basin during the time period when this WMP revision is in effect to help assess whether pulse flows are occurring with the frequency recommended in the 2008 comprehensive instream flow study.[5]

4.4.3. Curtailment of Water for Freshwater Inflows to Matagorda Bay

The 2010 WMP included three levels (critical, intermediate and target) of freshwater inflow criteria. This WMP includes five levels based upon the Matagorda Bay Health Evaluation (MBHE) study. [6] Storable Inflows that are available to help meet freshwater inflow criteria are determined on a monthly basis and exclude any Storable Inflows that have already been released to help meet instream flow criteria.

This WMP incorporates new criteria to guide implementation, and which are aimed at helping to meet the range of freshwater inflow needs from the Colorado River identified in the MBHE study. In all months, LCRA will release Storable Inflows to help meet at least the "Threshold" level of 15,000 acre-feet per month, to the extent of Storable Inflows. For higher flow levels, instead of the monthly requirement that has been used in prior WMPs, the criteria is designed to achieve seasonal freshwater inflow freshets. The MBHE three-month "spring" and "fall" freshets (shown in Table 4-5) and six-month "intervening" flow totals for a given inflow category have been converted into equivalent two-month Operational Criteria (OP 1-4) as first presented in Chapter 2 and repeated here in Table 4-6. (*See* Section 2.4.2 for further explanation of these criteria.) At the end of each month, to the extent that Storable Inflows are available, such Storable Inflows will be provided as necessary to help meet the two-month Operational Criteria. In May and June, LCRA will also determine if the three-month MBHE "spring" freshet for the given inflow category has been met within the Spring period, and if so, the two-month Operational Criteria will be reduced to the corresponding amount for the intervening period. In September and October, LCRA will similarly determine if the "fall" freshet has been met within the Fall period, and if so, the two-month Operational Criteria will be reduced to the corresponding amount for the intervening period. In the event of a pro rata curtailment of Firm Water supplies, the applicable freshwater inflow criteria (including the Threshold criteria) will be subject to the same percentage reduction as imposed on LCRA's Firm Water customers.

Table 4-5. MBHE Three-Month Freshets into Matagorda Bay

Inflow Category	Seasonal Three-Month Freshet (acre-feet)	
	Spring	Fall
MBHE-4	433,200	307,800
MBHE-3	246,200	175,000
MBHE-2	168,700	119,900
MBHE-1	114,000	81,000

Table 4-6. Operational and Threshold Criteria for Colorado River Freshwater Inflows to Matagorda Bay

Inflow Category	Two-Month Operational Criteria (acre-feet) applicable in the individual months			Monthly (acre-feet)
	Spring March-June	Fall July-Oct	Intervening Nov-Feb	-
OP-4	289,000	205,000	133,000	-
OP-3	164,000	117,000	76,000	-
OP-2	112,000	80,000	52,000	-
OP-1	76,000	54,000	35,000	-
Threshold	-	-	-	15,000

When providing water under this WMP to help meet freshwater inflow needs, the water available will be limited to the Storable Inflows to lakes Buchanan and Travis. In the event that the Storable Inflows in a given month are greater than the amounts released for that month's environmental flow needs, and Combined Storage is greater than 1.0 million acre-feet at the end of the month, the remainder of the Storable Inflows less the actual release for environmental flow needs ("Remaining Storable Inflows") will be carried forward for one month. If in the subsequent month, the Threshold criteria cannot be met using Storable Inflows from that month, up to 5,000 acre-feet of the prior month's Remaining Storable Inflows will be released to help meet the Threshold criteria. Table 4-7 presents the applicable freshwater inflow criteria.

Table 4-7. Freshwater Inflow Triggers and Flow Levels

When Combined Storage is…	On this date…	Freshwater Inflow Criteria
Greater than 1.95 MAF	March 1 or July 1	OP-4/ MBHE-4
Less than 1.95 MAF	March 1 or July 1	OP-3 / MBHE-3
Less than 1.50 MAF	March 1 or July 1	OP-2 / MBHE-2
Less than 1.30 MAF	March 1 or July 1	OP-1 / MBHE-1
Less than 1.00 MAF	March 1 or July 1	Threshold Only

The freshwater inflow criteria are further subject to the following specific limitations, which may reduce the amount of stored water LCRA must provide to help meet freshwater inflow needs:

1. Any time releases of Interruptible Stored Water for agricultural operations in Gulf Coast, Lakeside, and Pierce Ranch are cut off, the only freshwater inflow criteria in effect is Threshold. However, if releases of Interruptible Stored Water for agricultural operations in Gulf Coast, Lakeside, and Pierce Ranch are cut off for the Second Crop Season but Combined Storage is greater than 1.3 million acre-feet on July 1, the Operational Criteria shall be in effect pursuant to Table 4-6. In that instance, LCRA's releases of Storable Inflows to meet the Operational Criteria will be limited to no more than 50 percent of the Storable Inflows for the month remaining after the release of Storable Inflows for instream flow critieria and/or Threshold inflow needs, with a maximum release for the Operational Criteria in a single month of 82,000 acre-feet. (LCRA's releases of Storable Inflows to Meet Threshold will not be subject to this limitation.)
2. If Combined Storage falls below 1.0 million acre-feet at any time, the only freshwater inflow criteria in effect for that month and continuing until the next Evaluation Date is Threshold.
3. If Combined Storage is below 1.3 million acre-feet at the end of a month, the maximum release of Storable Inflows specifically to meet freshwater inflow criteria will be 25,000 acre-feet.
4. When Less Severe Drought conditions are in effect, releases of Storable Inflows to meet the Operational Criteria will be limited to no more than 50 percent of the Storable Inflows for the month remaining after the release of Storable Inflows for instream flow critieria and/or Threshold inflow needs, with a maximum release for the Operational Criteria in a single month of 82,000 acre-feet if storage is above 1.3 million acre-feet at the end of the month and a maximum release to for all freshwater inflow criteria of 25,000 acre-feet if storage is below 1.3 million acre-feet.

In the event that more than one of the above limitations would apply, the most restrictive limitation on releases shall apply.

4.4.4. Annual and Multi-year Caps on Water for Environmental Flows

The amounts of water made available for environmental flows are subject to limits to ensure that the actual amounts made available do not exceed the amounts simulated in the development of this WMP revision for periods when Combined Storage was below 1.3 million acre-feet on the Evaluation Date for a given season. In the event that the cumulative amounts made available in such periods equals or exceed the annual or multi-year caps below, dedicated releases to help meet environmental flow needs that are subject to these annual or multi-year caps are suspended for the remainder of the year. For purposes of the multi-year caps, the cumulating of water made available starts when Combined Storage drops below 98 percent of managed available capacity and multi-year caps are reset when storage increases to 98 percent or higher. The annual and multi-year caps on water made available for environmental flow needs when Combined Storage is below 1.3 million acre-feet on the Evaluation Date are as follows:

1. 75,000 acre-feet in any one year;
2. 133,000 acre-feet in any two consecutive years;
3. 195,000 acre-feet in any three consecutive years;
4. 241,000 acre-feet in any four consecutive years;
5. 306,000 acre-feet in any five consecutive years;
6. 327,000 acre-feet in any six consecutive years;
7. 389,000 acre-feet in any seven consecutive years;
8. 437,000 acre-feet in any eight consecutive years;
9. 437,000 acre-feet in any nine consecutive years;
10. 455,000 acre-feet in any 10 consecutive years;
11. 455,000 acre-feet in any 11 consecutive years; and
12. 455,000 acre-feet in any 12 consecutive years.

4.5. CURTAILMENT PROCEDURES FOR INTERRUPTIBLE STORED WATER DEMANDS OTHER THAN THE DOWNSTREAM AGRICULTURAL OPERATIONS

LCRA will limit additional sales or commitments of Interruptible Stored Water, other than for the downstream agricultural operations at Gulf Coast, Lakeside, Garwood, and Pierce Ranch or environmental flow needs, based on the Combined Storage in lakes Buchanan and Travis at certain times of the year. Sales of water in this category will be limited to not more than a combined total of 4,000 acre-feet per year as follows:

1. If Combined Storage on Jan. 1 is greater than 1.9 million acre-feet, up to 2,000 acre-feet will be made available for the period from Jan. 1 through June 30.
2. If Combined Storage on July 1 is greater than 1.9 million acre-feet, up to 2,000 acre-feet will be made available for the period from July 1 through Dec. 31.

LCRA will notify each holder of a contract under this provision of the availability of supply for the six months following the trigger dates.

LCRA will not enter into any new contracts or extend any existing contracts for this category of water sales for a term beyond Dec. 31, 2018. As of Jan. 1, 2019, LCRA will eliminate this category of water supply.

4.6. CURTAILMENT OF FIRM WATER DEMANDS

Pursuant to its water rights for lakes Buchanan and Travis, LCRA must follow reservoir operations procedures to ensure that it can meet Firm Water demands during a repeat of the Drought of Record.

Consistent with state law, LCRA will not invoke mandatory curtailments of Firm Water demand unless a particular drought is declared to be a Drought Worse than the Drought of Record, or some other water emergency exists that drastically reduces the available Firm Water supply. However, consistent with state law and Commission rules regarding drought contingency planning, LCRA will engage its Firm Water customers and seek voluntary reductions of Firm Water use in the early stages of a drought through its adoption and implementation of its Firm DCP (see Appendix F). Moreover, as part of its contracts, LCRA will continue to require each of its Firm Water customers to prepare and adopt a legally enforceable local drought contingency plan consistent with LCRA's rules and state law.

It is not possible to determine with absolute certainty whether a particular drought event is more or less severe than the Drought of Record until the event has concluded. However, LCRA has developed a "drought monitoring procedure" for identifying when a drought may become worse than the Drought of Record for the Highland Lakes watershed. (*See* Section 4.7.) When these conditions are reached, the LCRA Board of Directors will declare a Drought Worse than the Drought of Record (DWDR) (as described in Section 4.7) and LCRA will curtail and distribute the available supply of stored water among its Firm Water supply customers on a pro rata basis according to the amount of water to which they are legally entitled, consistent with the Pro Rata Plan for Firm Water Demands approved by TCEQ. (*See* Appendix C-7.) All releases of Interruptible Stored Water will be cut off prior to and during any mandatory pro rata curtailment of Firm Water supplies. Following a DWDR declaration, if conditions improve, pro rata curtailment of Firm Water customers will be lifted consistent with criteria determined by the LCRA Board.

4.7. DECLARATION AND CANCELLATION OF DROUGHT WORSE THAN DROUGHT OF RECORD

As discussed above, the WMP is designed so that LCRA can meet all Firm Water demands through a repeat of the historic 1950s Drought of Record. If drought conditions reach a stage where an ongoing drought has a real likelihood of becoming a new Drought of Record, LCRA must suspend all releases of Interruptible Stored Water and curtail Firm Water demands to extend the supply for critical human needs. To measurably extend the supply, LCRA may need

to take these actions before it is determined with absolute certainty that the drought is indeed a new drought of record. This section presents the conditions under which LCRA will respond to a severe drought by making a declaration of Drought Worse than Drought of Record (DWDR). A DWDR declaration would trigger action to cut off Interruptible Stored Water and implement mandatory pro rata curtailment of Firm Water demands. The criteria for making a DWDR declaration represent circumstances that have not been recorded during the historic period used in developing this WMP. However, even if the criteria are satisfied, there is still a possibility that the drought would not be a new drought of record. Thus, the declaration of a Drought Worse than Drought of Record is actually a declaration that a particular drought is *potentially* worse than the Drought of Record and warrants more significant response measures.

The LCRA Board of Directors will make a Drought Worse than Drought of Record declaration when the following three conditions are simultaneously met:

1. Drought duration of at least 24 consecutive months; and
2. Drought intensity greater than that of the Drought of Record as measured by Inflows into Lakes Buchanan and Travis; and
3. Combined Storage in lakes Buchanan and Travis is less than 600,000 acre-feet.

Additionally, the LCRA Board of Directors will declare a DWDR when a drought's duration is at least 10 years and Combined Storage in lakes Buchanan and Travis is less than 600,000 acre-feet.

For purposes of measuring drought duration, the beginning of the drought is based on the last time lakes Buchanan and Travis were both full. For purposes of measuring drought duration under this WMP, full is defined when either of the following criteria are met:

1. Combined Storage is at or above 98 percent of the combined managed conservation storage. This managed conservation storage excludes any water in the flood pool and may vary based on seasonal operational guidelines or other constraints on storage; or
2. Lakes Buchanan and Travis have each been at their respective managed conservation storage capacity within 30 days of each other.

For purposes of measuring drought intensity relative to the Drought of Record, the cumulative Inflows into Lakes Buchanan and Travis since the beginning of the drought will be compared to a Drought of Record inflow envelope curve that reflects the cumulative inflows in the Drought of Record. The envelope is represented by the following equation and is demonstrated in Figure 4-3.

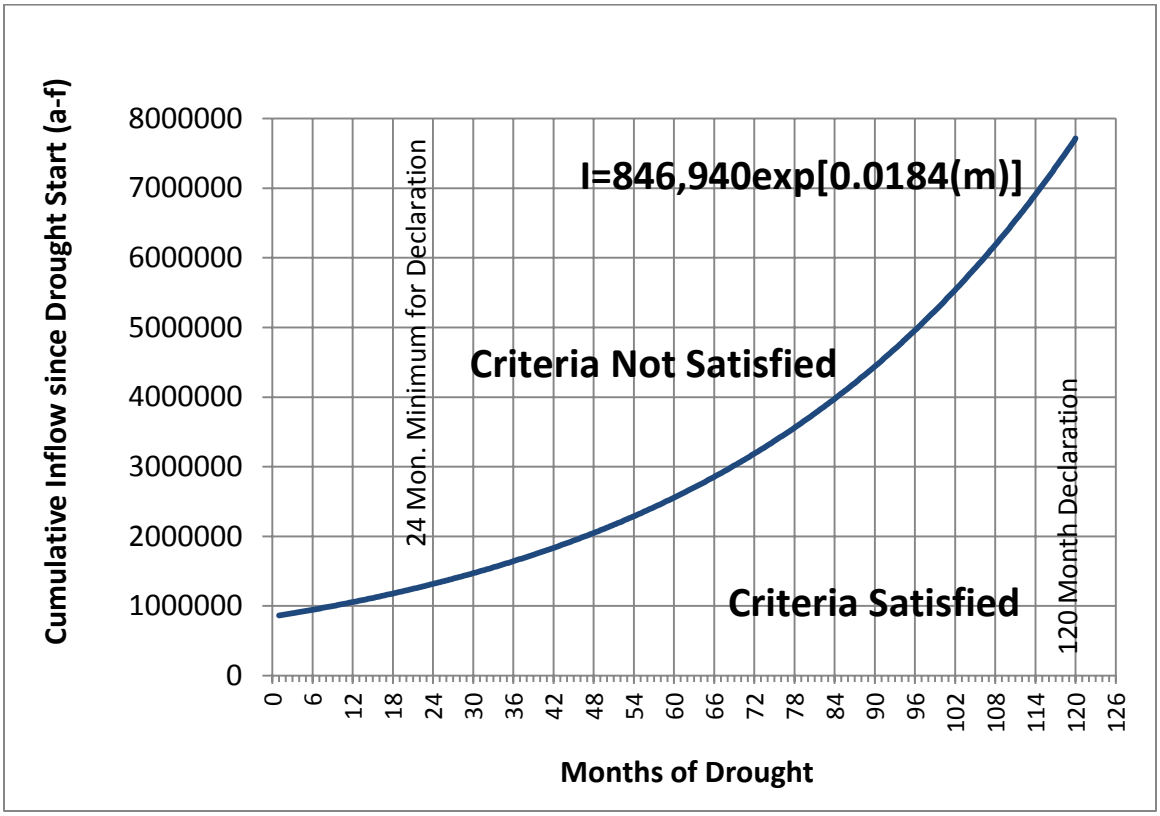
$$I = 846{,}940e^{(0.0184m)}$$

Where:

I = cumulative inflow in acre-feet since Travis and Buchanan were each full, using the determination of full described above.

m = months of drought duration using the criteria described above.

Figure 4-3. Drought intensity curve for Drought Worse than Drought of Record declaration



LCRA will cancel a DWDR declaration if Combined Storage increases to 1,400,000 acre-feet. LCRA will notify TCEQ within 30 days of the declaration or cancellation of a DWDR.

See Appendix A, Technical Paper A-7 for additional information regarding the evaluations of historic period (1940-2013) droughts for comparisons to the Drought of Record.

4.8. RESULTS OF THE RECOMMENDED CURTAILMENT POLICIES UNDER THIS WMP

This section summarizes potential impacts of this WMP revision on various interests based on modeling simulations. It should be noted that the specific values presented in this section are based on model simulations that include many assumptions, including a repeat of historic hydrologic conditions through 2013. Actual observed conditions while this plan is in effect may vary.

4.8.1. Firm Water Customers

All simulated demands for Firm Water customers can be fully satisfied under a simulated repeat of hydrologic conditions during the historic period of 1940-2013, including during the Drought

of Record and during short-term intense droughts experienced in recent decades. The minimum storage in the model was maintained above 600,000 acre-feet at all times, providing a safety factor for more severe drought conditions than were simulated.

4.8.2. Agricultural Customers in Downstream Agricultural Operations

With the increase in Firm Water needs, and additional safety factors included in this WMP to respond to severe drought conditions, there is less Interruptible Stored Water supply from lakes Buchanan and Travis as compared to the 2010 WMP because Firm Water needs take priority over Interruptible Stored Water uses. This WMP includes curtailment procedures with various elements (such as the separate evaluation of supply for the First and Second Crop Seasons, and a higher trigger at which no Interruptible Stored Water will be made available) that are more restrictive on the supply of Interruptible Stored Water for the downstream agricultural operations than the procedures in the 2010 WMP. The percent of overall agricultural demands (including first and second crop) in the four downstream agricultural operations that are met in the simulation of this WMP revision is about 80 percent over the simulation of the historic period (1940-2013) evaluated.

Agricultural users in the four downstream agricultural operations would be most affected during a repeat of the Drought of Record. The modeling analysis indicates that no Interruptible Stored Water would be available for both the First and Second Crop Seasons in 7 years out of the 12-year period for the Drought of Record.

The actual frequency and magnitude of Interruptible Stored Water curtailments may differ from the values reflected in this simulation, depending on factors such as future hydrologic conditions and actual demands associated with Firm and interruptible users.

4.8.3. Environmental Flows

The average annual amount of total stored water made available as dedicated releases for environmental purposes during the Drought of Record in simulations of this WMP revision of about 70,000 acre-feet per year represents an increase from the amounts estimated in the 2010 WMP of about 56,470 acre-feet per year. During the simulated repeat of the Drought of Record and the full historic period from 1940-2013, there are more curtailments and cutoffs of Interruptible Stored Water for the downstream agricultural operations under this WMP. As a result, less water would be flowing in the lower Colorado River to meet downstream agricultural demands, which means less of that water is available to help meet environmental flow needs. Thus, dedicated releases for environmental flows are expected to be needed on a more frequent basis under simulations of this WMP revision.

As mentioned in Section 4.4.1, LCRA is not recommending any changes to the level of Firm Water commitment for environmental flows as part of this WMP. The current total Firm Water reservation of 33,440 acre-feet for environmental flow purposes represents about 8 percent of the total Firm Water supply available from lakes Buchanan and Travis.

4.8.4. Individual Lake Storage and Elevations

As noted in Section 4.8.1, the minimum Combined Storage in lakes Buchanan and Travis in the WMP is maintained above 600,000 acre-feet at all times. This represents a significant increase as compared to the 2010 WMP. The percent of months in which simulated Combined Storage is below 900,000 acre-feet is about 4 percent. As noted in Section 5.4.1.3, the model simulations were not performed to represent with a high level of precision how the total Combined Storage in lakes Buchanan and Travis would be split between those two reservoirs. Thus, separate lake storage and elevation results are not presented herein.

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1. Pursuant to the certificates of adjudication for Lakes Buchanan and Travis, LCRA shall curtail the supply of interruptible water under such water rights to the extent necessary to allow LCRA to satisfy all firm demands. Certificate of Adjudication 14-5478 ¶ 2.B.(7); Certificate of Adjudication 14-5482 ¶ 2.B.(7).
2. TEX. COMM'N ENVTL. QUAL., *Agreed Order Approving Amendments to Lower Colorado River Authority's Water Management Plan*, Ordering Provision 1.f. (Jan. 27, 2010). Section 1.3 of this WMP provides a list of items to be addressed pursuant to the TCEQ 2010 Order.
3. *See* Chapter 1, note 14.
4. BIO-WEST, Inc., COLORADO RIVER FLOW RELATIONSHIPS TO AQUATIC HABITAT AND STATE THREATENED SPECIES: BLUE SUCKER, FINAL REPORT PREPARED FOR LCRA AND SAWS (2008).
5. *Id*. § 4.3 at 91-95 (2008).
6. FINAL REPORT: MATAGORDA BAY INFLOW CRITERIA (COLORADO RIVER), MATAGORDA BAY HEALTH EVALUATION, Prepared for LCRA and SAWS (Dec. 2008).

CHAPTER 5
RIVER OPERATIONS

5.1 INTRODUCTION

LCRA operates the Colorado River and the Highland Lakes as a system to efficiently manage water supply and mitigate flood damage. To accomplish these goals, LCRA uses a number of tools and practices that it regularly updates. To manage its river operations, LCRA develops and maintains data acquisition systems, decision support models and standard operating guidelines and procedures. This chapter provides a general description of river operations as of September 2014.

These tools and practices are regularly updated, and any references to specific tools and practices in this chapter does not bind LCRA to continue to use the specific tools and practices described herein, nor does it limit LCRA from using modified or additional tools and practices at any point.

Furthermore, LCRA may deviate from this general description of river operations to respond to emergency incidents, to accommodate requests for public events on a lake, to lower lakes below their normal operating range, to operate floodgates for testing and maintenance, or for other reasons. In the event of deviation from the general description contained in this chapter, LCRA will operate in a manner intended to minimize or avoid the risk of injury to life and property, and to conserve and protect water supply whenever reasonably possible.

5.2 DATA SOURCES

LCRA maintains and operates a Hydrological-meteorological Data Acquisition System (Hydromet) of about 265 gauges located throughout the lower Colorado River basin. The Hydromet gauges send water levels, rainfall and other weather data to LCRA computers every 15 minutes. Once stored on LCRA computers, the data can be validated, automatically shared with other partner agencies, and used to analyze the quantity and movement of water through the Colorado River basin and the Highland Lakes.

LCRA has executed an agreement with the U.S. Geological Survey (USGS) to share the maintenance and operation of 17 Hydromet gauges, and receives data from an additional 12

gauges that USGS operates cooperatively with other agencies. The USGS and LCRA share data from stream discharge measurements and discharge ratings (stage vs. flow ratings). This collaboration improves the timeliness of updates to ratings for ongoing operations and provides an independent review of basic data on quantities of flow. USGS publishes final stream discharge estimates upon completion of its quality assurance/quality control processes. Because of the real-time nature of river operations, LCRA must necessarily rely on "provisional" data, which is subject to change.

LCRA shares Hydromet data with the National Weather Service, West Gulf River Forecast Center in Fort Worth, Texas (WGRFC). The WGRFC uses rainfall data from the Hydromet system to calibrate radar estimates of rainfall and to produce Quantitative Precipitation Estimates (QPE). The WGRFC then shares the QPE data with LCRA. This improves the hydro-meteorological information available to LCRA and the WGRFC, and allows each agency to more accurately project lake levels and flow conditions along creeks and rivers in the Colorado River basin.

LCRA develops and maintains computer systems and protocols to collect data from its reservoirs and pump stations, and to communicate with major water users that operate reservoirs, pump stations, and wastewater treatment plants that contribute significant amounts of return flows to the Colorado River below Mansfield Dam. Data on expected and actual storage, diversions and return flows is used to plan water supply operations, to coordinate pumping operations and to report on water use.

5.3 DECISION SUPPORT MODELS

LCRA uses a number of specialized computer models to analyze the movement of water, help make decisions for river operations and allocate and report on water use.

5.3.1 Water Supply Operations Models

LCRA has developed a suite of models for water supply operations, including RiverWare models of the Colorado River and spreadsheet models for water supply operations.[1] Combined, these models make use of a variety of data sources described above, and are used to perform the following functions:

- Estimate the amount of flows entering the Colorado River;
- Evaluate the routing or timing and attenuation of flows released from the Highland Lakes to the lower Colorado River;
- Determine the necessary releases of stored water and Pass-Through of run-of-river flows to meet downstream demands;
- Schedule daily releases from dams; and
- Allocate releases and diversions for users to the appropriate source of supply (run-of-river or stored water) based on water rights priority.

5.3.2 Flood Operations Model

LCRA has developed a Corps Water Management System (CWMS) model of the Colorado

River basin for flood operations.[2] LCRA worked with the U.S. Army Corps of Engineers to adapt CWMS software for real-time flood forecasting.

The CWMS model for flood operations uses rainfall, streamflow and lake level data to predict Highland Lake inflows and lake levels and to recommend flood releases according to flood control regulations and agreements. The CWMS model can use a variety of sources of rainfall data, including Hydromet rain gauge data and data from the WGRFC. Results from the flood operations model are used to evaluate alternative operational scenarios and to support final operational decisions.

5.4 STANDARD GUIDELINES AND PROCEDURES FOR RIVER OPERATIONS

LCRA develops and maintains standard guidelines and procedures for two modes of River Operations: Water Supply Operations and Flood Operations. Water Supply Operations involve the provision of water to meet or help meet the demands or needs of customers, other water right holders, or environmental flow obligations, to adjust system storage or lake levels, or to produce hydroelectric power. Flood Operations occur when the discharge of water through a dam exceeds the normal discharge capacity of hydroelectric generating units at the dam, or when water is continuously discharged over the spillway of a dam. At Mansfield Dam, Flood Operations occur when water is discharged through Mansfield Dam because the level of Lake Travis exceeds or is expected to exceed the conservation pool elevation of 681 feet mean sea level (msl). Each of these modes of operation is described below.

5.4.1 Water Supply Operations

Water Supply Operations involve the management of the system to: (1) provide water to customers, (2) help meet environmental flow requirements, (3) honor senior water rights, (4) adjust system storage or lake levels, or (5) produce hydroelectric power.

During Water Supply Operations, water is captured and stored in lakes Buchanan and Travis up to the top of their conservation pool elevations, subject to available inflows. (The top of the conservation pool for Lake Travis is elevation 681 feet msl and for Lake Buchanan is 1,020 feet msl; however, LCRA limits Lake Buchanan to 1,018 feet in the months of May through October and, recently, has limited Lake Buchanan to 1,018 feet year round, as discussed in Section 5.4.2.) The intervening lakes (Inks, LBJ, Marble Falls and Austin) are normally maintained within a specified range of elevations at the dams shown in Table 5-1. Lake Austin is operated consistent with an agreement between LCRA and the City of Austin.[3] During flood operations, additional water may be temporarily stored in Lakes Buchanan and Travis and in the intervening lakes.

Table 5-1. Target Elevation Ranges for Intervening Lakes

Lake Level at the Dam (Headwater Gauge)	Lower Elevation (Legacy Datum[1])	Upper Elevation (Legacy Datum)	Adjustment to NAVD88
Inks	886.9	887.7	+0.31 ft.
LBJ	824.4	825.0	+0.68 ft.
Marble Falls	736.2	737.0	+0.69 ft.
Austin[2]	491.8	492.8	+0.31 ft.

1. Elevations are based on the "legacy" datum for each dam. Legacy data are elevation benchmarks set for construction of the dams forming the Highland Lakes that have not been adjusted to a standard datum such as the National Geodetic Vertical Datum of 1929 (NGVD29) or the North American Vertical Datum of 1988 (NAVD88).
2. Although LCRA typically operates Lake Austin within a one-foot range, the long-term agreement between the LCRA and Austin actually allows for operations within a 3-foot range

Within LCRA, Water Supply Operations involve a variety of key activities including:

- maintaining Hydromet field equipment and ratings to measure and report on rainfall, evaporation, streamflow, water levels and irrigation diversions;
- monitoring LCRA's water supply in the Colorado River and Highland Lakes on a daily basis; evaluating demands for water based upon specific orders and pumping status of certain customers (including the City of Austin, power plant customers and the irrigation operations, among others); determining the required releases of water from the Highland Lakes to most efficiently meet demands, consistent with water rights and agreements; and coordinating pumping operations of downstream customers;
- monitoring evaporation at lakes Travis and Buchanan; monitoring lake levels and river inflows; determining availability of hydroelectric generating units; setting the final Hydro Schedule at each of the dams that form the Highland Lakes; and controlling hydroelectric generation operations; and
- coordinating hydroelectric generation with the Electric Reliability Council of Texas (ERCOT).

The following subsections describe the manner in which LCRA supplies demands and needs to be met or backed up with water from lakes Buchanan and Travis.

5.4.1.1 Releases from Lake Travis

Tom Miller Dam, which forms Lake Austin, is downstream of Mansfield Dam, which forms Lake Travis, and is the most downstream of the six Highland Lakes dams operated by LCRA. Lake Austin is owned by the City of Austin, but operated by the LCRA pursuant to a long-term agreement. Longhorn Dam, which forms Lady Bird Lake, is immediately downstream of Lake Austin and is operated by the City of Austin. The majority of LCRA's major irrigation and industrial customers divert water along 300 miles of the lower river from Tom Miller Dam to Matagorda Bay. Requirements for instream flows and freshwater inflows to Matagorda Bay apply along the lower river below Longhorn Dam. Therefore, LCRA determines the daily release

from Tom Miller Dam to deliver water and regulate the flow in the lower river. Releases from Mansfield Dam are determined, as needed, to satisfy diversions from Lake Austin by the City of Austin and other municipal customers and to maintain Lake Austin within its normal operating range, consistent with the long-term agreement between LCRA and the City of Austin.

Releases from Tom Miller Dam typically require up to a week (or even longer during low flow conditions) to flow along the river channel to reach the points of delivery. Therefore, the timing of a release is as important as the quantity to ensure that the right amount of water is made available at the right place and the right time.

When making decisions regarding the daily operations of the Colorado River and Highland Lakes, LCRA first considers the location, amount and timing of the demands of major customers that take water from the Colorado River below Mansfield Dam, and the environmental requirements for instream flows and freshwater inflows to Matagorda Bay. LCRA next considers the requirements of all water rights and agreements that apply to each demand and uses the best information available at the time to estimate the amount and timing of run-of-river inflows to the Colorado River below Mansfield Dam, and to the Highland Lakes above Mansfield Dam. Finally, LCRA determines the minimum amount of stored water that must be released from Mansfield Dam to meet any demands that do not have access to run-of-river sources of supply. Releases are then scheduled from Tom Miller Dam and Mansfield Dam to meet all demands as efficiently as possible (i.e., with the least amount of stored water released from the Highland Lakes) and according to all applicable requirements.

For example, downstream demands that can be met from downstream run-of-river water rights are first supplied with run-of-river flows entering the Colorado River below Mansfield Dam. If this source is not sufficient to meet all such demands, then the remaining demands are supplied with run-of-river flows entering the Colorado River above Mansfield Dam. Finally, any remaining demands are met with stored water from the Highland Lakes.

Demands and releases from Tom Miller Dam are determined on a daily basis, but travel time to the points of diversion or stream gauges varies and is not necessarily an exact number of days. For example, the travel time may be three and a half days, rather than exactly three or four days. Furthermore, water released from Tom Miller Dam tends to attenuate as it moves downstream, so that one day's release at Tom Miller Dam may arrive at a downstream location over several days. Therefore, in practice, releases from Tom Miller Dam may be averaged over one or more days as needed to efficiently supply downstream demands.

Various factors affect the movement and delivery of water to locations below Tom Miller Dam. The amounts of water actually released through hydroelectric generation on a daily basis generally match the amounts scheduled for release within the constraints of the capacity of each hydroelectric unit. Releases from Tom Miller Dam to the lower river pass through Lady Bird Lake and Longhorn Dam, which are operated by the City of Austin. The operation of Longhorn Dam can affect the timing and flow rate of water released from Tom Miller Dam by LCRA as the water flows through Lady Bird Lake to the lower river. Many diversions from the Colorado River, and return flows to the river are not controlled by LCRA. The natural characteristics of the channel along the lower river are constantly changing. Furthermore, flow measurements at

gauging stations on tributary creeks and along the main stem of the Colorado River have a generally accepted level of precision. All these factors affect LCRA's ability to forecast the exact rate, timing, attenuation and gain or loss of flows along the lower river.

5.4.1.2 Releases from Lake Buchanan

LCRA's water supply needs are met from both lakes Buchanan and Travis. Thus, releases from Lake Buchanan are routed through the intervening lakes and Lake Travis to help meet the demands of LCRA's customers and environmental flow needs downstream of Mansfield Dam. Releases from Lake Buchanan also maintain lakes Inks, LBJ, and Marble Falls within their normal operating ranges and are used to meet LCRA customer demands.

5.4.1.3 Operating Guidelines

LCRA determines the amount of water to be released from both Lake Travis and Buchanan on a daily basis according to internal operating guidelines that provide general guidance on the allocation of releases from each lake. These allocation guidelines and river operations in general are intended to optimize the capture of inflows to the lakes, reduce evaporative losses, and minimize risks to life and property. In practice, the allocation of releases from lakes Buchanan and Travis is adaptive, based on actual conditions at the time, and may vary from the guidelines. Conditions considered by LCRA include lake levels and capacities, inflows to each lake, the location of needs for water, intake elevations, and planned operation and maintenance activities. LCRA regularly projects changes to lake elevations to assist customers in their planning efforts, consistent with these operating guidelines. Although LCRA's operating guidelines are regularly updated and refined to reflect new information, LCRA does not anticipate substantial changes to the guidelines related to allocating releases from lakes Buchanan and Travis as a result of this version of the WMP.

The WMP models include as output the Combined Storage of lakes Buchanan and Travis as well as individual storage levels for each reservoir. Because the WMP's primary focus is to preserve sufficient Combined Storage in *both* lakes Buchanan and Travis to meet Firm Water customers' demands relative to the amount of Interruptible Stored Water that can be provided, the models only allocate water between lakes Travis and Buchanan at a very coarse level. While the WMP models are limited to only two zones for determining which reservoir provides the entire release, in actual operations, lakes Buchanan and Travis are divided into four to five zones for which a percentage of the total release is specified for each reservoir. In other words, there is a greater level of control over the balance of releases between the reservoirs than can be simulated by the model, resulting in significant differences in the simulated Combined Storage split compared to what would actually occur under LCRA's operating guidelines.

The WMP model results related to lake elevations, therefore, do not represent specific anticipated lake elevations for any given Combined Storage amount. Rather, the actual allocation of releases from the two reservoirs – and the resulting lake elevations – will be based on LCRA's operational decisions governed by LCRA's internal operating guidelines and specific facts, as discussed above.

5.4.2 Flood Operations

In addition to managing the Highland Lakes for water supply, LCRA also operates the lakes for flood control purposes. Flood Operations occur when the total discharge of water through a dam exceeds the normal discharge capacity of hydroelectric generating units at the dam, or when water is continuously discharged over the spillway of a dam. At Mansfield Dam, Flood Operations occur when water is discharged through Mansfield Dam because the level of Lake Travis exceeds or is expected to exceed the conservation pool elevation of 681 feet msl. LCRA conducts Flood Operations at the six dams that form the Highland Lakes to mitigate downstream damages due to uncontrolled inflows to the lakes. Flood Operations take precedence over scheduled water supply and environmental release operations. Lake Travis is the only one of the Highland Lakes with a dedicated flood pool. Except for lakes Buchanan and Travis, the reservoirs formed by the dams do not have the ability to capture and store large volumes of runoff. Releases from one reservoir are generally passed through the next downstream reservoir.

At Buchanan Dam, Flood Operations begin when the discharge of water through Buchanan Dam exceeds the normal discharge capacity of hydroelectric generating units at Buchanan Dam, or when water is continuously discharged over the spillway. Flood Operations at Buchanan Dam are typically initiated by LCRA when the level of Lake Buchanan is forecast or observed to exceed its conservation pool elevation. At Inks, Wirtz, Starcke and Tom Miller dams, Flood Operations begin when the discharge of water through the dam exceeds the normal discharge capacity of hydroelectric generating units at the dam, or when water is continuously discharged over the spillway. Flood Operations at these dams are typically initiated by LCRA when flows into lakes Inks, LBJ, Marble Falls or Austin are forecast or observed to exceed the normal discharge capacity of turbines at the dam and require the use of floodgates or spillways to pass the flow and manage lake levels.

Flood Operations at Buchanan, Inks, Wirtz, and Starcke dams are conducted pursuant to an agreement between LCRA and the Federal Emergency Management Agency (FEMA) dated March 8, 1990. (*See* Appendix B-1.) Under the FEMA agreement, conservation storage in Lake Buchanan is limited to elevation 1,018 feet (two feet below maximum conservation storage) in the more flood-prone months of May through October. In recent years, LCRA has also limited Lake Buchanan at 1,018 feet elevation year round while repairs to the floodgates are underway. Flood Operations at Tom Miller Dam are pursuant to a long-term agreement between LCRA and the City of Austin.[4]

Lake Travis has dedicated flood control storage above elevation 681 feet msl. Thus, at Mansfield Dam, Flood Operations occur when water is discharged through Mansfield Dam because the level of Lake Travis exceeds or is expected to exceed 681 feet msl.

Flood Operations at Mansfield Dam and Lake Travis are governed by rules and associated requirements of the U.S. Army Corps of Engineers (USACE) pursuant to Section 7 of the Flood Control Act of 1944.[5] (*See* Appendix B-2.) LCRA implements these requirements in consultation with USACE consistent with agreements between LCRA and USACE. Under the USACE

requirements, Flood Operations at Mansfield Dam are determined by: specified ranges of observed or forecasted lake levels; the pool condition (i.e., rising or falling); the month of year; and stage and flow criteria at three designated downstream locations. When the pool is rising, forecasted lake levels (based on actual water on the ground) are used in determining flood release requirements. When the pool is falling, observed lake levels are used in determining release requirements. The amount of the release from Mansfield Dam increases with higher ranges of lake level as long as downstream stage and flow limitations are not exceeded.

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1. RiverWare is a modeling environment developed by the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at the University of Colorado.
2. CWMS is a software program developed by the U.S. Army Corps of Engineers.
3. Lease and Agreement between City of Austin and Lower Colorado River Authority, February 5, 1938.
4. *See* Endnote 3.
5. *See* 33 C.F.R. part 208.11; and Guidance in the implementation of these rules may be obtained from the USACE Mansfield (Marshall Ford) Dam Water Control Manual (September 2013).