LOWER COLORADO RIVER AUTHORITY
WATER CONSERVATION PLAN
DRAFT – For Board Consideration in April 2024

1.0 INTRODUCTION

1.1 Purpose and Policy

The Lower Colorado River Authority (LCRA) is a water conservation and reclamation district established by the Texas Legislature in 1934. LCRA was created to manage water supply and flooding in the lower Colorado River basin, generate and distribute electric power, protect the quality of surface water within the lower Colorado River basin, and provide water and land recreational opportunities for the residents ~~citizens~~ of Texas.

LCRA developed this Water Conservation Plan for municipal, irrigation, recreation, industrial and agricultural water rights. This plan fulfills requirements of the Texas Administrative Code, Title 30, Chapter 288, Subchapter A, Water Conservation Plans, and Subchapter C, Required Submittals. This Water Conservation Plan supersedes the components of the LCRA Water Conservation Plan approved by the LCRA Board of Directors in 2019~~4~~.

1.2 History of LCRA Water Conservation

Water conservation is an important strategy for mitigating the effects of urban growth on the region's water resources, particularly in Travis County and surrounding areas. In addition to reducing future water demands, water conservation can make important contributions toward satisfying the water and wastewater service requirements of growing urban populations and economies. ~~LCRA has been implementing water conservation measures since the late 1980s.~~ More than 25 years ago, LCRA implemented a comprehensive water conservation program targeted at what was then the two largest water use sectors within the water service area -- irrigated agriculture and municipal. ~~-- which together account for more than 70 percent of LCRA's total annual water use, even in drought years when irrigation agriculture is curtailed. Industrial use, mainly from LCRA's power plants, has become significantly more water efficient over time as older facilities have been replaced by more efficient facilities.~~

In 1989, prior to the Texas Administrative Code, Chapter 288 rules, LCRA developed Rules for Water Conservation and Drought Contingency and required all ~~new~~ firm water customers applying for a new or modified contract to develop plans in accordance with these rules. At that time, LCRA also began providing conservation program planning support to its wholesale municipal water customers by offering technical assistance, coordinating plumbing retrofit programs and developing education efforts.

As the largest historical user of water in the lower Colorado River basin, irrigated agriculture ~~has~~ provided a good ~~one of the best~~ opportunity ~~ies~~ for LCRA to reduce overall water demand through conservation programs. Between 1989 and 1997, the introduction of volumetric pricing and canal rehabilitation is estimated to have saved approximately 13% ~~percent~~ a year, or about 41,500 acre-feet annually, of the projected water use that would have occurred without conservation practices in place. House Bill (HB) 1437 was passed in 1999, allowing up to 25,000 acre-feet of water to be transferred to Williamson County subject to a requirement that there be no net loss to the Colorado River basin. Most of the

conservation strategies implemented in the LCRA irrigation divisions since then ~~at time~~ have been funded or partially funded by money collected from a surcharge on the water reserved or transferred.

1.3 2019~~9~~4 Water Conservation Plan Results

LCRA continually works ~~has an on-going process~~ to improve and expand conservation strategies throughout the basin, including ~~with its customers to~~ collecting baseline data, conducting verification studies and ~~an extensive~~ benchmarking ~~effort~~ of other successful water providers,~~,~~ and working with builders, landscapers and environmental interests.

Since 2012, new conservation programs include a residential outdoor rebate program; a commercial, ~~institutional~~institutional, and industrial (CII) water audit and rebate program; a firm water customer cost-share program; irrigation evaluation training; and an irrigation technology rebate program. LCRA periodically updates rebates offered through these programs and adopted~~ing~~ an expanded set of residential outdoor rebates in 2017.~~-~~ The most recent program update was in 2022. ~~All of t~~These~~se~~ programs are available to water users that directly or indirectly receive water from LCRA. Municipal customer mandatory requirements such as irrigation standards and permanent landscape watering schedules account for nearly 70 percent of the savings. In 2022, LCRA revised its W~~w~~ater C~~c~~onservation P~~p~~lan rules for firm water contracts to include a requirement for its municipal customers to adopt a permanent no more than twice weekly watering schedule. ~~Since 2014, LCRA estimates approximately 5,6004,500 acre-feet of water has been is saved annually from implementation of firm water conservation strategies. Of note, A~~about~~A~~s of 2023, about~~bout~~ XXXX~~ 7,400~~ acre-feet per year ~~was~~is~~were~~ saved from implementation of firm water conservation strategies~~in 2023~~. ~~These savings do not include those associated with water restrictions that were in effect during the drought in 2014-2015.~~

LCRA also has implemented or completed several~~k~~l key agricultural conservation projects since 2019. ~~These Previously funded c~~Conservation projects that ~~, which~~ continue to provide annual savings~~,~~ include the Garwood measurement project, a ~~the originalthe~~ land leveling grant program,~~,~~ ~~and completion of a gate rehabilitation project in~~ the Gulf Coast ~~Irrigation~~ Agricultural Division gate rehabilitation project and ~~(see section 4 for details). Since 2019, LCRA completed~~ the Garwood gate automation project. LCRA also has ~~and launched~~ a revised its land leveling grant program (see section 4). As of 2023~~17~~, LCRA estimates the three-year rolling average annual water savings in the irrigation divisions is 14,769~~2,437~~ acre-feet. This averaging is used to provide a more consistent savings number during droughts, when curtailments can result in no savings in Lakeside and minimal savings in Gulf Coast~~I~~, as ~~which~~ occurred in 2023.~~-~~ This methodology is also consistent with ~~reporting requirements for~~ the accounting approach for implementing requirements of HB1437. The 2022 three-year rolling average of the amount of conserved water was 16,520 acre-feet per year, reflecting ~~only~~ a curtailment of the second growing ~~crop~~ season in the Lakeside and Gulf Coast divisions.

1.4 20241919 Water Conservation Plan Development

LCRA is building developed built its 20241919 Water Conservation Plan strategies using largely the same largely on the framework asof the 201994 plan, with planned expansion of existing programs, outreach, technical assistance, and marketing efforts.

The plan is divided into chapters – a baseline chapter and chapters about firm water customers, LCRA irrigation agricultural divisions and LCRA power plants. Because the City of Austin has its own water rights, the Austin water utility is required to submit its own a water conservation plan directly to the Texas Commission on Environmental Quality (TCEQ). Water conservation strategies for Austin are have not been included in this plan.

2.0 Baseline Profile and Water Conservation Goals

2.1 Overview of LCRA Water Service Area

LCRA provides water from its water rights in the Colorado River basin for municipal, industrial, recreation, irrigation, agricultural, domestic, environmentalenvironmental, and other purposes. Surface water supplies are a combination of the natural flow of the Colorado River and stored water from lakes Buchanan and Travis.

the Highland Lakes, specifically lakes Buchanan and Travis.

As of FebruaryFebruary,April 20241919, LCRA had firm water contracts with 7322 68 municipal wholesale raw water customers, which serve ing an estimated population of more than 500350,000, and not including the City of Austin, which serves a population of more than 1 million. LCRA also has firm water contracts with 4035 larger 57 irrigation and recreation customers, of which 12 are including golf course customerss; 121 seven industrial use customers, which, includesing four LCRA power plants; fourtwo agricultural customers; 20 small landscape irrigation and recreation customers;, 3,776 domestic use customers; and 74 temporary customers.

LCRA also provides water to customers farmers in the LCRA-owned Gulf Coast, LakesideLakeside, and Garwood irrigation agricultural divisions, as well as Pierce Ranch, under provisions in the state-approved Water Management Plan. Figure 2-1 illustrates the LCRA water service area and s well as the locations of LCRA power plants, LCRA -owned irrigation agricultural divisions and large municipal water customers.

Water demands and water supply available under within LCRA's water rights vary with weather conditions. Water use also by type of use can variy es substantially from year to year based on dry or wetb conditions and drought response measures in place. Table 2-1 provides a summary of the reported water use from 2019-20234.

The annual demand for the municipal contracts, exclusive of Austin, in 2023 was approximately 118,51476,868 acre-feet. LCRA supplied 7,0416,667 acre-feet of water to its firm irrigation and recreational water customers, which are mainly golf courses. The majority

of LCRA ~~-~~industrial water use is for generating electricity. LCRA power plants used 12,616~~12,647~~ acre-feet in 2023.~~ The majority of water use at these facilities is evaporation from cooling reservoirs.~~ Other industrial water uses customers, including manufacturing and steam electric generation, used 17,707~~11,711~~ acre-feet in 2023.

In addition to ~~the above-mentioned~~ water use under firm water commitments, in 2023 the LCRA ~~irrigation~~ agricultural divisions and Pierce Ranch diverted and used 88,991~~239,150~~ acre-feet of water. Water use in 2022 reflects partial curtailment of water in the ~~irrigation~~ agricultural divisions during the second irrigation season~~;~~, water use in 2023 reflects complete curtailment of water in the Lakeside and Gulf Coast ~~irrigation~~ divisions, as well as Pierce Ranch. In addition, Stage 2 drought restrictions under LCRA's Drought Contingency Plan were in effect starting in August 2023.

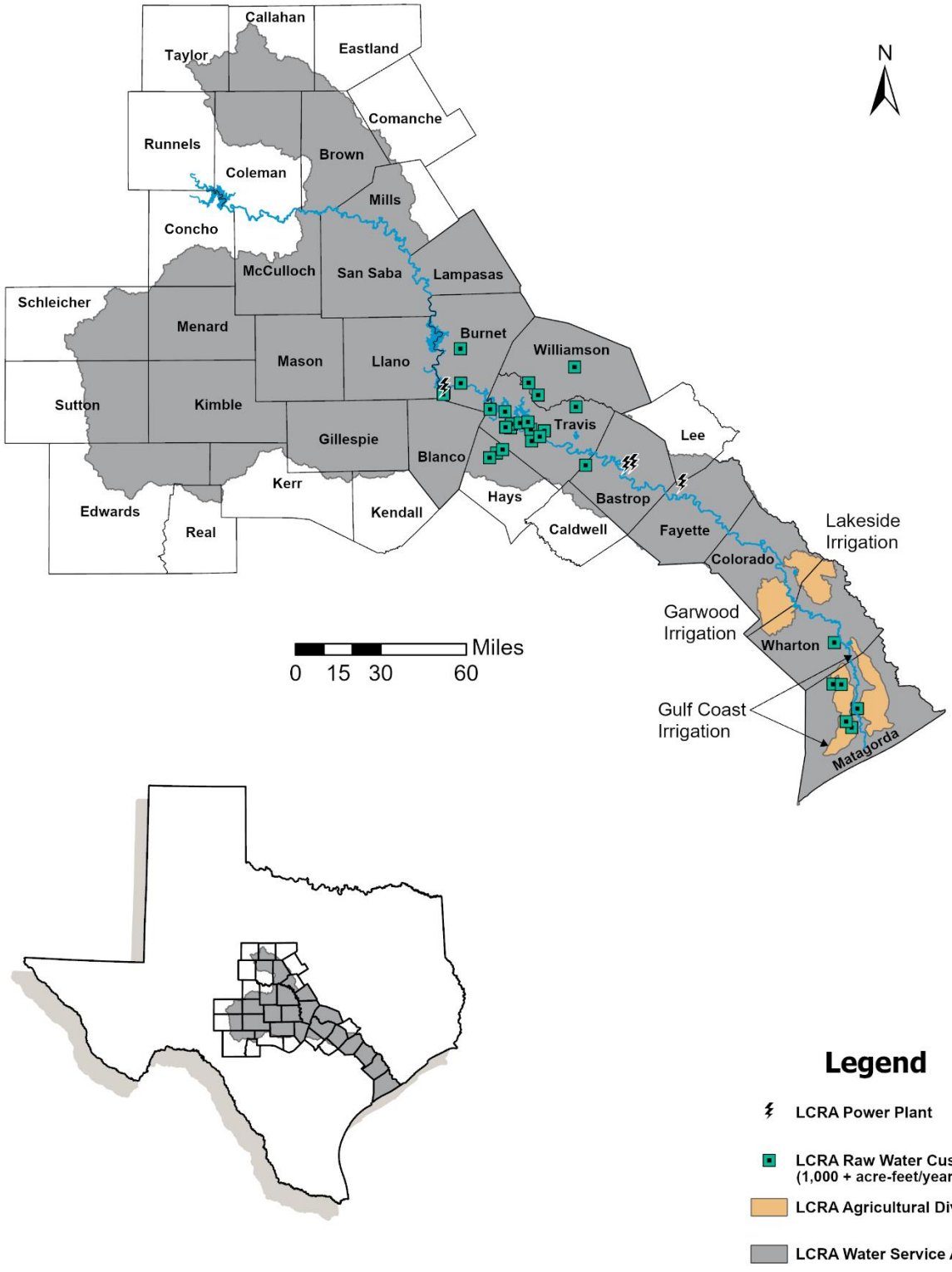
Balancing the need for well-planned infrastructure, water quality protection and water conservation is ~~are~~ important as LCRA works to protect and extend the basin's natural resources ~~to meet the needs of future generations~~. LCRA continues to work with its customers, regional interests, environmental interests, upstream water rights holders and adjoining regional planning groups to find sensible, equitable, beneficial and economical solutions to the water supply challenges that ~~will~~ face this growing region ~~for years to come.~~

Table 2-1 LCRA Reported Total Water Use (acre-feet)[1]

	2019	2020	2021	2022	2023[4]
Industrial	5,186	1,735	4,866	7,910	~~11,711~~17,707
LCRA Power Plants	9,296	7,041	8,468	15,007	12,616~~12,647~~
Municipal, City of Austin[2]	48,370	40,874	32,708	43, 678	80,275~~56,648~~
Municipal, Other	59,626	58,046	64,426	71,738	118,514~~76,868~~
Irrigation and Recreation	5,599	5,346	4,870	7,225	7,041~~6,667~~
Irrigation Operations	86,726	74,723	254,084	210,535	88,891~~239,150~~
Environmental Flow[3]	4,582	0	54,641	67,762	35,287~~55,924~~
Total	**219,386**	**187,765**	**424,063**	**423,855**	**360,331~~459,615~~**

[1] Reported water use numbers obtained from LCRA annual Water Use Reports and does not include groundwater use.
[2] The City of Austin used additional water for all years under its own water rights.
[3] Stored water released for the environment.
[4] Water use in 2023 reflects curtailment of water in the irrigation divisions due to the drought~~. Final data will be available in mid-March~~.

Figure 2-1: Map of LCRA Water Service Area, LCRA Irrigation Divisions, LCRA Power Plants and Large Municipal Water Customers


Callahan
Taylor
Eastland
Comanche
Runnels
Brown
Coleman
Mills
Concho
McCulloch
San Saba
Lampasas
Schleicher
Menard
Mason
Llano
Burnet
Williamson
Sutton
Kimble
Gillespie
Blanco
Travis
Lee
Kerr
Hays
Bastrop
Edwards
Real
Kendall
Caldwell
Fayette
Lakeside Irrigation
Colorado
Garwood Irrigation
Wharton
Gulf Coast Irrigation
Matagorda
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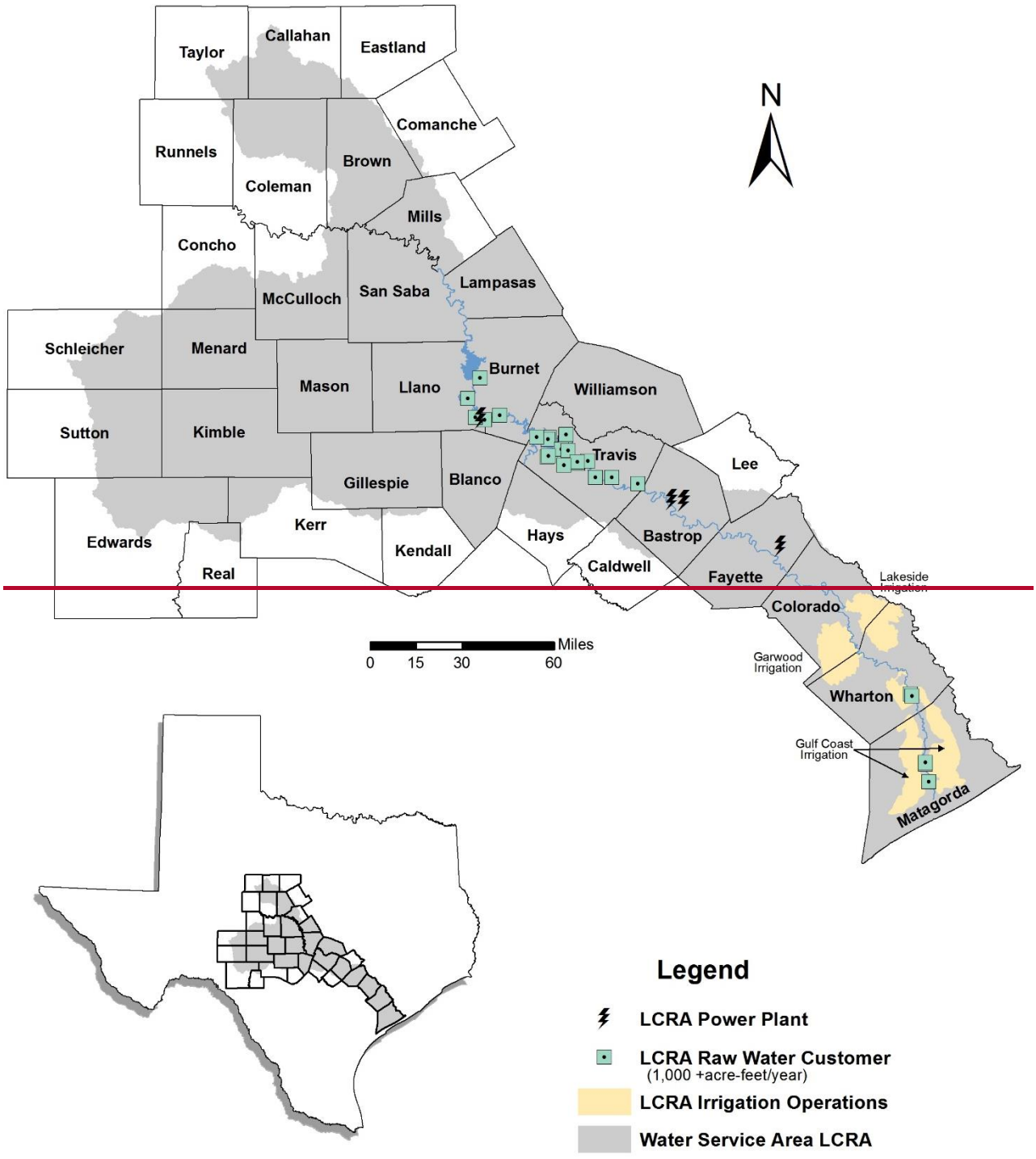
0 15 30 60
Legend
LCRA Power Plant
LCRA Raw Water Customer (1,000 + acre-feet/year)
LCRA Agricultural Division
LCRA Water Service Area


Taylor
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Kendall
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Fayette
Real
Colorado
Lakeside Irrigation
Garwood Irrigation
Wharton
Gulf Coast Irrigation
Matagorda
N
Miles
0 15 30 60
Legend
LCRA Power Plant
LCRA Raw Water Customer
(1,000 +acre-feet/year)
LCRA Irrigation Operations
Water Service Area LCRA

2.2 Water Use

2.2.1 Municipal Water Use

In 2023, LCRA supplied water to more than 500,000~~350,000~~ people through LCRA wholesale municipal water customers, not including the City of Austin. These customers ~~derive~~ obtain their water supplies from LCRA's water rights for lakes Buchanan and Travis and the amended Garwood water right. LCRA municipal customers are ~~very~~ diverse and include cities, water supply corporations, municipal utility districts, water control and improvement districts, and others, the majority of whom are located in the Highland Lakes and Travis County areas. Wholesale municipal customer metered water use for 2019-2023 is included in Appendix A.

O~~Outside of Austin, o~~nly a few mid-sized customers have substantial commercial and multifamily use, with 93~~2~~ percent of the connections reported in the service area outside of Austin in 2022 classified as single family. LCRA customer gallons per capita per day (GPCD) varies greatly, with several smaller rural systems near or less than 100 GPCD to systems serving mostly suburban single-family homes with large irrigated lots with usage near 200 GPCD.~~between 200 and 300 GPCD.~~ This wide range also is reflected in the ratio of summer to winter use. LCRA municipal customers use about twice as much water in the summer than winter. The system-wide estimated GPCD for 2022 was XX~~158~~.

2.2.2 Irrigation and Recreation Water Use

In 2023~~18~~, LCRA supplied 7,041~~6,667~~ acre-feet to 60~~57~~ irrigation (not including agricultural irrigation in the ~~irrigation~~ agricultural divisions) and recreational water customers with firm water contracts. Irrigation and recreational contracts include contracts with golf courses, children's camps, homeowner's associations, hotels, school districts and others including for agricultural irrigation and landscape irrigation around subdivisions. ~~The majority of these contracts are for golf courses located in the Highland Lakes area.~~ In 2023~~18~~, golf course water use accounted for ~~more than~~about 5~~8~~0 percent of the total water use by irrigation and recreation customers. In 2023~~18~~, municipalities in LCRA's service area outside of the City of Austin provided approximately 10,000~~XXXX6,037~~ acre-feet of treated wastewater, mainly to golf courses and irrigation of common areas around subdivisions and roadways. Wholesale irrigation and recreation metered water use for 2019~~4~~-2023~~18~~ is included in Appendix A.

2.2.3 Industrial Water Use

The majority of industrial water use in LCRA's service area goes toward power generation facilities, including LCRA's four~~three wholesale~~ power plants~~arks lants~~ (Fayette Power Project, Thomas C. Ferguson Power Plant~~, and~~ the Lost Pines Power Park, Winchester Power Plant)~~,~~ and Bastrop Energy Partners. STP Nuclear Operating Company (STPNOC) has a contract with LCRA, and jointly owns a water right with LCRA that provides run-of-river to the power plant. STPNOC has not used any backup water supply from lakes Buchanan and Travis in the last five years. In addition, LCRA provides water to customers with industrial facilities in the Gulf Coast ~~Irrigation~~ Agricultural Division canal system.~~ ~~ Other industrial customers include facilities that produce gravel and concrete. Wholesale industrial metered

water use for 2019-2023 is included in Appendix A. Water conservation strategies for LCRA wholesale power generation is found in Chapter 5 and Appendices B, ~~x~~ C and D.

2.2.4 Domestic and Temporary Water Use

In addition to firm municipal, industrial, irrigation and recreational contracts, LCRA also has several thousand domestic use contracts. Domestic use contracts are for individual or household domestic purposes. The water is diverted solely through the efforts of the end-user. As of February 2024, LCRA has 3,776~~581~~ domestic use contracts totaling about 4,600~~27~~ a~~A~~cre-feet. The contract quantity for domestic users is calculated based on LCRA's permanent maximum twice weekly watering restrictions that encourage efficient landscape watering.

LCRA also sells water to a wide~~-~~-ranging customer base that purchase ~~interested in~~ relatively small amounts of water (less than 10 acre-feet) for a relatively short amount of time (three years or less). These temporary customers use water for purposes such as irrigation, business interests, construction activities~~,~~ and recreational purposes. As of February 2024~~April 2019~~, LCRA has 74~~68~~ temporary use contracts.

2.2.5 Agricultural Irrigation Water Use

LCRA owns the water rights associated with the Garwood, Gulf Coast, Lakeside and Pierce Ranch ~~irrigation~~ agricultural operations, and~~. Of these,~~ LCRA operates the infrastructure associated with the Garwood, Gulf Coast and Lakeside ~~operations~~divisions. LCRA provides water to Pierce Ranch under a long-term interruptible contract, and to ~~numerous~~ farmers in the Garwood, Gulf Coast and Lakeside divisions who obtain interruptible agricultural water contracts. Combined, LCRA's three ~~irrigation~~ agricultural divisions cover an area of 830 square miles. Gulf Coast has the largest area at almost 500 square miles, Lakeside is almost 200 square miles, and Garwood is 150 square miles. Crops include rice, turf grass, cotton, corn, milo, soybeans and hay. Land also is sometimes ~~often~~ flooded for wildlife management at the end of the irrigation season if water is available for supplemental use contracts. In a non-curtailed year, over 90 percent of the crops planted in Lakeside and Garwood is rice (about 80 percent in Gulf Coast). In addition to row crops, the Gulf Coast ~~Irrigation~~ d~~D~~ivision has some turf grass farms and aquaculture.

Table 2-3: LCRA Irrigation Operations Acreage and Water Use: 2019~~94~~-2023~~18~~

Irrigation Operations	2019~~94~~	2020~~2015~~	2021~~2016~~	2022~~2017~~	2023~~2018~~
Gulf Coast					
First Crop Rice Acres	~~0~~6,253	~~0~~9,590	8,952~~13,714~~	8,327~~8,545~~	0
Second Crop Rice Acres	~~0~~3,280	~~0~~5,035	~~10,861~~2,972	~~5,537~~0	0
Supplemental Acres[1]	4,863~~47~~	5,975~~1,820~~	3,113~~1,881~~	4,662~~2,739~~	0
Total Water Diverted [2] (a-f/yr)	~~10,462~~3,838	56,836~~13,004~~	37,640~~91,753~~	40,116~~6,007~~	

Irrigation for Rice Crop (a-f/yr)	19,1370	033,553	46,38820,197	37,76922,521	0
First Crop (a-f/acre)	0.002.51	0.002.71	2.571.79	3.132.70	0
Second Crop –(a-f/acre)	1.040.00	1.500.00	1.031.42	1.990	0
Supplemental Water Use[1] (a-f/yr)	02,980	3,2361,641	2,1482,508	3,9842,352	0
Supplemental Water Use (a-f/acre)	0.54.00	0.900.47	1.330.33	0.860.85	0
Total Water Used (a-f/yr)	22,116140,462	13,00436,789	22,34556,149	26,5054 8,095	
Water Loss (a-f/yr)	11,7220	20,0470	13,81935,604	13,61118,911	
Percent of Water Loss	0.025.2 %	029.4.0%	29.638.8 %	25.128.2 %	
Lakeside					
First Crop Rice Acres	017,998	021,460	21,5944,190	25,62519,371	0
Second Crop Rice Acres	08,273	013,042	15,6668,099	010,754	0
Supplemental Acres[1]	1,3920	8560	1,2991,047	511875	0
Total Water Diverted	057,052	064,774	47,84088,142	77,5036 7,212	0
Irrigation for Rice Crop (a-f/yr)	041,928	048,671	70,32836,307	54,62964,606	0
First Crop (a-f/acre)	0.001.76	0.001.66	2.000.94	2.112.52	0
Second Crop (a-f/acre)	0.001.24	0.001.00	1.221.03	1.280	0
Supplemental Water Use[1] (a-f/yr)	02,869	01,199	2,0511,735	639235	0
Supplemental Water Use (a-f/acre)	0.002.10	0.001.40	1.961.30	1.250.30	0
Total Water Used (a-f/yr)	044,797	049,871	72,37938,041	55,26864,841	0
Water Loss (a-f/yr)	012,255	014,903	15,7639,799	11,944112,662	0
Percent of Water Loss	21.50.0 %	23.00.0%	20.517.9 %	16.317.8 %	0
Garwood					
First Crop Rice Acres	18,750117,574	18,35319,756	19,29019,777	16,14620,785	20,013
Second Crop Rice Acres	16,263113,319	14,14116,146	14,23817,308	15,8782,819	116,334
Supplemental acres[1]	4,6182,376	2,2553,136	2,3003,148	3,7083,508	3,406
Total Water Diverted	82,114774,615	66,54875,530	68,32563,565	100,24267,488	87,014
Irrigation for Rice Crop (a-f/yr)	66,575	53,567	49,530	52,985	75,761

First Crop (a-f/acre)	2.362.13	1.831.92	1.771.20	2.273.19	2.29
Second Crop -(a-f/acre)	1.381.27	1.411.05	1.091.14	1.281.24	1.83
Supplemental Water Use[1] (a-f/yr)	5,1417,502	4,9343,399	3,6353,533	3,4194,661	4,453
Supplemental Water Use (a-f/acre)	2.161.60	2.191.10	1.581.10	0.921.30	1.30
Total Water Used (a-f/yr)	71,7156 1,734	58,50158 ,429	53,16546 ,892	56,4049 0,617	80,214
Water Loss (a-f/yr)	10,3981 2,881	8,04717, 101	15,16016 ,673	11,0859, 625	6,800
Percent of Water Loss	17.312.7 %	22.612.1 %	26.22.2%	9.616.4 %	7.8%
Pierce Ranch					
First Crop Rice Acres	2,499733	2,494584	2,2252,482	2,6762,895	0
Second Crop Rice Acres	1,597243	1,74688	2,0681,522	2,7060	0
Supplemental Acres	8441,975	1,094844	1,162622	1,068724	0
Total Water Diverted	4,61316, 650	6,50817, 006	13,11812 ,465	16,8031 4,488	0
First Crop Diversions (a-f/yr)	8,3812,937	9,6633,227	5,9807,035	11,1241 0,047	0
Second Crop Diversions (a-f/yr)	8,2691,676	7,3433,281	6,4846,083	3,3646,757	0
Total Water Diverted - all Divisions (a-f/year)[2]	**97,1881 82,155**	**214,1458 4,392**	**161,5102 61,337**	**232,349 218,510**	**88,891**

[1]Other water use includes water used for irrigating turf and row crops, and for wildlife management.
[2] Diversions include industrial uses for customers served through the canal system (OQ Chemicalsxea and Underground Services Markham)
[3] 2023 data will be available by mid-March.

Various irrigation systems are used depending on the crop and irrigation structures in each division. Most fields are flood irrigated through a levee system. Within the canal systems, Lakeside Irrigation Agricultural Division has approximately 2,000 structures, Gulf Coast Irrigation Agricultural Division has approximately 2,400 structures and Garwood Irrigation Agricultural Division has approximately 1,150 structures. These structures include bulkheads, water boxes, aluminum slide gates, and control or “check” structures such as aluminum flash board risers, pipes and valves, pipe headers, bridges, foot bridges, crossings, siphons, and under-drains.

Total agricultural water useuses in the downstream irrigation agricultural operations in 202318 was 88,891239,150 acre-feet of water from the Colorado River. Water loss calculated for each of LCRA’s irrigation agricultural divisions representsrepresent the difference between the amount of water diverted from the river and the amount of water

measured and billed to customers at the field. Annual water loss for each LCRA agricultural division is shown in Table 2-3. This figure is not available for Pierce Ranch since it is an LCRA wholesale customer.

2.3 2024~~19~~ Water Conservation Goals

In the next five to ~~ten~~ 10 years, the municipal population served by LCRA is expected to grow significantly and ~~. With expected significant population growth, the majority of~~most municipal water conservation savings will come from landscape irrigation standards and permanent watering schedules implemented by customers, and infrastructure upgrades and reuse projects implemented through the water conservation incentives grant and rebates program.

LCRA goals for firm and interruptible water supply include:

Five-year goals:

- 1,0~~7~~00 acre-feet savings per year from ~~firm water contracted~~LCRA power generation industrial water use.
- ~~6,5~~12,000 acre-feet savings per year from firm water contract use. (non-power generation)
- ~~—~~1~~8~~5,000 acre-feet savings per year from ~~agricultural~~ use in the ~~irrigation~~ agricultural divisions. ~~during a year with no curtailment of interruptible water supply.~~
- ~~—~~

10-year goals:

- ~~7~~1,100 acre-feet savings per year from LCRA power generation~~firm water contracted~~ industrial water use.
- ~~9,~~15,000 acre-feet savings per year from firm water contract use. (non-power generation)
- ~~18,000 ,~~20,000 acre-feet savings per year from ~~agricultural~~ use in the ~~irrigation~~ agricultural divisions during a year with no curtailment of interruptible water supply.

The five-year goals build on water savings~~ed~~ from 2019-2023.~~4-2018~~ . The fFirm water savings are ~~is~~ estimated to~~will~~ increase from ~~6~~XXXX~~4,500~~ acre-feet in 2023~~198~~ to 12,000~~6,500~~ acre-feet in 2029~~3~~ and ~~are~~ are~~is~~ projected to come from expanding existing firm water programs and additional customer strategies. These goals do not reflect the conservation efforts ~~from the program~~ from~~at Austin Water~~the City of Austin, ~~at the City of Austin,~~ LCRA's largest municipal customer. Savings in the ~~irrigation~~ agricultural operations ~~divisions~~ are expected to ~~will~~ increase from 16~~53~~,500 acre-feet in 2022~~198~~ to 186,000 acre-feet in 2029~~3~~, with projected savings coming from completion of the gate ~~rehabilitation~~ automation project in the Garwood ~~Irrigation~~Agricultural Division, the completion of a gate automation project in the ~~Gulf Coast~~Lakeside ~~Irrigation~~ Agricultural Division, ~~, the beginning phase of gate automation in Lakeside and Garwood irrigation divisions, and continued~~ savings from existing and newly re-~~land~~ leveled fields, and canal lining of segments serving ~~along~~ industrial customers~~canal lines~~.

~~TCEQ also requires LCRA to set 10-year goals. The 10-year goals were increased at the same yearly rate as the five-year goals.~~ The 10-year goals build on expected water

savings~~ed~~ from 2024~~19~~-2029~~29~~. The firm water savings- are expected to ~~will~~ increase to 15,000 acre-feet by 2034 and ~~arei~~are~~es~~ projected to come from expanding existing firm water programs and additional customer strategies. These goals do not reflect the conservation efforts at the City of Austin ~~Water, LCRA's largest municipal customer~~. Savings in the ~~irrigation~~agricultural operations are expected to ~~will~~ increase to 20,000 acre-feet by 2034.

3.0 Firm Water Conservation Strategies

3.1 Monitoring and Record Management System

LCRA maintains records of water distribution and sales using a third-party billing system ~~the Oracle-based software called Advanced Utility Systems~~, which ~~for its water billing purposes. Advanced Utility Systems~~ provides a central, automated location for water billing information ~~and an automated way to compile and present that information~~. A detailed description of the billing system is available upon request.

3.2 Monitoring and Measuring Water Use

LCRA Water Contract Rules impose requirements on LCRA's raw water customers to properly measure water diversions. Measuring devices must be accurate within plus or minus 5% ~~percent~~ of the indicated flow over the possible flow range. Meters ~~are~~ generally are read on a monthly basis. Customers ~~are~~ generally are required to provide third-party verification of meter testing and calibration to LCRA staff each year, while some smaller customers with contract quantities not exceeding ~~20~~30 acre-feet per year must provide the verification at least once every two years.

Residential property owners pumping water from the Highland Lakes for domestic use are required to obtain contracts from LCRA. LCRA estimates an average of about 4~~5~~,6~~0~~00 acre-feet per year is being pumped from the Highland Lakes by lakeside residents, mostly for landscape watering. LCRA staff works with each customer to determine the size of the irrigated area, which determines the contract quantity. Domestic users must comply with a maximum twice-a-week permanent landscape watering schedule, except during extreme drought conditions or ~~other emergency,~~ when water restrictions change ~~could be implemented in accordance~~ under ~~with~~ the LCRA Drought Contingency Plan.

3.3 Reservoir Systems Operations Plan

LCRA manages the Highland Lakes under ~~according to a~~ the Water Management Plan (WMP) which is approved by TCEQ. The plan governs LCRA's operation of lakes Buchanan and Travis to meet the needs of major water users throughout the lower Colorado River basin. Under the WMP, LCRA uses unregulated inflows entering the river from drainage areas downstream of the Highland Lakes to the maximum extent possible before waters stored in the lakes are released to satisfy downstream water needs. The LCRA WMP is available at http://www.lcra.org/watermanagementplan.

LCRA has improved its ability to manage water supply operations by 1) improving coordination with major customers to better quantify return flows and manage pumping operations below the Highland Lakes; 2) improving river modeling to better quantify run-of-river water in the Colorado River below the Highland Lakes; 3) improving decision support tools to more efficiently use stored water by using run-of-river water to meet demands as much as possible; and 4) improving control of releases from the Highland Lakes to more precisely match releases to downstream demands.

3.4 Firm Water Contract Requirements

TCEQ rules mandate that LCRA, as a water rights holder, requires wholesale water customers with new or amended contracts to develop a water conservation plan. LCRA has developed Water Conservation Plan Rules for raw water customers, which are designed to . The rules extend existing surface water supplies through water conservation and help ensure there is an adequate supply of water within LCRA's water service area. LCRA requires all that its customers designate a water conservation coordinator, and provide annual plan implementation reports and adopt a permanent maximum twice-weekly watering schedule.

All firm raw water customers except domestic use and temporary contract customers are required to specify five- and 10-year conservation targets for water savings and adopt minimum conservation measures, such as leak detection and repair, conservation water rates, and education. LCRA encourages customers with new or revised contracts to adopt additional conservation strategies not required in the rules, such as irrigation evaluations, deed restrictions for new development, a permanent landscape watering schedule, and partnering with LCRA on rebate programs. The LCRA Water Contract Rules, including the Water Conservation Plan Rules, are available at www.lcra.org/firmwateruse. http://www.lcra.org/water/water-supply/water-supply-contracts/Pages/default.aspx.

3.5 Water Rates

LCRA's firm water rates encourage water conservation by combining reservation and volumetric water rate structures. The current water rate is $1455 per acre-foot per year of firm water used. The cost for any water used above the contracted amount increases to $290 per acre-foot. The water rate is $772.50 per acre-foot per year for firm water reserved for future use. Under LCRA's Water Conservation Plan Rules, all LCRA municipal wholesale customers must employ water rate structures that are not promotional, meaning the water rate structure must be cost-based and not encourage the excess use of water. LCRA's current water rate structure does not charge different firm water rates for different types of firm water use.

3.6 Customer Cost-Share Program

LCRA's Firm Water Conservation Cost-Share Program provides funding for water efficiency projects and programs established by LCRA's firm water customers. LCRA's firm water customers include cities, utilities, industries, and some irrigation and recreational water users.

Cost-share funds are available to projects that result in measurable water savings. Since 2019, LCRA has awarded $700,000 while leveraging an additional $13 million in cost-share funding provided by recipients. LCRA provides funding of up to ~~equal to~~ 50% ~~percent~~ of the project cost or an annualized cost of $1550~~50~~ per acre-foot (the current raw water rate), whichever is less. Projects funded in the past five ~~three~~ years include converting irrigated areas from raw or potable use to recycled water; decreasing utility system water loss including projects to recycle water in the water and wastewater treatment processes; ~~and~~ improving irrigation efficiency through irrigation technology upgrades;~~, or~~ and implementation of customer portals and utility-side tracking tools for water loss in conjunction with projects to convert metering systems from manual or drive-by monthly readings to automated metering infrastructure (AMI).~~nstallation of soil moisture sensors.~~ Applications are accepted twice yearly.~~-~~ LCRA plans to increase funding for this program in the next five years and expand the types of entities that are eligible to receive funding. ~~to include commercial end-users of LCRA's firm water customers such as school districts.~~

3.7 End-User Conservation Incentives

~~The residential rebate program…~~In ~~2012,~~ LCRA ~~began~~ offers ~~ring~~ up to $600 per year per property in ~~landscape irrigation technology~~ rebates for WaterSense smart irrigation controllers, irrigation system evaluations,~~projects including~~ ~~that include~~ pressure-reducing irrigation technology, soil moisture sensors and rain sensors, pool filters and covers, aeration, soil testing, and compost and mulch for residential end-users of LCRA's wholesale customers~~. In 2017, LCRA staff expanded theis program to include irrigation system evaluations, smart controllers, pool filters and covers, aeration, compost and mulch~~. ~~Since~~In 2019, LCRA ~~staff~~ began accepting ~~implemented an online~~ rebate applications online. ~~tool for property owners to submit rebate requests.~~ Since 2020, LCRA has processed 1,287 rebate applications and awarded $138,085 in rebates~~4.75. Since 2020, staff has processed 1,287 rebates totaling $138,084.75~~. ~~n the next five years,~~ LCRA plans to ~~expand this program by~~ increase~~ing~~ funding and marketing efforts to enhance program awareness and participation over the next five years.~~.~~

LCRA's~~The~~ Commercial, Industrial and Institutional (CII) Rebate Program helps businesses, industries, schools, churches and other institutions that directly or indirectly receive water from LCRA incorporate ~~adopt~~ new water-saving equipment and practices. The program provides rebates to replace inefficient plumbing, irrigation equipment, or process change outs up to a fixed dollar amount or cost per acre-foot saved, based on recommendations from indoor and outdoor water audits. A facility can receive a rebate of ~~up to $100 for each toilet and/or urinal replaced with water efficient models and~~ up to $1,500 per fiscal year ~~acre-foot saved~~ for other water-saving equipment and/or process changes. LCRA also has a grant that awards ~~gives~~ up to 50 percent~~%~~ of the project cost, up to $20,000, ~~-~~for large- scale rainwater harvesting, air-~~-~~cooled ice machines, HVAC condensate recycling and other water-~~-~~saving technology.

~~In 2012, LCRA began offering landscape irrigation technology rebates that include pressure-reducing irrigation technology, soil moisture sensors and rain sensors. In 2017, staff~~

~~expanded this program to include irrigation system evaluation, smart controllers, pool filters and covers, aeration, compost and mulch, and rainwater harvesting. Staff implemented an online rebate application tool for property owners to submit rebate requests.~~

3.8 Landscape Irrigation Evaluations

LCRA offers irrigation evaluation training to staff members who work for LCRA wholesale water customers~~' staff~~. As of 2022~~17~~, ~~ten~~10~~seven~~ LCRA municipal customers offer irrigation evaluations to their customers. ~~-~~LCRA also offers rebates for irrigation evaluations as part of its residential and commercial rebate programs; 118 ~~. One hundred eighteen~~118 ~~End-users of X~~ wholesale customers end-users have received rebates for irrigation evaluations since 2020. ~~In summer 2012,~~ LCRA also~~continues to~~ ~~began~~ offers~~ing~~ evaluations to domestic users.

~~Since 2017,~~ LCRA ~~has~~ offers~~ed~~ up to $100 reimbursements for irrigation system evaluations for residential properties, and up to $5,000 for an indoor and outdoor water audit for Commercial, Institutional, and Industrial (CII) customers. LCRA will continue to partner with firm water customers ~~on this revised program~~ to increase participation.

3.9 Public Education and Awareness

Community Outreach

LCRA staff regularly speaks to community groups such as homeowner associations, individual businesses, non-profit groups such as master gardeners and~~,~~ business groups~~,~~, and ~~presents at~~ firm water customer meetings.

LCRA's water conservation website, WaterSmart.org, provides ~~has~~ educational materials and links to additional water conservation ~~websites~~resources, including cost-share incentive and rebate programs. LCRA is working to expand participation in its water-saving programs. ~~The LCRA conservation team is exploring opportunities to expand participation of these water-saving programs. .Ongoing communication with Firm customers is important as we aim to increase participation of these incentive programs. As we think about expanding and increasing participation of the Incentive programs, a key component of this will be to reach more people. Increasing awareness among youth populations is important. How LCRA plays a role going forward is under discussion. Promotional campaigns such as Texas Runs on Water, collaboration with the Colorado River Alliance, and expansion of youth programming are all examples of potential opportunities to collaborate and raise awareness about water conservation.~~

WaterMyYard Program

LCRA has partnered with Texas A&M AgriLife Extension on its WaterMyYard program, which was developed to provide homeowners with scientific data to determine how much water they should use for their yards. The WaterMyYard~~.org~~ website provides homeowners with recommendations on how many minutes to run their irrigation systems based on their utility's current recommended irrigation schedule, ~~and using~~their sprinklers' precipitation rates ~~of their~~

sprinklers, the water holding capacity of their soil, and evapotranspiration rates based on their location within the service area to determine evapotranspiration rates.. As of December 2023, 46,373 users have signed up for the program.

LCRA contributes local climate data to theis website collected from eight LCRA Hydromet weather stations. WaterMyYard participants are notified weekly how long to run their irrigation system based on the climatic conditions such as rainfall, solar radiation, temperature and wind speeds that occurred during the past week. LCRA will continue to promote this program within the service area.

Regional Partnerships

In 2010, LCRA helped develop the annual Central Texas Water Conservation Symposium, a daylong workshop for community leaders featuring water conservation experts from around Texas and the United States, andStates and continues to have an active role in organizing and funding theis yearly event. LCRA joins along with a group of other central Texas water utilities suppliers and local environmental groups in the central Texas area in supporting the symposium, which . This effort also is supported by the Texas Water Development Board, central Texas water utilities, local environmental groups and non-profit groups. This symposium consistently generally has about attracts about 150 attendees. This symposium is organized by a planning group subset of the Central Texas Water Efficiency Network (CTWEN), a coalition of municipalities, water providers and water conservation advocates in the Central Texas region. Participants share information and promote water efficiency education, legislation, programs, technologies, and all other integral components of water conservation. in order to have an impact regionally on water supplies and use. CTWEN meets on bi-monthly throughout the year.

The Lone Star Golf Course Superintendents Association of America completed the Water Efficiency/Conservation BMP guide book in January 2014.LCRA is working with customers to implement suggested practices.

3.10 School Education

LCRA Parks Department

LCRA's Parks Department operates two natural science centers that provide educational and recreational programming to youth and adults. The LCRA Parks mission is to protect natural resources; provide access to parks, lakes and tributaries of the lower Colorado River for public recreation; and to promote land and water stewardship through education and recreation programs and services. Natural science programs educate pre-kindergarten through 12th grade students and youth developmentvarious community groups about water quality, water conservation, wildlife, geology, and other science and natural history curriculums, reaching over 23,000 visitors annually. Water quality and water conservation topics also are addressed during river rafting trips. LCRA Parks also participates in a Program Service Agreement with the Hyatt Regency Lost Pines. A water conservation message is delivered to almost 5,300 guests annually through the program.

Colorado River Alliance Programs

LCRA provides guidance and technical assistance to t~~T~~he Colorado River Alliance (CRA), which ~~-~~provides a Colorado River water education program, including information on water conservation, to third to fifth graders at LCRA's Redbud Center. The program raises student awareness of the Colorado River in Texas and increases conservation and stewardship of the river through hands-on, field-based learning. ~~LCRA staff provides guidance and technical assistance to CRA staff on their programs at the Redbud Center.~~

3.11 LCRA Facilities

LCRA facilities ~~and conservation~~ staff ensure~~s~~ the irrigation systems on LCRA grounds, particularly at the General Office Complex (GOC) and the Dalchau Service Center in Austin, are maintained to minimize leaks and ensure uniform distribution. Facilities staff members have performed irrigation system audits of GOC grounds. Staff plan to continue annual irrigation evaluations of the irrigation systems on LCRA grounds.

Additionally, LCRA facilities and water conservation staff members work with CRA and local native plant experts to maintain the native plant flora at the Redbud Center, which is part of the water education curriculum CRA provides.

3.12 Municipal Customer Mandatory Requirements

There are several types of regulatory requirements that have been adopted proactively by LCRA municipal customers or are required by the state for larger municipalities.

Irrigation System Standards
House Bill 1656, passed in 2007, requires all municipalities with a population of more than 20,000 to adopt landscape irrigation ordinances that follow TCEQ rules for irrigation design, require the installer of an irrigation system to be licensed, require a permit prior to installing an irrigation system, and include minimum standards for the design, installation and operation of irrigation systems. This applies to several large LCRA customers, and several additional customers have adopted these standards on their own~~voluntarily~~. As of 2022~~18~~, 14~~eleven~~ LCRA customers have a permitting and inspection program to implement the TCEQ landscape irrigation standards for new irrigation systems.

Permanent Mandatory Watering Schedules
LCRA updated its Water Conservation Plan Rules~~Following LCRA's water conservation plan rules update~~ in November 2022 to require its customers to adopt a permanent no more than twice weekly watering schedule.~~A, a Ass of 202318, almost all often LCRA's municipal customers have adopted permanent mandatory summer landscape watering schedules that are unrelated to drought conditions, allowing irrigation no more than twice weekly.~~ This measure, if enforced, not only saves a substantial amount of water, but lowers peak use during the summer, reducing pressure on water treatment plants and extending the period of time before a new water treatment plant is needed.

3.13 City of Austin/LCRA Water Partnership

In 2008, LCRA and the City of Austin agreed to a cooperative structure known as the Water Partnership. The Water Partnership is in place to jointly evaluate, plan and implement approved strategies to optimize water supplies in the basin. Water conservation collaboration is key to this partnership. LCRA and Austin staff meet monthly each year have held several joint staff meetings and have co-hosted workshops targeting commercial, industrial and institutional users, and yearly seminars for irrigation professionals. . LCRA and Austin also have improved the efficiency with which water is released from the Highland Lakes for downstream uses by increasing coordination on daily diversions to Austin water treatment and power plants, return flows from Austin wastewater treatment plants, and Austin's operation of Longhorn Dam.

3.14 Conservation Research and Verification

LCRA partners with customers and other research organizations to promote innovative measures and determine water savings.

LCRA compiles annual progress report surveys from its water customers to track progress on water conservation goals, develops its own program implementation reports to the Texas Water Development Board (TWDB) and plans future programs. LCRA will begin working with municipal customers to track GPCD using the state's GPCD reporting methodology.

LCRA monitors water savings using a conservation tracking tool developed by the Alliance for Water Efficiency (AWE). This tool was developed to be used at the retail level and is capable of providing a detailed cost benefit analysis of individual conservation strategies based on avoided utility costs for water and wastewater treatment, which are not applicable at the wholesale level. In 2018, TWDB released a municipal water conservation planning tool, based off of the AWE tool, and customized for Texas utilities. LCRA will work with its municipal customers to promote use of this tool as they update and implement their water conservation plans.

In 2022, LCRA contracted with Freese & Nichols to develop a model to verify conservation related water savings for LCRA's nine largest municipal customers, excluding the City of Austin. The model projected water demand over time, taking weather-related factors and the presence of drought restrictions into account and compared those projections to actual use to estimate water savings from conservation efforts. The study found a decrease of about 2 GPCD per year in water use since 2010, estimating a total water savings of about 11,000 a-f per year in 2022 for only the subset of LCRA's nine largest customers. It The study also compared this "top-down" approach to the "bottom-up" approach LCRA uses to estimate annual savings reported to TWDB using the AWE tracking tool and validated that LCRA's methodology for estimating savings is reasonable and lower than the savings estimated using the model-based "top-down" approach. The study also noted that LCRA's annual savings estimating methodology does not include TWDB plumbing code savings. LCRA used the study in o assist with setting the 2024 Water Conservation plan goals for firm water contract use.

LCRA is ~~currently~~ working with Freese & Nichols on an update to the water supply resource report by the end of 2024.~~-~~ The update will analyze the costs and benefits of various future water supply strategies, which will include several municipal and agricultural water conservation related strategies.

4.0 Agricultural Water Conservation Strategies

~~Since 2014,~~LCRA continues to reach ~~major~~ milestones ~~have been reached~~ completing significant water conservation related projects in it~~LCRA~~'s ~~irrigation~~ agricultural divisions. The 2019~~4~~ goal of saving 1~~3~~5,~~,~~000 acre-feet per year ~~would have been~~was almost met and would have been~~or~~ surpassed if the drought had not required LCRA to cut off ~~the supply of stored~~ interruptible stored water from lakes Buchanan and Travis to customers in the Lakeside and Gulf Coast agricultural ~~irrigation~~ divisions ~~had not been curtailed~~ in 2023~~12-2015~~. The conservation strategies implemented in the Garwood ~~Irrigation~~ Agricultural Division, which continued to receive ~~was entitled to a limited amount of stored~~ water in 2023~~, was not curtailed substantially~~, were instrumental to retaining savings. As of 2023~~18~~, the three-year rolling average annual water savings in the ~~irrigation~~ agricultural divisions is 14,769~~2,437~~ acre-feet. In 2019, LCRA completed automation and rehabilitation of main gates along all main canal lines in the Gulf Coast ~~Irrigation D~~division and in 2023, LCRA completed automation of main gates in the Garwood ~~Irrigation D~~division ~~will be complete~~. ~~LCRA plans to continue gate automation in Lakeside and Garwood with the goal of completing main gate structures within the next five~~510 years, ~~depending on funding and LCRA's ability to secure additional grants. Automation of Lakeside gates is in LCRA's 2018~~ 10tenfive ~~-year capital plan.~~

~~Precision~~ Laser land leveling grants distributed between 2006 and 2013 continue to generate water savings when~~ever~~ those fields are in production, but savings from fields that reached their 15-–year life cycle began to expire in 2021. In 2023, LCRA launched a ~~new~~ laser land leveling re~~-~~certification cost-share program to touch up fields with a permanent levee design and re~~-~~design fields with temporary levee designs to have permanent levee designs~~The land leveled fields are coming to the end of their expected life cycle, and staff is looking to study fields over the next 5 years to determine effectiveness and upkeep for each property is needed to maintain savings.~~ ~~-~~

4.1 Monitoring and Records Management Strategy

LCRA ~~irrigation~~ agricultural divisions are operated to maximize water efficiency under Canal Operating Procedures guidelines. ~~Copies of the Canal Operating procedures for each division are available upon request.~~ An irrigation coordinator manages the delivery of water to customer fields in each canal section, collecting on-farm water measurements, checking the system for leaks, high canal levels and potential water waste daily. Water orders are placed with the irrigation coordinator, who then generally has ~~up to six days~~a set number of days to deliver water to the customer field. Canals are managed daily and water is adjusted based on system demand. ~~D~~

~~The irrigation coordinator collects daily, on-farm water measurements in the morning and checks the system for leaks, high canal levels and potential water waste throughout the day.~~ ~~D~~Daily measurements ~~are recorded by the irrigation coordinator and~~ are ~~then~~ entered into LCRA's ~~volumetric~~ billing system software ~~(WAMS)~~, which tracks volumetric water use for each field.

LCRA maintains irrigation water use and sales records through the ~~WAMS (~~Water Application Management System (WAMS) and contract information is stored in LCRA's contract repository. A map indicating the Texas land survey number and outlined fields in production is attached to each irrigation contract at the local division office. The contract contains acreage for each land survey and is scanned and uploaded. Field location information is maintained in a GIS platform. The WAMS billing system includes a customer portal that has automated standard water use reports that provide a running total of water use data by field and by structure as well as detailed data by watering event. ~~-~~ This information is updated at least weekly~~, if not more frequently,~~ during the irrigation season.

~~In 2017, LCRA upgraded its irrigation division billing system to include a customer portal and more flexibility to maintain contract information. Automated standard reports are generated through this system to keep track of total water demand, and the new customer portal allows each farmer to access their field water usage at any time. The system generates an updated water use report for each field weekly.~~

4.2 Agricultural Water Rates

LCRA's current rate structure applies per acre-foot of water delivered. Agricultural irrigation water rates vary for each ~~irrigation~~ agricultural division. Information about the rates for all three divisions is available upon request. Interruptible customers are subject to tiered pricing which encourages conservation. This pricing has been implemented at all of the agricultural divisions in the form of surcharges, which apply when water use exceeds ~~to surcharges for use above~~ certain established limits. These surcharges can increase the effective rate for the water delivered to more than~~up to~~ 2.5 times the ~~normal~~ per acre-foot charge.

Through the customer portal mentioned above, c~~C~~ustomers are regularly provided with water use information so they are aware of the potential for high water use to result in surcharges. Surcharges have resulted in fewer customers and fewer fields with high water use.

~~Tiered rate pricing encourages conservation. In 2010, tiered rates were applied to Gulf Coast and Lakeside irrigation divisions. In 2013, tiered rates were applied to the Garwood Irrigation Agricultural Division. The pricing changes implemented since 2010 for the irrigation agricultural divisions have helped to changed high water use practices.~~

Volumetric measurement also is an important strategy to support the verification of savings for other conservation strategies such as precision land leveling. In 2021, LCRA worked with the University of Wisconsin to complete~~is conducting~~ a study to quantify savings from conservation strategies in Garwood. Based on that study, LCRA updated the savings estimate for the Garwood volumetric measurement project completed in 2012 to 0.33 acre-

foot per acre in production. LCRA will continue to monitor and measure water use to encourage efficient use of water in the irrigation agricultural divisions.

4.3 Automation and Modernization of Gates

In 2019, LCRA will completed the Gulf Coast gate rehabilitation and control project. From 2020-2023, In 2020 LCRA completedperformed began the Garwood gate automation project, as planned for the 2014 Water Conservation Plan. Prior to the project, this division had the highest water losses compared to the other irrigation divisi and to automated 46 main canal gate structures in the Garwood Agricultural Division. A after receiving ons. grant from the Texas Water Development BoardTWDB to cover TWDB grant helped cover of the project cost. The project was different from earlier gate proejctsprojects, because the main canal gate structures in the Garwood Agricultural Division re unique compared to the other divisions because they had already have metal slide gates in good condition and so they only needed to be automated. In 2023, LCRA began a pilot gate automation project in the Lakeside division to automate one main structure on the Chesterville line of the Lakeside canal system. The pilot project will test a gate design that will incorporate an overflow to pass high canal flows resulting from rainfall in the Lakeside system. LCRA plans to continue gate automation in Lakeside with the goal of completing main gate structures within the next five years. Automation of Lakeside gates is in LCRA's 2023 10-year capital plan.
In 2010, a $257,000 grant from the U.S. Bureau of Reclamation helped LCRA develop the centralized control system for the automated main canal gates in the division and launch the initial project phase, which automated 11 check gate structures at the head of the eastern canal system in the Gulf Coast Irrigation Division. Since then, LCRA launched five separate project phases over nine years to automate 45 main canal structures along main lines of the eastern and western canal systems in Gulf Coast at a cost of $1.88 million. LCRA received grants from the TWDB totaling $190,000 for two of those project phases. This three- year project was completed in 2023, and those structures are now integrated into the existing SCADA system developed for the Gulf Coast gate rehabilitation project.

4.4 Canal Lining

Recently, LCRA has shifted the focus of future canal lining efforts to canal lines servicing industrial customers, which are used year-round. LCRA is In 2013, Texas A&M Agrilife Extension completed a canal seepage study. The study identified 27 miles of canals in the Gulf Coast Irrigation Division with the potential for significant seepage losses, with 10 miles having the highest priority. Curtailment of water deliveries to the Gulf Coast irrigation division postponed ponding tests originally planned within the scope of this study to quantify seepage in high priority areas. In 2017, LCRA completed a series of ponding tests in canal sections with automated gates across the majority of the eastern and western canal systems in Gulf Coast. LCRA plans to evaluatinge the cost effectiveness of different canal lining options in select these areas and will prioritize lining of segments with higher than average water loss. in the next five years and to continue additional ponding tests to increase the accuracy of water loss estimates in these canal segmentsA recent pilot project conducted to line a small area with known seepage issues with bentonite clay was a successful and cost effective solution. LCRA is exploring whether this option could be scaled to larger canal lines and longer segments., If successful and proven to be cost effective, LCRA could explore

implement~~ing~~ a ~~larger~~ lining project in ~~the future~~the next five to ~~ten~~10 years, subject to availability of funding.

4.5 Precision Land Leveling

~~The precision land leveling program began in 2006, funded by HB 1437, LCRA and the Natural Resource Conservation Service's Environmental Quality Incentives Program (EQIP). By leveling land, the average required field flood depth is reduced, which increasesing the efficiency of water used on individual fields. This program has been very successful, with more than 30,000 acres of farmland leveled through 2013. This program also has been very cost-effective for LCRA due to the EQIP cost share of 50-70 percent and a minimum landowner contribution of 20 percent.~~

~~NRCS defines the useful life of projects in the EQIP program. Per NRCS, the useful life of precision land-leveling projects is 15 years. At the end of the 15 years, NRCS allows farmers to re-sign for additional financial assistance with the condition that new work must move at least 100 cubic yards of dirt per acre-. The useful life on land LCRA awarded cost-share grants will begin maturing in 2021, so staff began developing a new program.~~ In October 2022, the LCRA Board of Directors approved a new land leveling recertification program ~~that launched in January 2023~~ to upgrade fields previously leveled through the Natural Resource Conservation Service's Environmental Quality Incentives Program (EQIP) with temporary levee designs or recertify fields with permanent levee designs that are still reliably saving water~~, with the largest yearly acreage reaching its maturity in 2023-2024~~. ~~Staff will develop a plan, starting in 2019, to verify the quality of existing land-leveled fields before LCRA-funded fields reach their 15-year life~~ By leveling land, the average required field flood depth is reduced, which increases the efficiency of water used on individual fields. NRCS defines the useful life of projects in the EQIP program. Per NRCS, the useful life of precision land-leveling projects is 15 years~~. At the end of the 15 years, NRCS allows farmers to re-sign for additional financial assistance with the condition that new work must move at least 100 cubic yards of dirt per acre-~~. LCRA's previous land leveling program was from 2006 to ~~ended in~~ 2013, so using the NRCS definition, the useful life on land LCRA awarded cost-share grants began maturing in 2021. The new program incorporates more stringent requirements than the EQIP program, based on findings from savings verification studies, and includes funding for structures for water control. These ~~e~~ new requirements include a permanent levee field design with an average field levee density of less than 0.10 levees per acre. In recent years, NRCS has not funded re-certification of previously leveled projects and does not require permanent levee field designs, so LCRA's program no longer operates in conjunction with EQIP.

~~This authorization provided up to $500,000 for the program through 2025.~~ In 2023, LCRA executed 25 contracts to re-design or re-grade 1,970 acres. As of February 2024, this work is complete on 376 acres. Producers have up to two years to complete the re-leveling work following contract execution. LCRA plans to continue ~~to fund~~ this program through the next five to~~5~~ 10 years, subject to availability of funding.

In 2024, LCRA expects to complete a study began in 2021 to update a 2012 savings verification study conducted by LCRA and ~~worked with~~ Tthe University of Texas LBJ School

of Public Affairs. ~~ to complete a savings verification study of this program in 2012.~~ The~~is~~ original study quantified water savings from on-farm precision land leveling in the Lakeside ~~Irrigation~~ dAgricultural Division for five years using LCRA billing data and detailed farmer surveys. The study showed that precision land leveling ~~alone~~ accounted~~s~~ for 0.30 acre-feet of water saved per acre for the first crop when compared to unleveled fields. ~~The study also identified a significant difference in water use between leveled and non-leveled fields for the second, or ratoon, crop. However, because of the small sample size for the ratoon crop, there is uncertainty associated with the water savings estimate for the ratoon crop. That's because most precision leveled fields included in the study were used for hybrid seed rice, which does not produce a ratoon crop. The original savings estimate was 0.75 acre-foot per acre for a two-crop season.~~ LCRA has revised this estimate to 0.46 acre-feet per acre by extrapolating water savings for second crop from the savings for first crop based on average water use. ~~In 2021, LCRA staff began collecting data through farmer surveys to update this study and expects to complete the~~is study in 2024.

~~Differences between the original savings estimate and the savings for precision leveling found in the study are likely attributable to differences in levee density (the number of levees in a field divided by the size of the field). Fields where levees were removed as part of the precision leveling process saved more water than fields that were simply land leveled. However, not all precision leveled fields had levees removed because this was not an EQIP requirement.~~

In 20~~17~~, the model for this study was updated and used for a similar survey and analysis on water use data in the Garwood ~~Irrigation~~ Agricultural Ddivision. ~~-~~Based on findings from both of these ~~savings~~savings' verification studies, LCRA added a maximum levee density requirement to field designs to qualify for participation in the land leveling recertification program ~~mentioned above~~.

An additional survey to incorporate more years of data may be needed to finalize the results of the study.

5.0 Wholesale Power Generation

5.1 Introduction

Most of the water use characteristics of a power plant are fixed once the facility has been built. Modifications to make it more thermodynamically efficient can result in small reductions in water use, similar to the way new pollution abatement practices are designed. These small changes on a plant-by-plant basis are important to the water conservation potential for LCRA's electric generation system because energy conservation efforts can directly impact water use.

This chapter will provide information on LCRA power plants Fayette Power Project (FPP); Lost Pines Power Park, including Sim Gideon and Lost Pines 1 power plants; Winchester Power Park; and the Thomas C. Ferguson Power Plant and how a new generation mix and conservation efforts impact water use.

Unless otherwise noted, all generating capacity and energy values in this Industrial Water Conservation section refer to gross generation in units of megawatt hours (MWh) or kilowatt hours (kWh). "Gross" power values represent the total production from a generator. "Net" power values represent the remaining power after plant power usage has been subtracted. Gross power better reflects the water used for power production. In addition, the capacity values in this section represent the output levels that the generating units can dependably produce in the summer (Gross Dependable Capacities).

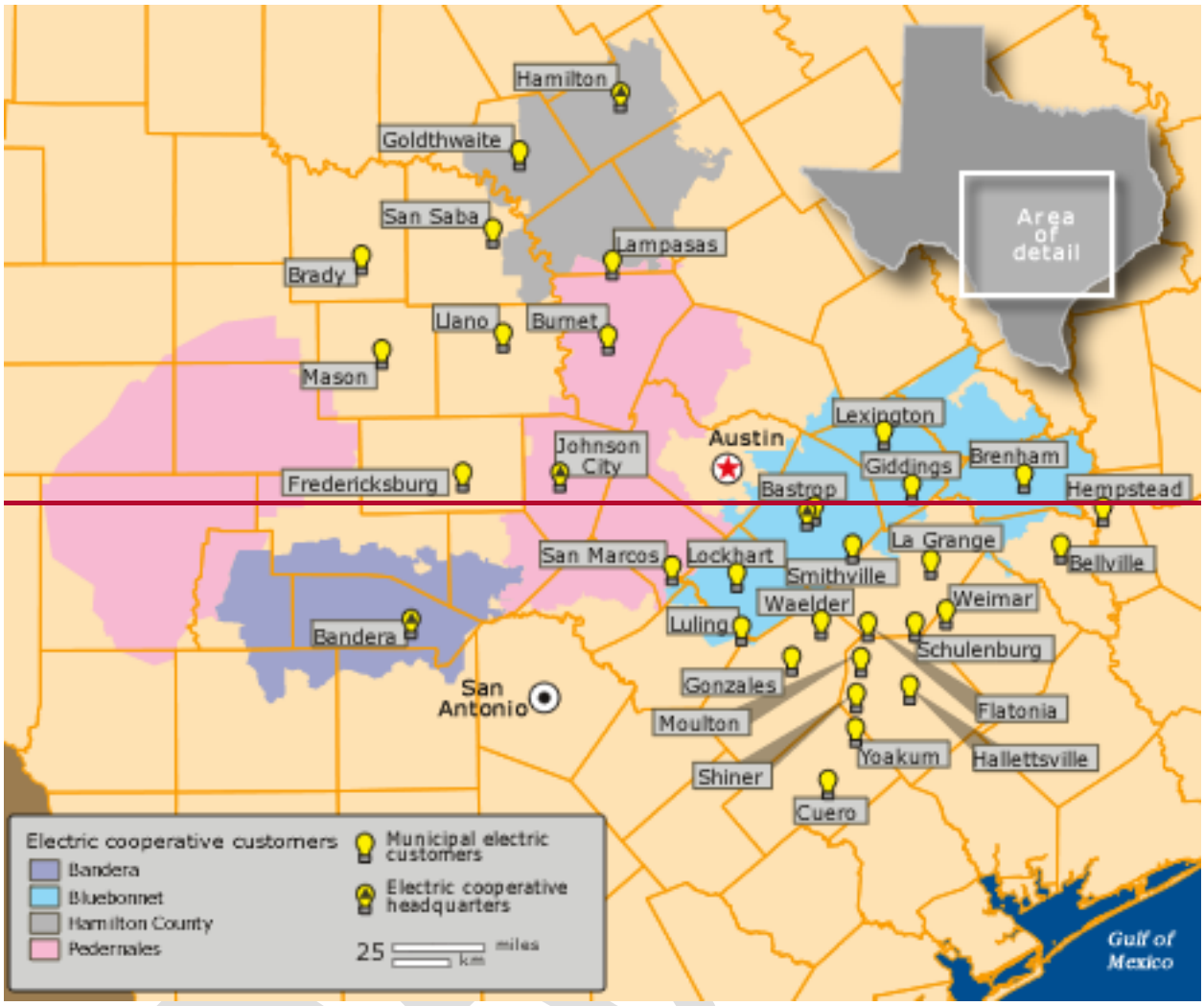
5.2 Baseline Profile

As of 2018, LCRA provides wholesale electric power to 33 utilities in a 53-county service area, as seen in Figure 5-1.

LCRA operates one gas-fired steam powered generating facility, one coal-fired steam powered generating facility, two combined cycle combustion turbine facilities, and a combustion turbine peaking facility. FPP has three units, two of which are owned jointly with Austin Energy. The power plants LCRA currently operates have a total dependable gross capacity of 3,854 MW, as summarized in Table 5-1.

A small portion of LCRA's electric generation is from renewable sources - hydroelectric and wind power. LCRA operates six dams along the Colorado River: Buchanan (forming Lake Buchanan); Inks (forming Inks Lake); Wirtz (forming Lake LBJ); Starcke (forming Lake Marble Falls); Mansfield (forming Lake Travis) and Tom Miller (forming Lake Austin). Together, the hydroelectric plants at the dams provide approximately 295 MW of capacity. Typically, hydroelectric generation only occurs during a water release intended for another purpose.

Figure 5-1 LCRA Electric Power Service Area



~~In 1995, LCRA invested in the first wind power project in Texas — the Texas Wind Power Project in Culberson County. However, because the project is located outside the Colorado River basin and the Region K planning area, it is not included in this plan.~~

~~LCRA owns 109 MW of the Sandy Creek Power Plant in McClennan County, along with LP Power and Brazos Electric Co-op. The Waco Metropolitan Area Regional Sewerage System (WMARSS) supplies 100 percent of the plant's water from reclaimed water sources. Since the Sandy Creek Power Plant is not located in the Colorado River basin or the Region K planning area, it is not included in this plan.~~

~~Table 5-1 Summary of the generating capacity operated by LCRA in the lower Colorado River basin (Region K)~~

~~Power Plant~~	~~Location~~	~~Type of Plant~~	~~Mega watts~~	~~Year Begun~~
~~Lost Pines 1~~	~~Bastrop~~	~~Gas fired combined cycle~~	~~518~~	~~2001~~

Sim Gideon	Bastrop	Gas fired steam	626	1965
Fayette Power Project	Fayette County	Coal fired steam	1,708[1]	1979
Hydroelectric Power	Various Locations	Hydroelectric turbine	295	1930s
Winchester Power Park	Winchester Texas	Gas fired combustion turbine	180	2010
Ferguson Power Plant	Horseshoe Bay	gas fired combined cycle	527	2014

[1] Austin Energy co-owns two FPP units. Austin Energy owns 624 MW and LCRA owns 1,084 MW.

5.2.1 Water Use

Once a power plant is built and put into operation, the opportunities to reduce its water use per kilowatt hour (kWh) are somewhat limited. However, beginning with Lost Pines 1 in 2001, and continuing with Winchester and the Ferguson Power Plant, all of LCRA's additional generation capacity has been designed to help conserve water and energy.

Table 5-2 Water Usage Summary and Comparison

Power Plant	Average Annual Water Usage 2015- 2017, (acre-feet per year)	Water Usage, (gallons per MWh)	Average Annual Savings Over Simple Cycle Steam Plant, (acre-feet per year)	Year Begun
Sim Gideon	473	439	N/A	1965
Fayette Power Project	13,262	400	N/A	1979
Lost Pines 1	1,034	135	2,103	2001
Winchester Power Park	1	7	55	2010
Ferguson Power Plant,	1,820	159	2,759	2014
Total	**16,590**	**N/A**	**4,917**	

Table 5-3 Water Reuse

Power Plant	Direct Reuse, acre-feet per year	Indirect Reuse, acre-feet per year
FPP	696	396
Lost Pines Power Park		89
Ferguson Power Plant		58
Total	**696**	**543**

5.2.2 Natural Evaporation

Natural evaporation occurs on any water surface. LCRA does not report natural evaporation as used or consumed water because it would occur whether the power plants existed or not. However, LCRA monitors evaporation and precipitation at the FPP weather station and also obtains data from the TWDB website: http://www.twdb.state.tx.us/surfacewater/conditions/evaporation/index.asp.

In Central Texas, the average annual gross evaporation from pond surfaces typically exceeds the average annual amount of precipitation that falls on pond surfaces. Lake Bastrop levels are maintained at approximately 449.3 feet above mean sea level (feet msl) elevation from October through March each year and is raised to 450 feet msl in the summer; thus, the surface area varies between 880 acres in the winter and 906 acres in the summer. By reducing the surface area in the winter, natural evaporation is reduced by a very small amount, but more storage capacity is made available to capture runoff, if it occurs. Based on precipitation and natural evaporation data available from TWDB for 2015 - 2017, the annual net evaporation for Lake Bastrop (natural evaporation minus precipitation) averaged 592 acre-feet per year.

The normal operating levels for Cedar Creek Reservoir are 388 to 391 feet msl. The resulting surface area of the reservoir is between 2,316 and 2,450 acres. The 2015 – 2017 average annual net evaporation for Cedar Creek Reservoir, based on the TWDB database, averaged 106 acre-feet per year..

Based on precipitation and natural evaporation data available from TWDB for 2015- 2017, the annual net evaporation for Lake LBJ (natural evaporation minus precipitation) averaged 7,411 acre-feet per year.

5.3 Water Conservation Savings and Goals

Currently, estimated water savings as a result of Lost Pines 1 and Winchester Power Park generation, compared to equal generation from LCRA simple cycle steam generating units, equals to 4,917 acre-feet per year. This is an LCRA system-wide consumed water savings of 23 percent, Table 5-2 summarizes this water usage. Table 5-3 summarizes water reuse at LCRA power plants. The direct reuse total of 696 acre-feet per year and the conservation total of 3 acre-feet per year (see Appendix C Section 3) are incorporated into LCRA's water conservation goals listed in Section 2.3.

Energy and water efficiency programs save water at the point of use and reduce the energy needed to pump, treat, and distribute water and wastewater. This reduction in energy use can equal an estimated 2 to 4 kilowatt-hour per 1,000 end-use gallons of water saved.

LCRA looks for opportunities to save and reuse water at its power plants. LCRA also will continue to track water use per MW of generation at each of its power plants to help ensure efficient use of water. Further detail on the specific conservation strategies and associated water savings amounts are provided for each of LCRA's power plants in Appendices B-D.

~~5.4 System-wide Conservation Strategies~~

~~5.4.1 LCRA POWERHOUSE Education Program~~

~~LCRA's POWERHOUSE energy investigation program teaches middle school students and their families about the effects of energy use on natural resources and the environment. Utilities sponsor the program for schools within their service areas. POWERHOUSE also helps users estimate water usage and costs. In the last five years, POWERHOUSE has served more than 29,000 school children. Online energy conservation audits are also available at www.lcra.org~~

~~5.4.2 Metering and Leak Detection~~

~~All water diverted from the Colorado River is measureds using meters, pump curves and other methods approved by TCEQ for water diversions. The water measurement devices, per LCRA rules, are maintained within an accuracy of plus or minus 5 percent. The Cedar Creek dam at FPP is equipped with monitoring equipment. Leaks that may occur within the structure of the power plant are easily visible. Major flows of water such as the cooling water pumps are monitored at all plants.~~

~~5.5 Conservation Plans for LCRA Power Plants~~

~~Water conservation plans for each LCRA power plant are found in Appendices B-D.~~

5.0 WHOLESALE POWER GENERATION

5.1 Introduction

Most of the water use characteristics of a power plant are fixed once the facility has been built. Modifications to make it more thermodynamically efficient can result in small reductions in water use, similar to the way new pollution abatement practices are designed. These small changes on a plant-by-plant basis are important to the water conservation potential for LCRA's electric generation system because energy conservation efforts can directly impact water use.

This chapter will provide information on LCRA power plants -- —Fayette Power Project (FPP); Lost Pines Power Park, including Sim Gideon and Lost Pines 1 power plants; Winchester Power Plant; and the Thomas C. Ferguson Power Plant -- and how a new generation mix and conservation efforts impact water use.

Unless otherwise noted, all generating capacity and energy values in this Industrial Water Conservation section refer to gross generation in units of megawatt hours (MWh) or kilowatt hours (kWh). "Gross" power values represent the total production from a generator. "Net" power values represent the remaining power after plant power usage has been subtracted. Gross power better reflects the water used for power production.
In addition, the capacity values in this section represent the output levels that the generating units can dependably produce in the summer (Gross Dependable Capacities).

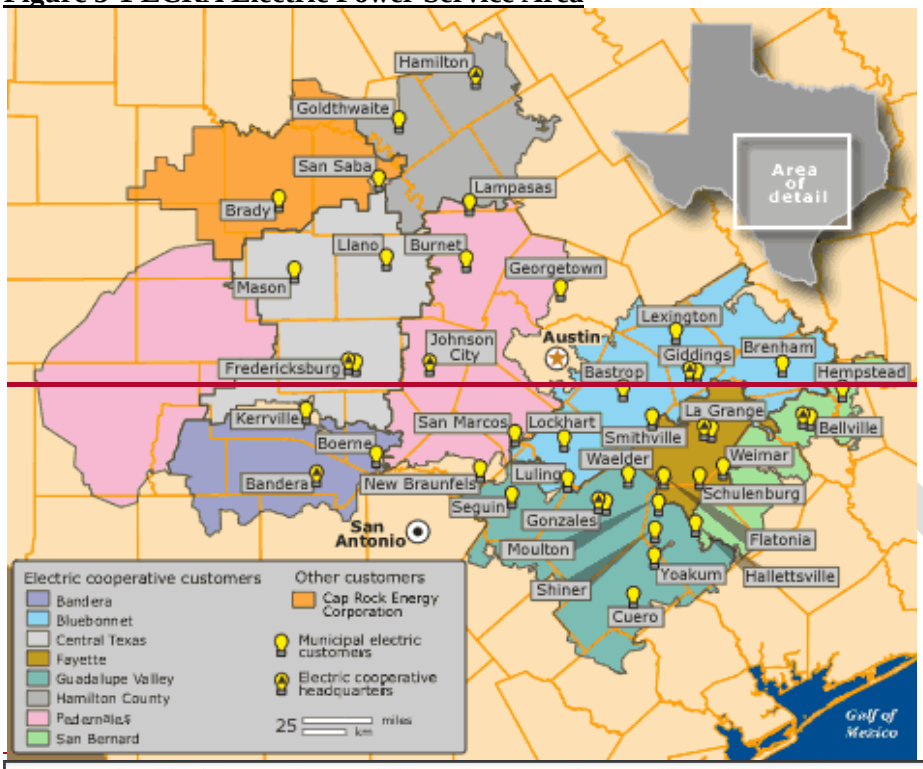
5.2 Baseline Profile

As of 2023~~18~~, LCRA provides wholesale electric power to ~~XX~~ over 30 city utilities in a 53-county service area, as seen in Figure 5-1.

LCRA operates one gas-fired steam powered generating facility, one coal-fired steam powered generating facility, two combined cycle combustion turbine facilities, and a combustion turbine peaking facility.~~-~~ FPP has three units, two of which are owned jointly with Austin Energy. The power plants that LCRA currently operates have a total dependable gross capacity of 3,854 MW, as summarized in Table 5-1.

A small portion of LCRA's electric generation is from renewable sources ~~-~~– hydroelectric, solar and wind power. LCRA operates six dams along the Colorado River: Buchanan (forming Lake Buchanan); Inks (forming Inks Lake); Wirtz (forming Lake LBJ); Starcke (forming Lake Marble Falls); Mansfield (forming Lake Travis) and Tom Miller (forming Lake Austin). Two of the lakes created by the dams, Buchanan and Travis, are water supply ~~multipurpose~~ reservoirs ~~that provide flood control, water supply, recreation and hydroelectric power production~~. ~~Lake LBJ is a cooling water reservoir and also provides recreation and hydroelectric power production. The other lakes provide hydroelectric power generation and recreation.~~ Together, the hydroelectric plants at each of the dams have ~~provide~~ more than 295 MW of capacity, but do not consume water for generating operations. Typically, hydroelectric generation only occurs during a water release intended for another purpose.

Figure 5-1 LCRA Electric Power Service Area



~~In 1995, LCRA invested in the first wind power project in Texas — the Texas Wind Power Project in Culberson County. However, because they are located outside the Colorado River basin and the Region K Planning Area, wind power will not be included further in this plan.~~

~~LCRA owns 109 MW of the Sandy Creek Power Plant in McClennan County, along with LP Power and Brazos Electric Co-op. The Waco Metropolitan Area Regional Sewerage System (WMARSS) supplies 100 percent of the plant's water from reclaimed water sources. Since the Sandy Creek Power Plant is not located in the Colorado River basin or the Region K Planning Area, it is not included further in this plan.~~

~~In 2019, LCRA purchased 10 MW of solar capacity from the Mars Solar Project in south Texas. LCRA increased its solar capacity by purchasing an additional 141 MWw from the Juno Solar Project in 2021. Since both facilities are based outside the Colorado River basin, these facilities are not included further in this plan.~~

~~In 2023, LCRA announced a future plans to build a 190 MW peaker facility in Caldwell County. This facility would utilize se reciprocating internal combustion engines and not draw water for process or cooling purposes. Because the facility has not been built, it also is also not included in this plan.~~

Table 5-1 Summary of the Generating Capacity operated by LCRA in the Lower Colorado River Basin (Region K)

Power Plant	Location	Type of Plant	Mega-watts	Year Begun
Lost Pines 1	Bastrop	Gas Fired Combined Cycle	518	2001
Sim Gideon	Bastrop	Gas Fired Steam	626	1965
Fayette Power Project	Fayette County	Coal Fired Steam	1,708[1]	1979
Hydroelectric Power	Various Locations	Hydroelectric Turbine	295	1930's
Winchester Power Park	Winchester Texas	Gas Fired Combustion Turbine	180	2010
Ferguson Power	Horseshoe Bay	Gas Fired Combined Cycle	527	2014

[1] Austin Energy co-owns two FPP units. Austin Energy owns 624 MW and LCRA owns 1,084 MW.

5.2.1 Water Use

Once a power plant is built and put into operation, the opportunities to reduce its water use per kilowatt hour (kWh) are somewhat limited. With the commissioning of ~~However, beginning with~~ Lost Pines 1 in 2001 and continuing with Winchester and ~~the~~ Ferguson Power

Plant, ~~all of~~all LCRA's additional generation capacity has been designed to help conserve water and energy.

Table 5-2 Water Usage Summary and Comparison

Power Plant	Average Annual Water Usage ~~2015~~ 2020 – ~~2017~~2022, acre-feet per year	Water Usage, gallons per MWh	Average Annual Savings over ~~simple cycle~~conventional steam plant (FPP), acre-feet per year	Year Begun
Sim Gideon	~~464~~ 3,976	~~431~~1,685	N/A	1965
Fayette Power Project	1~~3,260~~,382	~~400~~ 330	N/A	1979
Lost Pines 1	~~970~~ 1,178	~~126~~ 135	~~2,103~~1,654	2001
Winchester Power Park	~~1~~3	~~7~~5	~~55~~ 50	2010
Ferguson Power Plant	1,~~820~~220	~~159~~116	~~2,759~~2,241	2014
Current Total	1~~6~~6,~~517~~754	N/A	~~4~~3,896~~917~~	

Table 5-3 Water Reuse

	Direct Reuse, acre-feet per year	Indirect Reuse, acre-feet per year
FPP	~~696~~ 520	~~396~~ 554
Lost Pines Power Park		~~44~~ 155
Ferguson Power Plant		~~58~~49
Total	~~696~~520	7~~49~~8

5.2.2 Natural Evaporation

Natural evaporation occurs on any water surface. LCRA does not report natural evaporation as used or consumed water because it would occur whether the power plants existed or not. However, LCRA monitors evaporation and precipitation at the FPP weather station and also obtains data from the TWDB website: https://waterdatafortexas.org/lake-evaporation-rainfall.~~http://www.twdb.state.tx.us/surfacewater/conditions/evaporation/index.asp.~~

In Central Texas, the average annual gross evaporation from pond surfaces typically exceeds the average annual amount of precipitation that falls on pond surfaces. The level of Lake Bastrop ~~levels are~~is generally maintained at approximately 449.3 feet above mean sea level (feet msl) ~~elevation~~ from October through March each year and ~~are~~ is raised to 450 feet msl in the summer; thus, the surface area varies between 880 acres in the winter and 906 acres in the summer. By reducing the surface area in the winter, natural evaporation is reduced by a very small amount, but more storage capacity is made available to capture

runoff, if it occurs. Based on precipitation and natural evaporation data available from TWDB for ~~2015~~2020 -~~-~~20~~17~~22, the annual net evaporation for Lake Bastrop (natural evaporation minus precipitation) averaged ~~592~~ 891 acre-feet per year.

The normal operating levels for ~~Cedar Creek Reservoir~~ Fayette County Reservoir are 388 feet to 391 feet above mean sea level. The resulting surface area of the reservoir is between 2,316 and 2,450 acres. The ~~2015~~ 2020 – 20~~17~~22 average annual net evaporation for ~~Cedar Creek Reservoir~~Fayette County Reservoir (natural evaporation minus precipitation), based on the TWDB database, averaged 1,999~~06~~ acre-feet per year.

Based on precipitation and natural evaporation data available from TWDB for ~~2015~~2020-~~2017~~2022, the annual net evaporation for Lake LBJ (natural evaporation minus precipitation) averaged ~~7411~~ 12,863 acre-feet per year.

5.3 Water Conservation Savings and Goals

Currently, estimated water savings as a result of the combustion turbines at Lost Pines 1, Ferguson and Winchester generation~~, compared to equal generation from LCRA simple cycle steam generating units, equates~~ is ~~to~~ 4,917 acre-feet per year. This equates to an LCRA system-wide consumed water savings of 23% ~~percent~~., Table 5-2 summarizes this water usage. Table 5-3 summarizes water reuse at LCRA power plants. The direct reuse total of 696 acre-feet per year and the conservation total of 3 acre-feet per year (see Appendix C Section 3) are incorporated into LCRA's water conservation goals listed in Section 2.3.

Energy and water efficiency programs save water at the point of use and reduce the energy needed to pump, treat, and distribute water and wastewater. This reduction in energy use can equal an estimated two to four kilowatt-hour per 1,000 end-use gallons of water saved.

LCRA looks for opportunities to save and reuse water at its power plants. LCRA will also continue to track water use per MW of generation at each of its power plants to help ensure efficient use of water. Further detail on the specific conservation strategies and associated water savings amounts are provided for each of LCRA's power plants in Appendices B-D.

5.4 System-wide Conservation Strategies

5.4.1 LCRA POWERHOUSE Education Program

LCRA's POWERHOUSE energy investigation program teaches middle school students and their families about the effects of energy use on natural resources and the environment. Utilities sponsor the program for schools within their service areas. POWERHOUSE also helps users estimate water usage and costs. ~~In the last five years, POWERHOUSE has served more than 29,000 school children. Online energy conservation audits are also available at http://www.lcra.org~~

5.4.2 Metering and Leak Detection

All water diverted from the Colorado River is metered through the use of pump curves and other methods approved by TCEQ for water diversions. The plant master meters, per LCRA rules, are maintained within an accuracy of plus or minus 5% ~~percent~~ in order to measure and account for the amount of water diverted from the source of supply. The Cedar Creek dam is equipped with monitoring equipment. ~~-~~Leaks that occur within the structure of the power plant are easily visible. Major flows of water such as the cooling water pumps are monitored at all plants.

5.5 Conservation Plans for LCRA Power Plants

Water conservation plans for each LCRA power plant are found in Appendices B-D.

APPENDIX A

~~(Following three tables will be updated by the ROC in mid-March.~~

Municipal Firm Water Customer Contracted Use – 2019-2023~~2014-2018~~

Customer Name	2019	2020	2021	2022	2023
AQUA TEXAS D/B/A PECAN UTILITIES	0.0	0.0	26.0	41.3	34.8
AQUA TEXAS, INC. - BARTON CREEK LAKESIDE WATER SYSTEM	0.0	0.0	38.3	50.9	160.3
AQUA UTILITIES, INC D/B/A AQUA TEXAS (RIVERCREST)	374.8	409.5	378.9	500.3	479.0
AUSTIN YMBL SUNSHINE CAMPS	0.3	0.3	0.1	0.3	0.6
BRAZOS RIVER AUTHORITY	322.1	863.7	841.7	3,231.2	4,744.7
BRYANT, KATHIE	22.9	27.6	18.4	15.7	25.1
CAMP LONGHORN, LTD	70.7	63.2	50.9	86.6	75.3
CITY OF AUSTIN HANDCOX WTP	28,520.5	28,575.2	32,053.0	29,011.4	25,813.6
CITY OF BURNET	416.3	466.2	439.1	500.8	653.9
CITY OF CEDAR PARK	15,552.1	16,617.0	14,841.8	16,194.3	16,425.0
CITY OF COTTONWOOD SHORES	152.2	144.5	129.8	167.7	170.9
CITY OF DRIPPING SPRINGS	103.9	148.8	192.8	342.4	352.6
CITY OF GRANITE SHOALS	438.7	457.2	400.2	445.1	434.3
CITY OF HORSESHOE BAY	2,065.2	2,170.1	1,828.0	2,530.0	2,295.9
CITY OF LAGO VISTA	1,411.1	1,499.0	1,316.4	1,710.3	1,594.1
CITY OF LEANDER	8,653.7	10,615.6	9,450.7	12,039.9	12,335.4
CITY OF MARBLE FALLS	1,442.1	1,560.9	1,364.9	1,815.2	1,793.6
CITY OF PFLUGERVILLE	6,022.7	8,345.5	6,859.1	8,971.9	7,334.6
CORIX UTILITIES TEXAS INC.	245.7	277.5	242.1	284.5	324.7
DRIPPING SPRINGS WSC	701.4	740.7	927.4	1,049.7	1,011.8
EANES ISD	15.3	12.1	14.4	21.4	21.9
HAYS COUNTY WCID #1	424.8	511.3	437.5	560.9	725.7
HAYS COUNTY WCID #2	408.7	517.5	481.7	554.2	409.6

HIDDEN VALLEY SUBDIVISION COOPERATIVE	0.8	0.6	0.2	0.6	0.5
HURST CREEK MUD	1,071.4	1,055.6	852.3	1,236.9	1,051.5
JONESTOWN WSC	712.1	885.5	739.1	945.3	960.1
KINGSLAND WSC	817.1	930.2	837.7	1,057.9	1,001.3
LAKEWAY MUD #1	2,187.5	2,579.5	2,189.2	2,710.4	2,382.1
LAZY NINE MUD #1A	470.8	565.9	484.4	543.4	728.8
LEN D. JORDAN D/B/A SAIL HAVEN WATER SYSTEM	6.9	8.0	7.1	8.8	7.5
LLANO COUNTY MUD #1	66.3	84.3	79.1	80.0	77.8
LOOP 360 WSC	747.5	893.6	731.5	926.6	1,021.0
MONARCH UTILITIES I, LP	81.0	104.1	89.9	132.3	131.4
PECAN UTILITIES CO INC	32.9	39.5	4.8	0.0	0.0
PENINSULA BLUFFS, LP	20.3	26.3	12.8	13.2	11.4
RESORT RANCH OF LAKE TRAVIS, INC.	2.8	3.0	1.2	0.5	0.9
REUNION RANCH WCID	271.3	321.4	307.0	359.8	319.2
SENNA HILLS MUD #1	207.4	236.9	264.8	260.0	225.6
SJWTX D/B/A CANYON LAKE WATER SERVICE CO	177.7	213.2	190.4	236.8	203.9
TRAVIS COUNTY ID #1	0.0	0.0	0.0	0.0	0.2
TRAVIS COUNTY MUD #04	2,072.2	2,133.5	1,907.3	2,770.2	2,419.5
TRAVIS COUNTY MUD #10	84.1	92.6	78.2	119.5	85.0
TRAVIS COUNTY MUD #12	609.4	888.5	816.5	1,126.5	1,219.7
TRAVIS COUNTY MUD #18	188.7	204.2	173.4	227.9	338.3
TRAVIS COUNTY WCID #17	7,236.2	8,099.6	7,263.4	9,330.1	8,851.5
TRAVIS COUNTY WCID #18	729.4	871.2	719.9	985.8	917.4
TRAVIS COUNTY WCID #20	477.5	466.2	392.2	530.8	554.4
TRAVIS COUNTY WCID POINT VENTURE	229.9	257.5	206.9	228.2	241.8
UNDINE DEVELOPMENT LLC	104.8	93.7	80.4	111.8	98.5
VILLAGE OF BRIARCLIFF	271.7	306.1	266.5	336.2	328.9
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	5,589.0	6,371.6	6,745.0	8,094.6	6,392.5
WINDERMERE OAKS WSC	55.2	68.2	44.5	50.7	48.3
Grand Total	**91,887**	**101,824**	**97,819**	**112,551**	**106,836**
Customer Name	**2014**	**2015**	**2016**	**2017**	**2018**

AQUA UTILITIES, INC D/B/A AQUA TEXAS (RIVERCREST)~~Customer Name~~	337.6~~2014~~	400.5~~2015~~	356.0~~2016~~	410.8~~2017~~	365.5~~2018~~
AUSTIN YMBL SUNSHINE CAMPS~~AQUA UTILITIES, INC D/B/A AQUA TEXAS (RIVERCREST)~~	0.4~~337.6~~	0.3~~400.5~~	0.4~~356.0~~	0.3~~410.8~~	0.2~~365.5~~
AUSTIN, CITY OF~~AUSTIN YMBL SUNSHINE CAMPS~~	47,387.7~~0.4~~	~~0.3~~	~~0.4~~	~~0.3~~	~~0.2~~
AUSTIN, CITY OF - DAVIS AND ULRICH ~~AUSTIN, CITY OF~~	~~47,387.7~~	17,792.7~~-~~	794.9~~-~~	12,413.5~~-~~	26,242.8~~-~~
AUSTIN, CITY OF - PARKS~~AUSTIN, CITY OF - DAVIS AND ULRICH~~	163.6~~-~~	82.1~~17,792.7~~	366.3~~794.9~~	456.0~~12,413.5~~	411.9~~26,242.8~~
AUSTIN, CITY OF - RIVERPLACE~~AUSTIN, CITY OF - PARKS~~	31.6~~163.6~~	154.0~~82.1~~	26.8~~366.3~~	53.4~~456.0~~	0.0~~411.9~~
AUSTIN, CITY OF - WTP#4~~AUSTIN, CITY OF - RIVERPLACE~~	~~31.6~~	22,926.3~~154.0~~	28,834.8~~26.8~~	31,109.8~~53.4~~	30,026.1~~0.0~~
BRAZOS RIVER AUTHORITY~~AUSTIN, CITY OF - WTP#4~~	0.0~~-~~	33.7~~22,926.3~~	34.8~~28,834.8~~	80.4~~31,109.8~~	258.13~~0,026.1~~
BRYANT, KATHIE~~BRAZOS RIVER AUTHORITY~~	20.5~~0.0~~	22.9~~33.7~~	22.2~~34.8~~	25.5~~80.4~~	25.2~~58.1~~
CAMP LONGHORN, LTD~~BRYANT, KATHIE~~	40.8~~20.5~~	53.3~~22.9~~	53.1~~22.2~~	63.5~~25.5~~	63.7~~25.2~~
CITY OF BURNET~~CAMP LONGHORN, LTD~~	396.2~~40.8~~	601.5~~53.3~~	317.8~~53.1~~	441.1~~63.5~~	457.4~~63.7~~
CITY OF CEDAR PARK~~CITY OF BURNET~~	12,600.0~~396.2~~	14,303.9~~601.5~~	14,240.7~~317.8~~	14,850.5~~441.1~~	15,167.4~~457.4~~
CITY OF COTTONWOOD SHORES~~CITY OF CEDAR PARK~~	156.7~~12,600.0~~	177.4~~14,303.9~~	153.5~~14,240.7~~	178.4~~14,850.5~~	153.3~~5,167.4~~
CITY OF DRIPPING SPRINGS~~CITY OF COTTONWOOD SHORES~~	0.0~~156.7~~	0.0~~177.4~~	~~153.5~~	83.3~~178.4~~	70.6~~153.3~~
CITY OF GRANITE SHOALS~~CITY OF DRIPPING SPRINGS~~	454.3~~0.0~~	429.5~~0.0~~	390.0~~-~~	419.1~~83.3~~	434.5~~70.6~~
CITY OF HORSESHOE BAY~~CITY OF GRANITE SHOALS~~	1,722.2~~454.3~~	2,185.4~~429.5~~	1,933.2~~390.0~~	1,970.7~~419.1~~	1,935.9~~434.5~~
CITY OF LAGO VISTA~~CITY OF HORSESHOE BAY~~	1,646.5~~1,722.2~~	1,776.3~~2,185.4~~	1,260.2~~1,933.2~~	1,667.4~~1,970.7~~	1,411.9~~1,935.9~~
CITY OF LEANDER~~CITY OF LAGO VISTA~~	4,652.4~~1,646.5~~	6,025.9~~1,776.3~~	6,361.3~~1,260.2~~	6,761.8~~1,667.4~~	7,474.3~~1,411.9~~
CITY OF MARBLE FALLS~~CITY OF LEANDER~~	1,594.8~~4,652.4~~	1,518.9~~6,025.9~~	1,516.0~~6,361.3~~	1,601.3~~6,761.8~~	1,448.8~~7,474.3~~
CITY OF PFLUGERVILLE~~CITY OF MARBLE FALLS~~	2,264.0~~1,594.8~~	3,010.2~~1,518.9~~	4,628.3~~1,516.0~~	4,405.5~~1,601.3~~	5,312.5~~1,448.8~~

DEER CREEK RANCH WATER CO., LLC~~CITY OF PFLUGERVILLE~~	131.9~~2,264.0~~	150.0~~3,010.2~~	151.1~~4,628.3~~	181.5~~4,405.5~~	88.3~~5,312.5~~
DRIPPING SPRINGS WSC~~DEER CREEK RANCH WATER CO., LLC~~	428.5~~131.9~~	573.4~~150.0~~	642.2~~151.1~~	686.1~~181.5~~	620.8~~88.3~~
EANES ISD~~DRIPPING SPRINGS WSC~~	15.5~~428.5~~	21.2~~573.4~~	16.5~~642.2~~	16.8~~686.1~~	16.3~~620.8~~
HAYS COUNTY WCID #1~~EANES ISD~~	380.5~~15.5~~	427.8~~21.2~~	517.4~~16.5~~	526.1~~16.8~~	510.4~~6.3~~
HAYS COUNTY WCID #2~~HAYS COUNTY WCID #1~~	220.6~~380.5~~	283.3~~427.8~~	233.5~~517.4~~	285.4~~526.1~~	344.9~~10.4~~
HIDDEN VALLEY SUBDIVISION COOPERATIVE~~HAYS COUNTY WCID #2~~	0.4~~220.6~~	0.0~~283.3~~	0.0~~233.5~~	0.3~~285.4~~	0.5~~344.9~~
HURST CREEK MUD~~HIDDEN VALLEY SUBDIVISION COOPERATIVE~~	896.6~~0.4~~	1,076.2~~0.0~~	993.9~~0.0~~	1,154.3~~0.3~~	1,003.2~~0.5~~
INVERNESS UTILITY COMPANY, INC.~~HURST CREEK MUD~~	44.9~~896.6~~	47.4~~1,076.2~~	56.7~~993.9~~	73.7~~1,154.3~~	64.5~~1,003.2~~
JONESTOWN WSC~~INVERNESS UTILITY COMPANY, INC.~~	538.6~~44.9~~	613.9~~47.4~~	615.4~~56.7~~	633.6~~73.7~~	652.9~~64.5~~
KINGSLAND WSC~~JONESTOWN WSC~~	735.0~~538.6~~	805.0~~613.9~~	779.1~~615.4~~	843.9~~633.6~~	862.5~~652.9~~
LAKE AUSTIN DOMESTIC WATER USE~~KINGSLAND WSC~~	945.6~~735.0~~	672.7~~805.0~~	~~779.1~~	~~843.9~~	~~862.5~~
LAKE BUCHANAN DOMESTIC WATER USE~~LAKE AUSTIN DOMESTIC WATER USE~~	1,610.4~~945.6~~	2,339.7~~672.7~~	2,522.2-	2,478.3-	1,563.8-
LAKE TRAVIS DOMESTIC WATER USE~~LAKE BUCHANAN DOMESTIC WATER USE~~	2,025.6~~1,610.4~~	639.7~~2,339.7~~	1,376.6~~2,522.2~~	1,450.1~~2,478.3~~	2,666.6~~1,563.8~~
LAKEWAY MUD #1~~LAKE TRAVIS DOMESTIC WATER USE~~	2,033.4~~2,025.6~~	2,350.3~~639.7~~	2,210.1~~1,376.6~~	2,302.9~~1,450.1~~	2,287.7~~2,666.6~~
LAMPASAS COUNTY REGIONAL WATER AND WASTEWATER SYST~~LAKEWAY MUD #1~~	833.7~~2,033.4~~	682.4~~2,350.3~~	879.7~~2,210.1~~	758.3~~2,302.9~~	534.0~~2,287.7~~
LAZY NINE MUD #1A~~LAMPASAS COUNTY REGIONAL WATER AND WASTEWATER SYST~~	172.7~~833.7~~	200.8~~682.4~~	238.5~~879.7~~	304.9~~758.3~~	372.0~~534.0~~
LEN D. JORDAN D/B/A SAIL HAVEN WATER SYSTEM~~LAZY NINE MUD #1A~~	8.0~~172.7~~	7.6~~200.8~~	6.7~~238.5~~	6.9~~304.9~~	7.2~~372.0~~
LLANO COUNTY MUD #1~~LEN D. JORDAN D/B/A SAIL HAVEN WATER SYSTEM~~	47.6~~8.0~~	55.5~~7.6~~	58.7~~6.7~~	63.7~~6.9~~	64.3~~7.2~~
LOOP 360 WSC~~LLANO COUNTY MUD #1~~	997.2~~47.6~~	897.1~~55.5~~	805.3~~58.7~~	820.0~~63.7~~	710.5~~64.3~~
PARADISE POINT~~LOOP 360 WSC~~	8.2~~997.2~~	~~897.1~~	~~805.3~~	~~820.0~~	~~710.5~~

PECAN UTILITIES CO., INC.~~PARADISE POINT~~	26.4~~8.2~~	32.0-	27.3-	29.2-	32.3-
PENINSULA BLUFFS, LP~~PECAN UTILITIES CO., INC.~~	21.0~~26.4~~	13.8~~32.0~~	16.0~~27.3~~	13.5~~29.2~~	12.4~~32.3~~
PK/RE DEVELOPMENT CO. INC.~~PENINSULA BLUFFS, LP~~	113.6~~21.0~~	123.8~~13.8~~	104.7~~16.0~~	119.1~~13.5~~	103.6~~1 2.4~~
RESORT RANCH OF LAKE TRAVIS, INC.~~PK/RE DEVELOPMENT CO. INC.~~	3.0~~113.6~~	4.2~~123.8~~	2.5~~104.7~~	2.7~~119.1~~	4.4~~103.6~~
REUNION RANCH WCID~~RESORT RANCH OF LAKE TRAVIS, INC.~~	74.2~~3.0~~	88.9~~4.2~~	140.6~~2.5~~	191.2~~2.7~~	208.5~~4.4~~
RIDGE HARBOR~~REUNION RANCH WCID~~	46.9~~74.2~~	~~88.9~~	~~140.6~~	~~191.2~~	~~208.5~~
RIVERPLACE MUD~~RIDGE HARBOR~~	588.6~~46.9~~	-	-	-	-
SANDY HARBOR DEVELOPMENT CO.~~RIVERPLACE MUD~~	6.7~~588.6~~	-	-	-	-
SENNA HILLS MUD #1~~SANDY HARBOR DEVELOPMENT CO.~~	256.2~~6.7~~	257.9-	240.1-	224.9-	207.7-
SJWTX D/B/A CANYON LAKE WATER SERVICE~~SENNA HILLS MUD #1~~	~~256.2~~	~~257.9~~	~~240.1~~	~~224.9~~	98.9~~20 7.7~~
SMITHWICK MILLS~~SJWTX D/B/A CANYON LAKE WATER SERVICE~~	11.6-	-	-	-	~~98.9~~
TRAVIS COUNTY MUD #04~~SMITHWICK MILLS~~	1,611.7~~11.6~~	1,815.6-	1,917.4-	2,058.5-	2,140.8-
TRAVIS COUNTY MUD #10~~TRAVIS COUNTY MUD #04~~	60.2~~1,611.7~~	64.0~~1,815.6~~	61.9~~1,917.4~~	74.0~~2,058.5~~	74.2~~2,140.8~~
TRAVIS COUNTY MUD #12~~TRAVIS COUNTY MUD #10~~	400.2~~60.2~~	376.6~~64.0~~	453.3~~61.9~~	618.7~~74.0~~	603.1~~74.2~~
TRAVIS COUNTY MUD #18~~TRAVIS COUNTY MUD #12~~	10.1~~400.2~~	57.4~~376.6~~	113.6~~453.3~~	166.0~~618.7~~	161.1~~603.1~~
TRAVIS COUNTY WCID #17~~TRAVIS COUNTY MUD #18~~	6,125.1~~10.1~~	6,481.5~~57.4~~	7,007.0~~113.6~~	7,581.8~~166.0~~	7,402.1~~161.1~~
TRAVIS COUNTY WCID #18~~TRAVIS COUNTY WCID #17~~	788.1~~6,125.1~~	883.7~~6,481.5~~	811.2~~7,007.0~~	778.0~~7,581.8~~	761.5~~7,402.1~~
TRAVIS COUNTY WCID #20~~TRAVIS COUNTY WCID #18~~	428.7~~788.1~~	424.8~~883.7~~	419.5~~811.2~~	439.4~~778.0~~	413.5~~761.5~~
TRAVIS COUNTY WCID POINT VENTURE~~TRAVIS COUNTY WCID #20~~	204.5~~428.7~~	225.4~~424.8~~	199.3~~419.5~~	196.4~~439.4~~	235.9~~413.5~~
UNDINE DEVELOPMENT LLC~~TRAVIS COUNTY WCID POINT VENTURE~~	~~204.5~~	~~225.4~~	~~199.3~~	~~196.4~~	8.1~~235.9~~
UPPER HIGHLAND LAKES RWS~~UNDINE DEVELOPMENT LLC~~	91.6-	-	-	-	~~8.1~~

VILLAGE OF BRIARCLIFF~~UPPER HIGHLAND LAKES RWS~~	189.5~~91.6~~	211.8-	219.3-	243.0-	272.9-
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY~~VILLAGE OF BRIARCLIFF~~	4,885.2~~189.5~~	5,473.0~~211.8~~	5,463.4~~219.3~~	5,660.4~~243.0~~	5,335.7 ~~272.9~~
WINDERMERE OAKS WSC~~WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY~~	38.6~~4,885.2~~	41.2~~5,473.0~~	43.9~~5,463.4~~	58.8~~5,660.4~~	57.7~~5,335.7~~
Grand Total~~WINDERMERE OAKS WSC~~	**101,525.8**~~38.6~~	**99,914.3**~~41.2~~	**90,634.9**~~43.9~~	**108,034.7**~~58.8~~	**121,764.7**~~57.7~~
~~**Grand Total**~~	~~**101,525.8**~~	~~**99,914.3**~~	~~**90,634.9**~~	~~**108,034.7**~~	~~**121,764.7**~~

Irrigation Firm Water Customer Contracted Use – 2019-2023

~~Irrigation Firm Water Customer Contracted Use – 2014-2018~~

Customer Name	2019~~14~~	2020~~15~~	2021~~16~~	2022~~17~~	2023~~18~~
6D RANCH, LTD	22.0	25.3	15.6	57.3	40.5
APPLIED MATERIALS, INC.	64.0	64.0	64.0	64.0	64.0
AUSTIN COUNTRY CLUB	195.4	218.3	175.9	272.7	266.4
AUSTIN GOLF CLUB, INC.	189.5	198.9	122.6	254.7	232.3
BAE SYSTEMS INTEGRATED DEFENSE SOLUTIONS	3.6	3.6	3.6	3.6	3.6
BARTON CREEK LAKESIDE IRRIGATION CO, INC	119.4	173.8	151.2	181.9	168.8
BARTON CREEK RESORT LLC	238.4	301.7	261.6	356.3	220.2
BLUE LAKE GOLF CLUB, INC.	40.6	11.1	0.0	1.8	0.0
BLUEBONNET HILLS GOLF COURSE, LTD	111.0	0.0	0.0	0.0	0.0
BOOT RANCH HOLDINGS LLC	79.6	50.3	36.3	22.2	35.0
BULL CREEK MANAGEMENT LLC	48.1	45.6	46.4	46.6	66.4
CF RIVER PLACE ARCIS LLC	44.4	103.3	81.0	220.0	131.7
CF TWIN CREEKS ARCIS LLC	187.2	273.1	163.7	161.4	230.9
CITY OF AUSTIN (WALLER CREEK)	141.9	52.7	200.6	163.3	226.9
CITY OF AUSTIN D/B/A GREY ROCK GOLF CLUB	45.9	54.0	54.0	54.0	54.0
CLUBCORP GOLF OF TEXAS LP	143.2	68.6	66.9	95.4	139.0

COLOVISTA COUNTRY CLUB POA	0.0	0.0	0.0	0.0	0.0
ESCONDIDO CLUB, INC.	298.3	312.9	264.4	432.2	381.9
GIACOMO PROPERTIES LLC D/B/A LEGENDS ON LBJ	0.0	0.0	42.6	250.3	269.5
GRAY WOLF GOLF, LLC	0.0	0.0	0.0	23.9	4.5
GREAT HILLS GOLF CLUB OF AUSTIN INC D/B/A GREAT HILLS CC	114.7	131.7	121.1	120.6	153.9
GRIDIRON CREEK RANCH LAKE LEWIS & RIVER BLUFF	0.0	0.0	0.0	42.2	126.3
GRIDIRON CREEK RANCH LTD	0.0	0.0	0.0	11.2	0.0
HIGHLAND LAKE ATHLETIC CORP D/B/A/ CAMP CHAMPIONS	0.0	0.0	0.0	0.0	0.0
HORSESHOE BAY APPLEHEAD ISLAND POA INC.	0.0	0.0	0.0	0.0	0.0
HORSESHOE BAY POA	21.5	21.0	16.0	25.0	21.0
HORSESHOE BAY RESORT LTD	1,091.3	1,159.6	688.2	1,156.0	965.8
HYATT CORPORATION (AUSTIN)	1.9	0.0	0.0	0.0	0.0
HYATT REGENCY LOST PINES RESORT	256.0	278.9	216.8	328.5	284.0
ISLAND ON LAKE TRAVIS COA, INC.	19.2	17.9	14.6	16.7	12.7
KING RANCH TURFGRASS LP	553.2	742.8	630.5	773.2	693.1
LA GRANGE ISD	17.3	20.0	7.0	16.9	8.4
LAKECLIFF DREAM, LLC	344.6	264.6	68.5	438.6	622.7
LAKE POINTE MUD	23.2	11.9	8.0	19.0	26.8
LAKESIDE HEIGHTS INC	0.0	0.0	10.8	31.5	28.8
LCRA FACILITIES	8.6	20.4	13.4	21.4	16.6
MARINA CLUB HOA, INC.	9.8	14.3	6.8	6.6	5.9
PAM MCCASKILL D/B/A AUSTIN ORCHARD	4.9	5.4	13.2	20.3	15.6
PEDERNALES GOLF CLUB, INC.	40.2	43.0	24.6	37.4	40.4
POINT VENTURE POA, INC.	0.8	0.0	0.0	22.4	18.7
POTTS LAND COMPANY, LLC	11.9	12.7	9.2	10.7	12.3
RESERVE AT LAKE TRAVIS RESIDENTIAL COMMUNITY, INC.	102.2	119.0	60.9	74.1	132.0
RICHARD T SUTTLE JR, TRUSTEE	0.0	0.0	0.3	0.0	0.0
RIVER PLACE GOLF GROUP, LP	0.0	0.0	0.0	0.0	0.0
ROUGH HOLLOW SOUTH SHORE II MASTER COMMUNITY, INC.	47.8	21.3	31.4	33.7	39.3
ST. STEPHEN'S EPISCOPAL SCHOOL	47.2	38.0	16.9	52.8	50.0
TEXAS WATER TRADE	0.0	0.0	0.0	292.0	277.8
TOMMY LEE JONES (FLEMING SPRINGS RANCH)	0.0	20.0	20.0	20.0	20.0
TRAILS POA, INC.	12.2	26.3	30.0	20.4	37.7
TRAVIS COUNTY MUD #04	551.2	487.2	170.3	444.5	806.2

TRAVIS COUNTY WCID #17	0.0	0.1	0.0	0.0	21.9
TUSCAN VILLAGE HORSESHOE BAY COMMUNITY, INC.	0.0	0.0	0.0	10.7	16.9
VOLENTE BEACH, INC.	0.5	0.0	0.0	0.0	0.0
WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY	175.8	139.3	52.0	430.8	302.1
Grand Total	**5,429**	**5,553**	**3,981**	**7,139**	**7,293**
~~6D RANCH, LTD~~	~~12.2~~	~~15.5~~	~~12.6~~	~~29.5~~	~~28.0~~
~~APPLIED MATERIALS, INC.~~	~~0.0~~	~~0.0~~	-	~~55.8~~	~~64.0~~
~~AUSTIN AMERICAN - STATESMAN~~	~~4.7~~	~~3.0~~	~~7.0~~	~~4.8~~	~~4.1~~
~~AUSTIN COUNTRY CLUB~~	~~205.2~~	~~175.8~~	~~193.9~~	~~205.1~~	~~197.2~~
~~AUSTIN GOLF CLUB, INC.~~	~~190.4~~	~~83.5~~	~~185.7~~	~~173.5~~	~~170.9~~
~~BAE SYSTEMS INTEGRATED DEFENSE SOLUTIONS~~	~~4.0~~	~~3.6~~	~~3.6~~	~~3.6~~	~~3.6~~
~~BARTON CREEK LAKESIDE IRRIGATION CO, INC~~	~~102.3~~	~~109.2~~	~~130.1~~	~~151.1~~	~~138.0~~
~~BARTON CREEK RESORT & CLUBS, INC.~~	~~271.7~~	~~217.5~~	~~261.3~~	~~314.6~~	~~274.1~~
~~BASTROP RESORT PARTNERS, INC.~~	~~189.3~~	-	-	-	-
~~BLUE LAKE GOLF CLUB, INC.~~	~~1.1~~	~~5.5~~	~~0.1~~	~~3.9~~	~~16.7~~
~~BLUEBONNET HILLS GOLF COURSE, LTD~~	~~126.0~~	~~128.6~~	~~125.6~~	~~148.5~~	~~118.4~~
~~BOOT RANCH HOLDINGS LLC~~	-	-	-	-	~~20.6~~
~~BOOT RANCH REAL ESTATE, LLC~~	~~0.0~~	~~29.3~~	~~86.8~~	~~69.7~~	-
~~BULL CREEK MANAGEMENT LLC~~	-	~~43.1~~	~~26.4~~	~~48.1~~	~~38.2~~
~~C & D TURFGRASS, INC.~~	~~412.9~~	~~588.7~~	~~400.4~~	~~563.5~~	~~541.5~~
~~CAMP CHAMPIONS~~	~~0.5~~	~~1.6~~	~~0.9~~	~~0.2~~	~~2.4~~
~~CITY OF AUSTIN WALLER CREEK PROJECT~~	-	~~131.0~~	~~39.5~~	~~128.9~~	~~17.5~~
~~CITY OF MEADOWLAKES~~	~~0.0~~	~~51.7~~	~~1.5~~	~~29.7~~	~~0.0~~
~~CLUBCORP GOLF OF TEXAS LP~~	~~26.3~~	~~4.4~~	~~0.0~~	~~5.4~~	~~85.7~~
~~ESCONDIDO CLUB, INC.~~	-	-	~~259.6~~	~~308.7~~	~~310.1~~
~~ESCONDIDO PARTNERSHIP LTD~~	~~313.1~~	~~295.6~~	-	-	-
~~GRAY WOLF GOLF, LLC~~	~~31.2~~	~~36.8~~	~~6.4~~	~~5.0~~	~~11.2~~
~~GREAT HILLS GOLF CLUB OF AUSTIN, INC. (DBA GREAT HILLS CC)~~	~~181.3~~	~~62.6~~	~~177.9~~	~~185.8~~	~~139.3~~
~~HORSESHOE BAY APPLEHEAD ISLAND POA INC.~~	~~2.7~~	~~3.0~~	~~3.3~~	~~8.3~~	~~9.8~~
~~HORSESHOE BAY POA~~	~~17.0~~	~~14.2~~	~~10.2~~	~~10.1~~	~~13.2~~
~~HORSESHOE BAY RESORT, LTD~~	~~1,105.1~~	~~1,075.6~~	~~926.0~~	~~861.6~~	~~877.6~~
~~HYATT REGENCY - AUSTIN~~	~~2.3~~	~~4.2~~	~~3.2~~	~~3.8~~	~~3.7~~
~~HYATT REGENCY LOST PINES RESORT~~	-	~~254.6~~	~~151.4~~	~~247.0~~	~~257.2~~
~~ISLAND ON LAKE TRAVIS COA, INC.~~	~~12.0~~	~~15.4~~	~~12.3~~	~~18.4~~	~~16.9~~
~~KENT REAL ESTATE II LP D/B/A LAKECLIFF COUNTRY CLUB~~	~~492.0~~	~~541.6~~	~~341.7~~	~~362.9~~	~~377.1~~

~~LA GRANGE ISD~~	~~8.9~~	~~7.7~~	~~13.1~~	~~22.2~~	~~16.2~~
~~LAKEWAY ROUGH HOLLOW SOUTH COMMUNITY, INC.~~	~~32.8~~	~~90.6~~	~~152.4~~	~~154.5~~	~~110.0~~
~~LCRA FACILITIES~~	~~10.4~~	~~6.1~~	~~7.9~~	~~1.2~~	~~1.7~~
~~MARINA CLUB HOA, INC.~~	~~-~~	~~-~~	~~-~~	~~5.1~~	~~6.6~~
~~PEDERNALES GOLF CLUB, INC.~~	~~45.3~~	~~40.2~~	~~39.9~~	~~43.9~~	~~35.8~~
~~POINT VENTURE POA, INC.~~	~~21.6~~	~~10.6~~	~~7.1~~	~~0.5~~	~~9.9~~
~~POTTS LAND COMPANY, LLC~~	~~11.1~~	~~9.4~~	~~10.4~~	~~13.2~~	~~13.6~~
~~RESERVE AT LAKE TRAVIS RESIDENTIAL COMMUNITY, INC.~~	~~67.7~~	~~90.0~~	~~94.7~~	~~107.8~~	~~103.4~~
~~RIVER PLACE GOLF GROUP, LP~~	~~33.8~~	~~38.7~~	~~0.0~~	~~14.0~~	~~31.2~~
~~SPICEWOOD BEACH POA~~	~~0.0~~	~~0.0~~	~~0.0~~	~~0.0~~	~~-~~
~~ST. STEPHEN'S EPISCOPAL SCHOOL~~	~~54.8~~	~~44.9~~	~~40.3~~	~~48.1~~	~~44.3~~
~~STARK WATERFORD, LLC~~	~~5.7~~	~~-~~	~~-~~	~~-~~	~~-~~
~~TIM MCCASKILL D/B/A RIO RANCHITO~~	~~-~~	~~7.4~~	~~6.9~~	~~11.6~~	~~16.2~~
~~TRAILS POA, INC.~~	~~44.5~~	~~34.9~~	~~13.4~~	~~19.2~~	~~30.3~~
~~TRAVIS COUNTY MUD #04~~	~~511.6~~	~~394.8~~	~~449.0~~	~~628.6~~	~~612.0~~
~~TRAVIS COUNTY WCID #17~~	~~75.4~~	~~111.7~~	~~67.3~~	~~71.5~~	~~46.4~~
~~TWIN CREEKS GOLF GROUP, LP~~	~~199.4~~	~~216.7~~	~~187.6~~	~~247.5~~	~~222.0~~
~~VOLENTE BEACH, INC.~~	~~0.3~~	~~0.3~~	~~0.3~~	~~0.8~~	~~1.1~~
~~WATERS CONDOMINIUM ASSOC INC~~	~~3.4~~	~~5.0~~	~~6.7~~	~~0.0~~	~~-~~
~~WEST TRAVIS COUNTY MUD #3~~	~~15.4~~	~~17.0~~	~~21.6~~	~~26.2~~	~~15.4~~
~~WEST TRAVIS COUNTY PUBLIC UTILITY AGENCY~~	~~152.2~~	~~-~~	~~18.9~~	~~236.5~~	~~217.8~~
~~**Grand Total**~~	~~**4,997.6**~~	~~**5,021.6**~~	~~**4,504.8**~~	~~**5,599.9**~~	~~**5,270.9**~~

Industrial Firm Water Customer Contracted Use – 20[19-2023]~~14-2018~~

Customer Name	201~~9~~4	20~~20~~15	20~~21~~16	20~~22~~17	20~~23~~18
ALAMO CONCRETE PRODUCTS CO	0.0	0.0	0.0	78.3	93.2
BASTROP ENERGY PARTNERS LP	1,582.6	1,863.5	1,282.3	2,035.3	2,254.3
CITY OF AUSTIN D/B/A AUSTIN ENERGY	600.4	3,593.0	2,578.2	5,029.5	3,413.3
INEOS USA OIL & GAS	0.0	9.3	7.2	44.7	0.0
MAGNOLIA OIL & GAS OPERATING LLC	39.3	159.5	62.4	0.0	13.1
OQ CHEMICALS CORP	5,089.5	5,869.9	3,424.6	4,804.0	4,962.9
STP NUCLEAR OPERATING COMPANY[1]	24,028.4	12,794.7	79,094.4	9,955.3	42,137.5
TXI OPERATIONS, LP	36.3	57.5	47.6	40.4	47.0
UNDERGROUND SERVICES MARKHAM LLC	7,686.9	6,636.4	4,526.4	9,448.7	7,184.3

[1]

Grand Total	39,063	30,984	91,023	31,436	60,106
APAC TEXAS, INC.	46.9	0.0	-	-	-
AUSTIN, CITY OF - DECKER POWER PLANT	900.4	14.6	208.3	0.0	0.0
BASTROP ENERGY PARTNERS, LP	942.1	1,326.1	1,995.7	1,644.1	1,629.1
FAYETTE PP - LCRA SHARE	6,468.9	5,293.5	5,440.1	11,049.4	11,168.7
GENTEX POWER CORPORATION (LOST PINES POWER PARK)	151.0	-	-	-	-
LCRA BU FOR AUSTIN @ FPP	2,149.1	354.0	714.2	2,761.4	4,959.5
OXEA CORPORATION	15.7	0.0	79.3	883.2	1,124.2
SIM GIDEON POWER PLANT	58.7	0.0	0.0	0.0	0.0
SOUTH TEXAS PROJECT NUCLEAR OPERATING COMPANY	0.0	0.0	0.0	0.0	0.0
T.C. FERGUSON POWER PLANT	906.4	1,747.7	1,535.5	1,826.6	0.0
TXI OPERATIONS, LP	72.9	43.6	31.1	54.2	53.3
UNDERGROUND SERVICES MARKHAM, LP	5.9	0.0	466.6	1,533.5	2,194.5
Grand Total	**11,717.9**	**8,779.5**	**10,470.9**	**19,752.4**	**21,129.3**

[1] Values are diversions from the river to refill the main cooling reservoir when river water is available and do not reflect consumptive use from the reservoir. Includes diversions under Gulf Coast water right

[2] Water use reflects only water supplied from Lakes Bu plant is also supplied by a run-of-river water right.

APPENDIX B

LOST PINES POWER PLANT WATER CCONSERVATION PLAN

1.0 Lost Pines Power Park Description

Lost Pines Power Park in Bastrop County is comprised of the Sim Gideon Power Plant and the Lost Pines 1 Power Project, co-owned by LCRA and GenTex Power Corporation, an LCRA affiliate. Lost Pines 1, in service since 2001, is a 518536 5 MW natural gas-fired, combined-cycle power plant. Lost Pines 1 has two gas-fired combustion turbines and one steam turbine. The two combustion turbines work much like jet engines, with the waste heat from the two turbines used to generate steam in the heat recovery steam generator (HRSG). Because of this configuration, the plant is 30-40 percent more thermodynamically efficient than a conventional steam electric system.

The Sim Gideon units are conventional steam electric units and are the oldest gas-fired power plants in service in the LCRA system. The three units of Sim Gideon include:

- Unit 1, completed in 1965, with a capacity of 142 MW
- Unit 2, completed in 1968, with a capacity of 142 MW
- Unit 3, completed in 1971, with a capacity of 342 MW

Winchester is a 180 64 MW "peaker" plant located about 20 miles north of La Grange in Fayette County. Although it is operated from Lost Pines 1, it is not technically part of Lost Pines 1. Winchester has no cooling reservoir and uses simple cycle combustion turbines that require relatively small amounts of water, which helps reduce water consumption in the LCRA generating system.

Both Sim Gideon and Lost Pines 1 are located on Lake Bastrop. TCEQ Certificate of Adjudication No. 14-5473 authorizes LCRA to divert water from the Colorado River and impound it in Lake Bastrop for power plant operations. The reservoir can also capture inflows from two creeks that flow into the reservoir. LCRA can impound up to 16,590 acre-feet when the reservoir is full. In addition to its surface water rights, LCRA also has groundwater permits that allow a maximum of 10,000 acre-feet per year to be pumped in a single year, and up to 6,500 acre-feet per year on a five-year average.

Lake Bastrop acts as a large cooling pond for Sim Gideon and Lost Pines 1. Water is passed through the power plant condensers to condense steam back into water for reuse in the plant's steam cycle. Warmed lake water is returned to circulate through the reservoir and cool before being used again. The cooling water from the plants is discharged into a lined discharge channel, which travels approximately one mile and enters the north side of Lake Bastrop. This separation of the discharge from the intake side of the lake prevents short-circuiting and ensures that the full cooling capacity of the lake surface is utilized. Water captured from the two creeks flowing into the lake keeps Lake Bastrop at a proper operating

~~level.~~ Water can also be released back into the river downstream of the lake to pass flood flows.

~~In XX, LCRA added four groundwater wells around Lake Bastrop to allow LCRA to pump up to 10,000 acre-feet of water a year, under certain conditions, to help provide cooling water for Lost Pines Power Park. In 2015, 2016 and 2017~~Between 2020-2022, ~~-~~groundwater use ~~measured 3,269 acre-feet; 1,258 acre-feet and 4,914 acre-feet, respectively.~~averaged 5,040 acre-~~-~~feet annually. ~~During the years~~Between 2020~~15~~ -20~~17~~22, LCRA diverted no water from the Colorado River into Lake Bastrop.

2.0 Lost Pines Power Park Water Use

The primary water uses at Lost Pines Power Park are cooling pond forced evaporation from condenser cooling and other equipment cooling, boiler makeup water and employee sanitation.

2.1 Condenser cooling

Condenser cooling is the process by which water from a cooling pond is pumped through a heat exchanger to remove waste heat and condense the steam after it passes through the steam turbine. At Lost Pines Power Park, the cooling pond (Lake Bastrop) water is heated between approximately 6 to10º F as it passes through the condenser. This warm water is then circulated back into and through the reservoir for cooling by the processes of evaporation, convection and radiant cooling.

In 20~~15~~20, 2021~~16~~ and 2022~~17~~, Lost Pines 1 produced an average of~~-~~ 2,~~501~~769,~~866~~413 MWh each year - an average of 969~~889~~,~~342~~295 ~~-~~MWh per year from the steam turbine and 1,~~612~~800,~~524~~119~~-~~ MWh per year from the two combustion turbines. Thus, the combustion turbines generate approximately ~~64~~ 65 percent of the Lost Pines 1 power output and the steam turbine generates approximately ~~36~~ 35 percent.

Because the Lost Pines 1 combustion turbines ~~do not~~ reject very little heat to the cooling pond, Lost Pines 1 causes much less forced evaporation than an equivalent steam unit. Assuming that the Lost Pines 1 steam turbine has a heat rejection characteristic comparable to the similarly loaded FPP units, and using the method developed by George Ward[1] as an improvement to the Harbeck diagram method, Lost Pines 1 forced evaporation ~~calculates to a~~for ~~2015~~ 2020~~—-~~ ~~2017~~ 2022 is an ~~annual~~ average of 1,096~~905~~ ~~-~~acre-feet per year. The combustion turbines do use a small amount of cooling water for cooling (i.e. lube oil coolers). This amount is factored into the calculation of the steam turbine heat rejection.

Generation from the Sim Gideon facilities has ~~decreased from 1,035,161 MWh in 2009, 931,112 MWh in 2010 and 595,111 MWh in 2011, to an average output of 351,144 MWh per year between 2015 and 2017~~increased considerably over the past five years. The average generation from the facility was 761,285 MWh annually between 2020 and 2022. ~~-~~The ~~output decline in these less water-efficient steam units has lowered the forced evaporation from Lake Bastrop attributable to the Sim Gideon units~~increase in output has increased the

contribution of the facility toward the forced evaporation of Lake Bastrop. The forced evaporation attributable to the Sim Gideon units ~~has decreased from 1,276 acre-feet in 2009, to~~averaged ~~an annual average of 455~~3,890 acre-feet annually from 20~~15~~20 to 20~~17~~22.

The total steam generation output for both Lost Pines 1 and Sim Gideon facilities averaged 3,530,699~~1,240,486~~ MWh per year for the 2020~~15~~-2022~~17~~ time period. ~~Therefore, T~~the Lost Pines 1 steam turbine produced an average of ~~72~~ 78 %~~percent~~ of the steam power generated at Lost Pines Power Park and the Sim Gideon facilities produced the remaining ~~28~~ 22 percent.

2.2 Boiler makeup water

Boiler makeup water is taken from ~~Lake Bastrop~~wells on the LPPP facility. It is treated by filtration, reverse osmosis (RO) and ion exchange before being used in the boiler. The resulting water is extremely pure. High purity water is also used in the laboratory and for cooling of the gas turbines inlet air. Based on recent operating levels for these two facilities, approximately ~~73~~ 168 acre-feet a year are used ~~-~~for this purpose. Another ~~44~~ 143 acre-feet are returned~~-~~ to the cooling pond reservoir for reuse.

2.3 Employee sanitation

Employee sanitation facilities use potable water purchased from the Aqua Water Supply Corporation. The two power plants at Lost Pines Power Park ~~currently~~ have about 40 plant and office personnel. Lost Pines Power Park purchases approximately ~~two~~ 2 acre-feet of potable water per year according to LCRA records and the water balance. A wastewater treatment plant at Lost Pines Power Park treats human wastewater and discharges most of the effluent to an onsite sewage facility spray field. The balance is sent ~~int~~to the cooling pond for reuse as cooling water. This report assumes that one-half of the potable water is consumed, or ~~one~~ 1 acre-foot per year for years 2020-2022.

~~Toilets at Lost Pines Power Park are older models which use 3.5 gallons per flush and 5.0 gallons per flush. Showerheads are primarily 2.5 gallons per minute per the Federal Energy Policy Act Standard, because most have been replaced since the act became effective in 1992. Urinals flush approximately 1.0 to 1.5 gallons per flush.~~

2.4 Landscape irrigation

~~There is not landscape irrigation at Lost Pines Power Park.The drought has eliminated all landscape irrigation.~~In an effort to reduce fresh water usage, Lost Pines Power Park has eliminated landscape irrigation at the facility.

Table 1 Summary of Estimated Water Use for the Lost Pines Power Park – ~~2015~~ 2020 ~~-~~ 2022~~17~~

Type of Use	Lost Pines 1 Acre-feet/year	Sim Gideon Acre-feet/year	Combined Acre-feet/year

Forced Evaporation	~~905~~ 1,096	~~455~~ 3,890	~~1360~~ 4986
Boiler Makeup	~~64~~ 82	~~9~~ 86	~~73~~ 168
Employee Sanitation	1	0	1
Total	**~~970~~ 1,179**	**~~464~~ 3,976**	**5~~1~~,154~~434~~**

Lost Pines 1 uses 23~~68~~ percent of all consumed water and Sim Gideon uses 77~~32~~ percent.

Table 2 Summary of Estimated Water Use for Winchester Power Park – ~~2015~~ 2020 ~~-~~ 2022~~17~~

Type of Use	Acre-feet/year
Combustion and generation enhancement	~~1~~3
Total	**~~1~~3**

Based on an average generation for the years ~~2015~~ 2020 ~~-~~ 201~~7~~22 and the water use ~~above,~~above; Lost Pines 1 ~~u~~utilizes~~s~~ 0.~~126~~ 135 gallons per kWh or ~~126~~ 135 gallons per MWh. The Sim Gideon Plant ~~uses~~utilizes 1~~0~~.~~431~~ 685 gallons per kWh or 1,685~~431~~ gallons per MWh. Winchester Power Park ~~uses~~utilizes 0.005 ~~007~~gallons per kWh or 5~~7~~ gallons per MWh.

3.0 Lost Pines Power Park Water Conservation Goals and Strategies

The following are water conservation features for Lost Pines Power Park:

- Lost Pines 1 combined cycle power plant is~~,~~ the most significant conservation feature of Lost Pines Power Park. This saves at least ~~If this was a conventional steam electric power plant, water use would increase by at least~~ 1~~2~~,~~103~~ 654 acre-feet per year over what a conventional steam electric plant would use. Lost Pines 1 savings are based on water usage rates of the similarly loaded FPP units, applied to the non-steam, combustion turbine generation of Lost Pines 1.
- Low-NOx burners and selective catalytic reduction technology instead of water injection. This technology controls nitrogen oxides during combustion without water, potentially reducing ~~. If Lost Pines 1 owners had not chosen this type of technology at the time of design and construction of Lost Pines 1 in 1999, Lost Pines 1 would have had an additional~~ water usage of ~~water requirement of~~up to 503 acre-feet per year.
- ~~Reuse of half of treated domestic wastewater saves one 1 acre-foot per year.~~
- Water conservation discussions during monthly safety meetings.*
- Aggressive repair of potable water leaks both within the plant and up to the water meter just outside of the plant boundaries.*

- Aggressive repair of service water leaks within the plant.*
- Indirect reuse due to boiler water production rejects and sanitation water processing totals 44 acre-feet per year.
- The use of groundwater for plant use has eliminated delivery losses for water released from lLakes Buchanan and Travis by an average of 140 145 acre-feet per year.

*These items save an estimated one 1 acre-foot per year combined.

Future conservation strategies include:

- Maintaining zero water use for landscape with a savings goal of one 1 acre-foot per year.
- Continuing existing water conservation strategies outlined above.

APPENDIX C

FAYETTE POWER PLANT WATER CONSERVATION PLAN

1.0 Fayette Power Project Description

FPP is a coal-fired steam electric power plant. Beginning operation in 1979, the~~is~~ three-unit ~~facility in the past used a mixture of western sub-bituminous coal and local lignite, but has used sub-bituminous coal exclusively for many years. The three units~~ have a generating capacity of 1,708 MW. ~~Some of the generating capacity is co-owned by LCRA and the City of Austin.~~

- Unit 1, completed in 1979, with a gross dependable capacity of 624 MW (co-owned with Austin Energy)
- Unit 2, completed in 1980, with a gross dependable capacity of 624 MW (co-owned with Austin Energy)
- Unit 3, completed in 1988, with a gross dependable capacity of 460 MW

FPP is in Fayette County on ~~Cedar Creek Reservoir~~Fayette County Reservoir. Certificate of Adjudication 14-5474 authorizes LCRA to impound up to ~~71,400~~ 74,140 acre-feet in the reservoir. LCRA is authorized to divert up to 73,759 acre-feet per year of water from the Colorado River to the reservoir for industrial purposes under Certificates of Adjudication Nos.14-5478 and 14-5482. As part of 14-5474, LCRA is also authorized to impound inflows from the Cedar Creek Watershed. LCRA is authorized to divert, circulate and re-circulate from the ~~Cedar Creek Reservoir~~Fayette County Reservoir for industrial purposes. LCRA is also authorized to divert water under water right 14-5434E (the amendment Garwood right) for use at FPP. The City of Austin has its own water right, no. 14-5471, for the diversion of up to 24,000 acre-feet per year from the Colorado River, plus a contract with LCRA for 7,500 acre-feet per year.

The surface water is pumped from the Colorado River through a pipeline to maintain lake levels. The metered diversions from the river for ~~2015~~2020, 20~~16~~21 and 2022~~17~~ measured 13,361~~9,893~~ acre-feet ~~per year~~, 12,766~~8,581~~ acre-feet ~~per year~~ and 14~~7~~,~~426~~358 acre-feet per year, respectively, for an average of 13~~1~~,495~~,967~~ acre-feet per year. These values include both LCRA and Austin Energy portions. Additional water is captured from the Cedar Creek watershed and impounded.

There are several smaller industrial waste ponds on site, including the Reclaim Pond, the Coal Pile Runoff Pond (CPRP), the Combustion By-products Landfill Pond (CBLP) and the Ash Silo Area Pond. Water from CPRP, CBLP and the Ash Silo Area Pond are capable of transferring water to the Reclaim Pond, along with other sources from the plant for reuse.

2.0 Fayette Power Project Water Use

Water is currently used at FPP for the following:

- Cooling pond forced evaporation from condenser cooling and other equipment cooling;
- Stack gas scrubbers for air pollution control on Units 1, 2 and 3;
- Natural evaporation from the various industrial waste ponds;
- Boiler soot blowing and venting;
- Boiler seal systems and bottom ash removal systems;
- Plant wash-down systems and dust suppression; and
- Potable water purchased for employee sanitation and landscape irrigation.

2.1 Condenser cooling

The cooling pond water at FPP is heated between approximately 8 to 20º F as it passes through the condenser heat exchangers. This warm water is then circulated back into and through the reservoir to cool by the processes of evaporation, convection and radiant cooling. During ~~2015~~ 2020 ~~-~~ -20~~17~~22, FPP generated a total of 3~~2~~0,752~~388~~,898~~575~~ MWh or an average of 10,~~796~~250,966~~192~~ MWh per year. Based on the previously mentioned method by George Ward, the forced evaporation for all three units due to condenser cooling calculates to an average of ~~10~~7,918~~517~~ acre-feet per year.

Water from ~~Cedar Creek Reservoir~~Fayette County Reservoir also cools a variety of mechanical equipment. Based on historical test data, this cooling water stream rejects approximately 2 percent as much heat to the lake as the condenser cooling water. This results in another ~~210~~ 161 acre-feet per year of forced evaporation.

2.2 Stack gas scrubbers

Stack gas scrubbers are used to remove sulfur oxides from the power plant stack gas emissions. All three FPP units have flue gas desulfurization systems, and use scrubbers with a slurry of powdered limestone to capture the sulfur oxides. The heat content of the stack gas represents approximately 10% ~~percent~~ of the energy released through coal combustion at the power plant. Water in the slurry cools the gas to below the water boiling point through evaporation. This process results in approximately 1,~~952~~ 833 acre-feet per year of water consumed through evaporation, based on water use testing and the ~~2015~~ 2020 ~~—~~ -20~~17~~22 generating output levels. The resulting slurry from the scrubber process contains calcium sulfate and is a by-product sold to third parties for ~~making wall board or as a concrete additive~~beneficial reuse.

Much of the water used for the scrubber process can be obtained from the Reclaim Pond which collects water from the following sources:

- Rainwater, both direct and runoff;
- Boiler water treatment processes;
- Domestic wastewater treated effluent; and
- Runoff from other sources.

This Reclaim Pond is an example of an industrial storm and rainwater reuse project.

2.3 Industrial wastewater pond natural evaporation

The Reclaim Pond, CPRP, CBLP and the Ash Silo Area Pond exist to support plant operations. ~~Therefore, t~~This report categorizes their net natural evaporation (natural evaporation minus rainfall) as used water. During ~~2015~~ 2020 ~~–~~ - ~~2017~~2022, these ponds had a combined net natural evaporation average of ~~7~~ 65 acre-feet of water per year. ~~During that time period, natural evaporation and rainfall at the FPP location almost equaled each other.~~

2.4 Boiler soot blowing and vents

The boilers use ~~324~~ 290 acre-feet per year through soot blowing operations and a variety of ventings to atmosphere.

2.5 FPP Boiler seal systems and bottom ash removal

The bottom ash and seal systems currently use ~~65~~ 157 acre-feet per year. ~~In 2010, FPP completed the installation of the Unit 1 and Unit 2 Submerged Scraper Conveyor projects. This allowed the completion of another project to close and backfill the Ash Pond. Before the completion of these two projects, the Ash Pond evaporated 40 acre-feet per year.~~

2.6 Plant wash-down systems and dust suppression

FPP uses water to limit the generation, dispersion and accumulation of dust, including coal dust, throughout the plant site. According to a combination of measured flows and FPP Water Balance values, the plant uses ~~168~~ 140 acre-feet per year to perform these health- and safety-related tasks.

2.7 Potable water purchases

FPP purchases potable water from the Fayette Water Supply Corporation (WSC) whose source is groundwater from the Carrizo-Wilcox Aquifer. The plant has about 185 personnel. Approximately ~~19~~ 16 acre-feet of treated water are purchased annually, of which approximately ~~one~~ 1 acre-foot is used for landscape irrigation purposes and ~~18~~ 15 acre-feet for employee sanitation. Approximately 11 acre-feet per year of treated waste-water is sent to the Reclaim Pond for reuse.

The plumbing fixtures at FPP are water-conserving based on the current federal standard.

Table 1 Fayette Power Project Estimated Annual Water Use

Type of Use	Acre- feet/year
Forced evaporation	~~10~~8,~~727~~ 079
Scrubbers	1,~~952~~ 733
Boiler soot blowing and venting	~~324~~ 290

Boiler sealing and bottom ash handling	~~65~~58
Net natural evaporation from industrial waste ponds	~~7~~ 65
Dust control and wash down	~~168~~ 140
Employee consumption	~~18~~ 16
Landscape i~~l~~rrigation	1
Total	**~~13,262~~10,382**

Table 1 indicates that more than 99 percent of the water use at FPP is for plant operation, while less than 1 percent is used for employee sanitation and irrigation purposes. Based on an average generation for ~~2015~~ 2020 ~~-~~-20~~17~~22 and the above water use, water use per kWh at FPP is 0.~~400~~ 330 gallons per kWh or ~~400~~ 330 gallons per MWh.

3.0 Fayette Power Project Water Conservation Features and Strategies

Water-saving features for FPP include:

- Water-saving plumbing fixtures for employees: ~~two~~ 2 acre-feet per year~~;~~.
- Minimal landscape watering: ~~one~~ 1 acre-foot per year.~~;~~
- **Total savings: 3 acre-feet per year**.

Direct reuse features for FPP involve using the Reclaim Pond water for:

- Stack gas scrubber makeup: ~~546~~ 347 acre-feet per year.~~;~~
- Various plant wash down locations: ~~37~~ 23 acre-feet per year.~~;~~
- Boiler sealing systems: ~~113~~ 150 acre-feet per year.~~;~~
- **Total direct reuse: ~~696~~ 520 acre-feet per year.**

Indirect reuse features for FPP include:

- Recycling CPRP water back to the reservoir: ~~267~~ 373 acre-feet per year.~~;~~
- Sending boiler water production system (reverse osmosis system) process reject water to the reservoir for makeup purposes: ~~129~~ 181 acre-feet per year.~~;~~
- **Total indirect reuse: ~~396~~ 554 acre-feet per year.**

APPENDIX D

FERGUSON POWER PLANT WATER CONSERVATION PLAN

1.0 Ferguson Power Plant Description

The Thoms C. Ferguson Power Plant a 527 MW (Gross Dependable, Summer Capacity) natural gas-fired, combined-cycle power plant in Horseshoe Bay, became commercially operational in 2014. Like Lost Pines 1, the Ferguson Power Plant employs two combustion turbine-generators and one steam-powered turbine-generator. As a result, the Ferguson Power Plant incorporates the same water-saving arrangement as Lost Pines 1, in which the two combustion turbines units do not reject heat to the cooling lake and therefore do not cause any forced evaporation.

2.0 Ferguson Power Plant Water Use

The primary water uses at the Ferguson Power Plant are forced evaporation on Lake LBJ from condenser cooling and other equipment cooling, boiler makeup water and employee sanitation.

2.1 Condenser Cooling

Water from Lake LBJ is heated between approximately 6 to 12°F as it passes through the condenser's heat exchange process. This warm water is then circulated back into and through the lake for cooling by the processes of evaporation, convection, and radiant cooling.

In 2015 20, 2016 21, and 2017 22, Ferguson produced an average of 3,728 417,674 219 MWh each year – an average of 1,251 365,928 684 MWh per year from the steam turbine and 2,165 362,535 746 MWh per year from the two combustion turbines. Thus the combustion turbines generate approximately 63 4 percent of the power output, and the steam turbine generates approximately 37 6 percent. Like Lost Pines, the combustion turbines do not reject heat to the cooling lake, causing much less forced evaporation than an equivalent simple cycle steam unit. Ferguson forced evaporation calculates to a 2015 2020 -- 2017 22 annual average of 1,683 acre-feet. Note: based on a recommendation from LCRA Engineering, Ferguson has refined its method for calculating forced evaporation beginning with the October 2018 data. The refined method results in a 20 to 30% reduction in forced evaporation rates from the previous method. The 1683 acre-ft stated above results from the previous calculation method.

2.2 Boiler makeup water

Boiler makeup water is taken from Lake LBJ. It is treated by filtration, reverse osmosis (RO) and ion exchange before being used in the boiler. The resulting water is extremely pure. High purity water is also used in the laboratory and for cooling of the gas turbines inlet air. Between 2020 and 2022 In 2016 – 2017, Ferguson withdrew approximately 194 136 acre-feet of water per year for this purpose and returned 58 45 acre-feet to Lake LBJ.

2.3 Employee sanitation

Ferguson purchases approximately one 1 acre-feet of water per year from the City of Horseshoe Bay for employee sanitation facilities.

2.4 Landscape irrigation

There is ~~Ferguson performs~~ no landscape irrigation at Ferguson Power Plant.

Table 1 Ferguson Power ~~Project~~ Plant Estimated Annual Water Use

Type of Use	Acre- feet/year
Forced evaporation	1,~~683~~128
Boiler Makeup	~~136~~91
Employee consumption	1
Total	**1,~~820~~220**

3.0 Ferguson Power Plant Water Conservation Features and Strategies

The following are water conservation features for the Ferguson Power Plant:

- The Ferguson combined cycle design. This uses at least 2,241 acre-feet a year less than a ~~If Ferguson was a~~ conventional, simple cycle steam power plant~~, water use would increase by at least 2,759~~ 241 ~~acre-feet per year.~~* ~~Ferguson savings are based on water usage rates of the similarly loaded FPP units, applied to the non-steam, combustion turbine generation of Ferguson.~~
- Indirect reuse due to boiler water production rejects and sanitation processing totals 45~~136~~ acre-feet per year.
- Aggressive repair of water leaks within the plant.

* Ferguson savings are based on water usage rates of the similarly loaded FPP units, applied to the non-steam, combustion turbine generation of Ferguson.

~~Appendix B~~

~~Lost Pines Power Plant Water conservation Plan~~

~~1.0 Lost Pines Power Park Description~~

~~Lost Pines Power Park in Bastrop County is comprised of the Sim Gideon Power Plant and the Lost Pines 1 Power Project, owned by GenTex Power Corporation, an LCRA affiliate. Lost Pines 1, in service since 2001, is a 518 MW natural gas-fired, combined-cycle power plant. Lost Pines1 has two gas-fired combustion turbines and one steam turbine. The two combustion turbines work much like jet engines, with the waste heat from the two turbines used to generate steam in the heat recovery steam generator (HRSG). Because of this configuration, the plant is 30-40 percent more thermodynamically efficient than a conventional steam electric system.~~

~~The Sim Gideon units are conventional steam electric units and are the oldest gas-fired power plants in service in the LCRA system. The three units of Sim Gideon include:~~

- ~~Unit 1, completed in 1965, with a capacity of 142 MW~~
- ~~Unit 2, completed in 1968, with a capacity of 142 MW~~
- ~~Unit 3, completed in 1971, with a capacity of 342 MW~~

~~Winchester is a 176 MW "peaker" plant located about 20 miles north of La Grange in Fayette County. Although it is operated from Lost Pines 1, it is not technically part of Lost Pines 1. Winchester has no cooling reservoir and uses simple cycle combustion turbines that require relatively small amounts of water trucked in from Lost Pines, which helps reduce water consumption in the LCRA generating system.~~

~~Both Sim Gideon and Lost Pines 1 are located on Lake Bastrop. TCEQ Certificate of Adjudication No. 14-5473 authorizes LCRA to divert water from the Colorado River that was released from lakes Buchanan or Travis and impound it in Lake Bastrop for power plant operations. LCRA can impound up to 16,590 acre-feet when the reservoir is full. LCRA can also supply Colorado River water to power park under its amended Certificate of Adjudication 14-5434E. Further, LCRA holds groundwater rights issued by the Lost Pines Groundwater Conservation District that can be used for the power park.~~

~~Lake Bastrop acts as a large cooling pond for Sim Gideon and Lost Pines 1. Water is passed through the power plant condensers to condense steam back into water for reuse in the plant's steam cycle. Warmed lake water is returned to circulate through the reservoir and cool before being used again. The cooling water from the plants is discharged into a lined discharge channel, which travels approximately one mile and enters the north side of Lake Bastrop. This separation of the discharge from the intake side of the lake prevents short-circuiting and ensures that the full cooling capacity of the lake surface is utilized. Water captured from the two creeks flowing into the lake and water pumped from the river keeps Lake Bastrop at a proper operating level. Water also can be released back into the river to~~

pass flood flows. In 2015, 2016 and 2017, groundwater use was 3,269 acre-feet; 1,258 acre-feet and 4,914 acre-feet, respectively. .
During the years 2015-2017, LCRA diverted no water from the Colorado River into Lake Bastrop.

2.0 Lost Pines Power Park Water Use

The primary water uses at Lost Pines Power Park are cooling pond forced evaporation from condenser cooling and other equipment cooling, boiler makeup water and employee sanitation.

2.1 Condenser Cooling

Condenser cooling is the process by which water from a cooling pond is pumped through a condenser to remove waste heat and condense the steam after it passes through the steam turbine. At Lost Pines Power Park, the cooling pond (Lake Bastrop) water is heated approximately 10°F as it passes through the condenser. This warm water is then circulated back into and through the reservoir for cooling by the processes of evaporation, convection and radiant cooling.

In 2015, 2016 and 2017, Lost Pines 1 produced an average of 2,501,866 MWh each year - an average of 889,342 MWh per year from the steam turbine and 1,612,524 MWh per year from the two combustion turbines. The combustion turbines generate approximately 64 percent of the Lost Pines 1 power output and the steam turbine generates approximately 36 percent.

Because Lost Pines 1 combustion turbines do not reject heat to the cooling pond, Lost Pines 1 causes much less forced evaporation than an equivalent simple cycle steam unit. Assuming that the Lost Pines 1 steam turbine has a heat rejection characteristic comparable to the similarly loaded FPP units, and using the method developed by George Ward[1] as an improvement to the Harbeck diagram method, Lost Pines 1 forced evaporation calculates to a 2015-2017 annual average of 905 acre-feet per year.

The Sim Gideon units fire natural gas to generate steam for their turbine-generators. This design is less water-efficient than combined cycle units. In recent years, generation from the Sim Gideon units has decreased, resulting in decreased forced evaporation from Lake Bastrop. For example, during the years from 2009 to 2011, the Sim Gideon plant produced an annual average of 853,795 MWh, resulting in an average annual forced evaporation of 1,038 acre-feet. During the years from 2015 to 2017, the Sim Gideon Plant produced an annual average of 351,144 MWh, resulting in an annual average forced evaporation of 455 acre-feet.

The total steam generation output for both Lost Pines 1 and Sim Gideon facilities averaged 1,240,486 MWh per year for the 2015-2017 time period. The Lost Pines 1 steam turbine produced an average of 72 percent of the steam power generated at Lost Pines Power Park and the Sim Gideon facilities produced the remaining 28 percent.

2.2 Boiler Makeup Water

Boiler makeup water is taken from Lake Bastrop. It is treated by filtration, reverse osmosis (RO) and ion exchange before being used in the boiler. The resulting water is extremely pure. High purity water also is used in the laboratory and for cooling of the gas turbines inlet air. Based on 2016 and 2017 operating data, the RO system pulls an annual average of 235 acre-feet from the lake for purification. The plants use 146 acre-feet per year and return the remaining 89 acre-feet per year to the cooling pond reservoir for reuse.

2.3 Employee Sanitation

Employee sanitation facilities use potable water purchased from the Aqua Water Supply Corporation. The two power plants at Lost Pines Power Park have 40 plant and office personnel. Lost Pines Power Park purchases approximately 2 acre-feet of potable water per year according to LCRA records and the water balance. A wastewater treatment plant at Lost Pines Power Park treats human wastewater and discharges the effluent into the cooling pond for reuse as cooling water. This report assumes one-half of the potable water is consumed, or 1 acre-foot per year.

Toilets at Lost Pines Power Park are generally older models which use 3.5 gallons per flush and 5.0 gallons per flush. Showerheads are primarily 2.5 gallons per minute per the Federal Energy Policy Act Standard, because most have been replaced since the act became effective in 1992. Urinals flush approximately 1.0 to 1.5 gallons per flush.

2.4 Landscape Irrigation

Table 1 Summary of Estimated Water Use for the Lost Pines Power Park – 2015 - 2017

Type of Use	Lost Pines 1 (acre-feet/year)	Sim Gideon (acre-feet/year)	Combined (acre-feet/year)
Forced Evaporation	905	455	1,360
Boiler Makeup	128	18	146
Employee Sanitation	1	0	1
Total	**1,034**	**473**	**1507**

Lost Pines 1 uses 68 percent of all consumed water and Sim Gideon uses 32 percent.

Table 2 Summary of Estimated Water Use for Winchester Power Park – 2015 - 2017

Type of Use	Acre-feet/year

Combustion and generation enhancement	1
Total	**1**

Based on an average generation for years 2015 - 2017 and the water use above, Lost Pines 1 uses 0.135 gallons per kWh or 135 gallons per MWh. The Sim Gideon Plant uses 0.439 gallons per kWh or 439 gallons per MWh. Winchester Power Park uses 0.007 gallons per kWh or 7 gallon per MWh.

3.0 Lost Pines Power Park Water Conservation Goals and Strategies

The following are water conservation features for Lost Pines Power Park:

- Lost Pines 1 is a combined cycle power plant, the most significant conservation feature of Lost Pines Power Park. If this was a conventional steam electric power plant, water use would increase by at least 2,103 acre-feet per year. Lost Pines 1 savings are based on water usage rates of the similarly loaded FPP units, applied to the non-steam, combustion turbine generation of Lost Pines 1.
- Use of low-NOx burners and selective catalytic reduction technology instead of water injection. This controls nitrogen oxides during combustion. If Lost Pines 1 owners had not chosen this type of technology at the time of design and construction of Lost Pines 1 in 1999, Lost Pines1 would have had an additional water requirement of 503 acre-feet per year.
- Reuse of half of treated domestic wastewater saves 1 acre-foot per year. *
- Water conservation discussions during monthly safety meetings.
- Aggressive repair of potable water leaks both within the plant and up to the water meter just outside of the plant boundaries.*
- Aggressive repair of service water leaks within the plant.*
- Indirect reuse due to boiler water production rejects and sanitation water processing totals 44 acre-feet per year.
- The use of groundwater for plant use has eliminated delivery losses for water released from lakes Buchanan and Travis by an average of 140 acre-feet per year.

*These items save an estimated 1 acre-foot per year combined.

Future conservation strategies include:

- Maintaining zero water use for landscape with a savings goal of 1 acre-foot per year.
- Continuing existing water conservation strategies outlined above.

APPENDIX C

FAYETTE POWER PROJECT WATER CONSERVATION PLAN

1.0 Fayette Power Project Description

FPP is a coal-fired steam electric power plant. Beginning operation in 1979, this three unit facility in the past used a mixture of western sub-bituminous coal and local lignite, but has used sub-bituminous coal exclusively for many years. The three units have a generating capacity of 1,708 MW. Some of the generating capacity is co-owned by LCRA and the City of Austin.

- Unit 1, completed in 1979, with a gross capacity of 624 MW (co-owned with Austin Energy)
- Unit 2, completed in 1980, with a gross capacity of 624 MW (co-owned with Austin Energy)
- Unit 3, completed in 1988, with a gross capacity of 460 MW

FPP is in Fayette County on Cedar Creek Reservoir. Certificate of Adjudication 14-5474 authorizes LCRA to impound up to 71,400 acre-feet in the reservoir. LCRA is authorized to divert up to 73,759 acre-feet per year of water from the Colorado River to the reservoir for industrial purposes under Certificates of Adjudication Nos.14-5478 and 14-5482. As part of 14-5474, LCRA is also authorized to impound inflows from the Cedar Creek Watershed. LCRA is authorized to divert, circulate and re-circulate from the Cedar Creek Reservoir for industrial purposes. The City of Austin has its own water right, no. 14-5471, for the diversion of up to 24,000 acre-feet per year from the Colorado River, plus a contract with LCRA for 7,500 acre-feet per year.

The surface water is pumped from the Colorado River through a pipeline to maintain lake levels. The metered diversions from the river for 2015, 2016 and 2017 measured 9,893 acre-feet per year, 8,581 acre-feet per year and 17,426 acre-feet per year, respectively, for an average of 11,967 acre-feet per year. These values include both LCRA and Austin Energy portions. Additional water is captured from the Cedar Creek watershed and impounded.

There are several smaller industrial waste ponds on site, including the Reclaim Pond, the Coal Pile Runoff Pond (CPRP), the Combustion By-products Landfill Pond (CBLP) and the Ash Silo Area Pond. Water from CPRP, CBLP and the Ash Silo Area Pond are capable of transferring water to the Reclaim Pond, along with other sources from the plant for reuse.

2.0 Fayette Power Project Water Use

Water is currently used at FPP for the following:

- Cooling pond forced evaporation from condenser cooling and other equipment cooling.
- Stack gas scrubbers for air pollution control on Units 1, 2 and 3.
- Natural evaporation from the various industrial waste ponds.

- Boiler soot blowing and venting.
- Boiler seal systems and bottom ash removal systems.
- Plant wash-down systems and dust suppression.
- Potable water purchased for employee sanitation and landscape irrigation.

2.1 Condenser Cooling

The water from the cooling pond at FPP is heated approximately 20^{o} F as it passes through the condenser heat exchangers. This warm water is then circulated back into and through the reservoir to cool by the processes of evaporation, convection and radiant cooling. During 2015 - 2017, FPP generated a total of 32,388,575 MWh or an average of 10,796,192 MWh per year. Based on the previously mentioned method by George Ward, the forced evaporation for all three units due to condenser cooling calculates to an average of 10,517 acre-feet per year.

Water from Cedar Creek Reservoir also cools a variety of mechanical equipment. Based on historical test data, this cooling water stream rejects approximately 2 percent as much heat to the lake as the condenser cooling water. This results in another 210 acre-feet per year of forced evaporation.

2.2 Stack Gas Scrubbers

Stack gas scrubbers are used to remove sulfur oxides from the power plant stack gas emissions. All three FPP units have flue gas desulfurization systems, and use scrubbers with a slurry of powdered limestone to capture the sulfur oxides. The heat content of the stack gas represents approximately 10 percent of the energy released through coal combustion at the power plant. Water in the slurry cools the gas to below the water boiling point through evaporation. This process results in approximately 1,952 acre-feet per year of water consumed through evaporation, based on water use testing and the 2015-2017 generating output levels. The resulting slurry from the scrubber process contains calcium sulfate and is a by-product sold to third parties for making wall board or as a concrete additive.

Much of the water used for the scrubber process can be obtained from the reclaim pond which collects water from the following sources:

- Rainwater, both direct and runoff.
- Boiler water treatment processes.
- Domestic wastewater treated effluent.
- Runoff from other sources.

This reclaim pond is an example of an industrial storm and rainwater reuse project.

2.3 Industrial Wastewater Pond Natural Evaporation

The reclaim pond, CPRP, CBLP and the Ash Silo Area Pond exist to support plant operations. This report categorizes their net natural evaporation (natural evaporation minus rainfall) as used water. During 2015-2017, the ponds evaporated a combined average of 7

acre-feet of water per year. During that time period, natural evaporation and rainfall at the FPP location almost equaled each other.

2.4 Boiler Soot Blowing and Vents

The boilers use 324 acre-feet per year through soot blowing operations and a variety of ventings to atmosphere.

2.5 FPP Boiler Seal Systems and Bottom Ash Removal

The bottom ash and seal systems use 65 acre-feet per year. In 2010, FPP completed the installation of the Unit 1 and Unit 2 Submerged Scraper Conveyor projects. This allowed the completion of another project to close and backfill the Ash Silo Area Pond. Before the completion of these two projects, the Ash Silo Area Pond evaporated 40 acre-feet per year.

2.6 Plant Wash-Down Systems and Dust Suppression

FPP uses water to limit the generation, dispersion and accumulation of dust, including coal dust, throughout the plant site. According to a combination of measured flows and FPP Water Balance values, the plant uses 168 acre-feet per year to perform these health- and safety-related tasks.

2.7 Potable Water Purchases

FPP purchases potable water from the Fayette Water Supply Corporation (WSC) whose source is groundwater from the Carrizo-Wilcox Aquifer. The plant has about 185 personnel. Approximately 19 acre-feet of treated water are purchased annually, of which approximately 1 acre-feet is used for landscape irrigation purposes and 18 acre-feet for employee sanitation. Approximately 11 acre-feet per year of treated waste water is sent to the reclaim pond for reuse.

The plumbing fixtures at FPP are water-conserving based on the current federal standard.

Table 1 Fayette Power Project Estimated Annual Water Use

Type of Use	Acre- feet/year
Forced evaporation	10,727
Scrubbers	1,952
Boiler soot blowing and venting	324
Boiler sealing and bottom ash handling	65
Net natural evaporation from industrial waste ponds	7
Dust control and wash down	168
Employee consumption	18
Landscape irrigation	1
Total	**13,262**

Table 1 indicates more than 99 percent of the water use at FPP is for plant operations, while less than 1 percent is used for employee sanitation and irrigation purposes. Based on an average generation for 2015 - 2017 and the above water use, water use per kWh at FPP is 0.400 gallons per kWh or 400 gallons per MWh.

3.0 Fayette Power Project Water Conservation Features and Strategies

Water-saving features for FPP include:

- Water-saving plumbing fixtures for employees: (2 acre-feet per year).
- Minimal landscape watering: (1 acre-foot per year).
- **Total savings: 3 acre-feet per year**.

Direct reuse features for FPP involve using the reclaim pond water for:

- Stack gas scrubber makeup: (546 acre-feet per year).
- Various plant wash down locations: (37 acre-feet per year).
- Boiler sealing systems: (113 acre-feet per year).
- **Total direct reuse: 696 acre-feet per year.**

Indirect reuse features for FPP include:

- Recycling CPRP water back to the reservoir: (267 acre-feet per year).
- Sending boiler water production system (reverse osmosis system) process reject water to cooling pond for makeup purposes: (129 acre-feet per year).
- **Total indirect reuse: 396 acre-feet per year.**

~~APPENDIX D~~

~~FERGUSON POWER PLANT WATER CONSERVATION PLAN~~

~~1.0 Ferguson Power Plant Description~~

~~The Thomas C. Ferguson Power Plant, a 527 MW (Gross Dependable, Summer Capacity) natural gas-fired, is combined-cycle power plant in Horseshoe Bay. The Ferguson plant became commercially operational in 2014. Like Lost Pines 1, Ferguson employs two combustion turbine-generators and one steam-powered turbine-generator. As a result, Ferguson incorporates the same water-saving arrangement as Lost Pines 1, in which the two combustion turbines units do not reject heat to the cooling lake and do not cause any forced evaporation.~~

~~2.0 Ferguson Power Plant Water Use~~

~~The primary water uses at the Ferguson Power Plant are forced evaporation on Lake LBJ from condenser cooling and other equipment cooling, boiler makeup water and employee sanitation.~~

~~2.1 Condenser Cooling~~

~~Water from Lake LBJ is heated approximately 12^{o}F as it passes through the condenser's heat exchange process. This warm water is then circulated back into and through the lake for cooling by the processes of evaporation, convection, and radiant cooling.~~

~~In 2015, 2016, and 2017, Ferguson produced an average of 3,728,219 MWh each year – an average of 1,365,684 MWh per year from the steam turbine and 2,362,535 MWh per year from the two combustion turbines. The combustion turbines generate approximately 63 percent of the power output, and the steam turbine generates approximately 37 percent. Like Lost Pines, the combustion turbines do not reject heat to the cooling lake, causing much less forced evaporation than an equivalent simple cycle steam unit. Ferguson forced evaporation calculates to a 2015 - 2017 annual average of 1683 acre-feet. LCRA has refined its method for calculating forced evaporation at Ferguson beginning with the October 2018 data. Using the new calculation method, the resulting evaporation rates are approximately 20 to 30 percent lower than the rates calculated under the prior method.~~

~~2.2 Boiler Makeup Water~~

~~Boiler makeup water also is taken from Lake LBJ. It is treated by filtration, reverse osmosis (RO) and ion exchange before being used in the boiler. The resulting water is extremely pure.~~

~~High purity water also is used in the laboratory and for cooling the gas turbines inlet air. In 2016-2017, Ferguson pulled an average of 194 acre-feet of water per year for this purpose,~~

using average of 136 acre-feet per year and returning an average of 58 acre-feet per year to Lake LBJ.

2.3 Employee Sanitation

Ferguson purchases approximately one acre-feet of water per year from the City of Horseshoe Bay for employee sanitation facilities.

2.4 Landscape Irrigation

Ferguson performs no landscape irrigation.

Table 1 Ferguson Power Plant Estimated Annual Water Use

Type of Use	Acre- feet/year
Forced evaporation	1,683
Boiler makeup	136
Employee consumption	1
Total	**1,820**

3.0 Ferguson Power Plant Water Conservation Goals and Strategies

The following are water conservation features for the Ferguson Power Plant:

- The Ferguson combined cycle design. If Ferguson was a conventional, simple cycle steam power plant, water use would increase by at least 2,759 acre-feet per year. Water savings at Ferguson are based on water usage rates of the similarly loaded FPP units, applied to the non-steam, combustion turbine generation of Ferguson.
- Indirect reuse due to boiler water production rejects and sanitation processing totals 58 acre-feet per year.
- Aggressive repair of water leaks within the plant.