REGION C WATER PLANNING GROUP

MODEL WATER CONSERVATION PLAN FOR STEAM ELECTRIC POWER GENERATORS

AUGUST 2019

Prepared for:

REGION C WATER PLANNING GROUP

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FOREWORD

This model water conservation plan for the fictional Poca Agua Steam Electric Power Station was prepared by Plummer, Freese and Nichols, and CP&Y for the Region C Water Planning Group. It is a template for steam electric power generators to use as they develop their own water conservation plans. Each steam electric power generator should customize the details to match their unique situation. The model plan was prepared pursuant to Texas Commission on Environmental Quality rules. The rules do not require a drought contingency plan for steam electric power generators.

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This model water conservation plan is based on the Texas Administrative Code in effect on August 5, 2019, and considers water conservation best management practices from the Texas Water Development Board's *Best Management Practices for Industrial Water Users*. Currently, the Water Conservation Advisory Council (WCAC) is reviewing additional Best Management Practices (BMPs) for industrial water users.

POCA AGUA STEAM ELECTRIC POWER STATION

WATER CONSERVATION PLAN

AUGUST 2019

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Poca Agua Steam Electric Power Station
Water Conservation Plan

August 2019

1. INTRODUCTION AND OBJECTIVES

Water supply has always been a key issue in the development of Texas. In recent years, the increasing population and economic development in Region C have led to growing demands for water supplies. At the same time, local and less expensive sources of water supply are largely developed. Additional supplies to meet higher demands will be expensive and difficult to develop. It is therefore important that we make efficient use of our existing supplies and make them last as long as possible. This will delay the need for new supplies, minimize the environmental impacts associated with developing new supplies, and delay the high cost of additional water supply development.

Recognizing the need for efficient use of existing water supplies, the Texas Commission on Environmental Quality (TCEQ) has developed rules governing the development of water conservation plans for industrial and mining water use (Appendix B).[1] The Poca Agua Steam Electric Power Station has adopted this water conservation plan pursuant to TCEQ rules.

This model water conservation plan includes measures that are intended to result in ongoing, long-term water savings. Best management practices established by the Texas Water Development Board were also considered in the development of the water conservation measures.[2] This plan replaces a previous model plan dated October 2014.

This model plan is a template for industrial users to use as they develop their own water conservation plans. This model plan includes all of the elements required by TCEQ. Each industrial user should customize the details to match its unique situation. At a minimum, this will include:

- Setting five-year and ten-year goals for per capita water use (Section 6).
- Completing a water conservation implementation report (Section 13).
- Adopting ordinance(s) or regulation(s) approving the model plan (Section 13).

The final adopted version should be provided to the TCEQ.

The plan lists the TCEQ rules; describes the power generation process at the Poca Agua Steam Electric Power Station and associated water uses; sets a water conservation goal; describes water measurement devices and methods; discusses leak detection, repair, and water loss accounting; and reports existing and future water use efficiency practices.

[1] Superscripted numbers match references listed in Appendix A.

2. TEXAS COMMISSION ON ENVIRONMENTAL QUALITY RULES

The TCEQ rules governing development of water conservation plans for industrial or mining use are contained in Title 30, Part 1, Chapter 288, Subchapter A, Rule 288.3 of the Texas Administrative Code (TAC), which is included in Appendix B. Holders of an existing permit, certified filing, or certificate of adjudication for the appropriation of surface water in the amount of 1,000 acre-feet a year or more for industrial uses must develop, submit, and implement a water conservation plan.

A water conservation plan is defined as "a strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s)[3]." The minimum requirements for water conservation plans for industrial or mining use are as follows:

TAC Reference	Subject	Plan Location
30 TAC §288.3(a)(1)	Production Process	Section 3, Appendix C
30 TAC §288.3(a)(2)	Water Conservation Goals	Section 4
30 TAC §288.3(a)(3)	Accurate Metering	Section 5
30 TAC §288.3(a)(4)	Leak Detection, Repair, and Water Loss Accounting	Section 6
30 TAC §288.3(a)(5)	Water Use Efficiency Process and/or Equipment Upgrades	Section 7
30 TAC §288.3(a)(6)	Other Conservation Practices	Section 8
30 TAC §288.3(b)	Review and Update of Plan	Section 9
30 TAC §288.30(2)	Water Conservation Implementation Report	Section 9

[TCEQ rules do not require a drought contingency plan for industrial or mining water users.]

3. DESCRIPTION OF THE WATER USES IN THE ELECTRIC GENERATION PROCESS

[This section must include a description of the use of the water in the production process, including how the water is diverted and transported from the source(s) of supply, how the water is utilized in the production process, and the estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal. If your facility uses other cooling methods, such as once-through cooling or dry-type cooling, please amend the process description below. Also modify the water sources and water uses to match those at your facility.]

The Poca Agua Steam Electric Power Station is a natural gas-fired electric generating facility located at 4220 Poca Agua Road in the City of Poca Agua, Texas, on the south shore of Poca Agua Reservoir. The facility consists of one natural gas-fired, 300 megawatt (MW) steam electric generating unit that has been in service since 1972.

Water used for cooling and industrial uses is supplied with surface water from Poca Agua Reservoir, a man-made reservoir that was constructed in part to meet water demands from the generating facility. This water is used for cooling, boiler feed, fire protection, and service water. A water use diagram for the Poca Agua Steam Electric Power Station is presented in Appendix C.

Cooling water is pumped from Poca Agua Reservoir through the condensers and returned to the reservoir (a "once-through" cooling process). Service water is taken from the cooling water and used for boiler feed and miscellaneous purposes. Service water is treated using a reverse osmosis/demineralization process to create a high-purity boiler feed water. Reverse osmosis reject water and boiler blowdown are monitored and treated as necessary before being returned to the reservoir along with the cooling water.

Miscellaneous non-potable water uses include equipment washdown and fire protection. The amount of miscellaneous surface water use is estimated by multiplying the capacity of the service water pumps by their run times. Average flowrates under normal operating conditions are shown on the water use diagram in Appendix C.

Stormwater from the facility is collected and routed through oil-water separators, monitored, and discharged to the reservoir.

Potable water for domestic purposes is supplied by the City of Poca Agua. Wastewater treatment is provided by an on-site septic system.

The largest consumptive water use at the Poca Agua Steam Electric Power Station is forced evaporation from the once-through cooling process. The forced evaporation is estimated to be 0.35 gallons per kilowatt-hour (kWh) of generation[2]. The exact amount varies from year to year depending on the amount of power generated at the facility and climatic conditions. Assuming a 50 percent load factor, approximately 1,411 acre-feet per year (ac-ft/yr) of cooling makeup water is required.

Miscellaneous uses consume approximately 7 ac-ft/yr, and domestic uses consume an average of approximately 2 ac-ft/yr. Because water is used for fire protection on a very infrequent, as-needed basis, no average annual quantity has been estimated.

4. SPECIFICATION OF WATER CONSERVATION GOALS

[This section must include specification of 5-year and 10-year water conservation goals and the basis for development of such goals. The goals established by an industrial user under this subparagraph are not enforceable.

Please amend the water conservation goals, basis, and time frame to match those at your facility. Examples of methods that could be used to conserve water include switching to a higher quality source water for cooling tower makeup water, using advanced treatment processes to allow more cycling of process water and to reduce water waste, switching to reclaimed water as a source for most uses, water wise landscaping, retrofit of domestic plumbing fixtures with water-efficient fixtures, and employee education[3,4].]

The Poca Agua Steam Electric Power Station has set a five-year water conservation goal of reducing total water usage by ___ percent (from 1,411 ac-ft/yr to ____ ac-ft/yr assuming a 50 percent load factor) by _____ *[five years from date of plan]*. The ten-year goal is the same as the five-year goal. This will be achieved by _____ *[insert proposed water conservation methods]*.

[In response to a charge by the 82nd Texas Legislature, the Texas Water Development Board and the TCEQ, in consultation with the Water Conservation Advisory Council, developed water use and calculation methodology for preparation of water use reports and water conservation plans in accordance with TCEQ rules. The guidance document[4] contains a chapter on developing and evaluating water use in the industrial sector, including identifying total water use, appropriate metrics for evaluating water use, factors that may affect industrial water use, establishment of water conservation goals, and measurement of water savings.]

5. ACCURATE METERING TO MEASURE AND ACCOUNT FOR WATER

[This section must include a description of the device(s) and/or method(s) within an accuracy of plus or minus five percent to be used to measure and account for the amount of water diverted from the source of supply. Please amend the metering description to match those at your facility.]

The Poca Agua Steam Electric Power Station estimates water usage by multiplying pump run times and pump capacity (from manufacturers' pump curves). This is the best available technology for measuring cooling water flows that can reach 360 million gallons per day when the plant is operating at full capacity. Daily cooling water flows are reported to the Texas Commission on Environmental Quality (TCEQ).

Domestic water supply obtained from the City of Poca Agua is metered by the City. The meter is calibrated according to the City's schedule and specifications.

6. LEAK DETECTION, REPAIR, AND WATER LOSS ACCOUNTING

[This section must include a description of leak-detection, repair, and water loss accounting in the water distribution system. Please amend the description below to match operations at your facility.]

At the Poca Agua Steam Electric Power Station, leaks are identified through the following methods:

- Plant personnel routinely observe, operate, and maintain facilities throughout the day. Inspection of aboveground piping and pump packing is a normal part of employee duties.

- Plant personnel collect water samples from various points in the process and have them analyzed for key water quality parameters. Water quality problems can be indicative of water leaks.

- Operators monitor the water level in various ponds and sumps. A large change in water level can also signify a water leak.

If a water leak is indicated by any of the above means, the source of the leak is investigated and a work order for repairs is issued as necessary.

7. WATER USE EFFICIENCY PROCESS AND/OR EQUIPMENT UPGRADES

[This section must include a description of equipment and/or process modifications to improve water use efficiency. Please amend the description below to match operations at your facility.]

Several water conservation methods are already in use at the Poca Agua Steam Electric Power Station, including the following:

- Cooling water is pumped from Poca Agua Reservoir through the condensers and returned to the reservoir (once-through cooling). Much of the cooling water returned to the reservoir is eventually drawn into the cooling water intake and reused for cooling purposes.

- Water/steam is circulated through the boiler process multiple times to reduce water usage.

- Chemical dosages and concentrations are closely monitored to allow maximum cycling of boiler water/steam without scaling or corrosion.

- Reverse osmosis treatment equipment has been placed ahead of the demineralizer in the boiler feed treatment process to increase the run time of the demineralizer between regeneration events. This has extended the run time of the demineralizer by a factor of ten and has resulted in 90 percent less water wasted from the regeneration process.

- Boiler wash water is recycled.

- Stormwater, floor/equipment drainage, and miscellaneous low-volume wastes are passed through oil-water separators and discharged back to the reservoir under an existing Texas Pollutant Discharge Elimination System (TPDES) permit. Much of this water is eventually drawn into the cooling water intake and reused for cooling purposes.

- Landscape areas around the generating station are not irrigated.

8. OTHER CONSERVATION PRACTICES, METHODS, OR TECHNIQUES

[This section must include any other water conservation practice, method, or technique that the user shows to be appropriate for achieving the stated goal(s) of the water conservation plan. Please amend the description below to match operations at your facility.

Best management practices established by the Texas Water Development Board should also be considered in the development of the water conservation measures.[2]]

No other water conservation methods are necessary to achieve the water conservation goals for the Poca Agua Steam Electric Power Station.

9. IMPLEMENTATION OF THE WATER CONSERVATION PLAN

Appendix D contains a copy of the Water Conservation Implementation Report for the Poca Agua Power Company. *[From 30 TAC §288.30(2), an implementation report for industrial use must include the following:*

- *The list of dates and descriptions of the conservation measures implemented;*
- *Data about whether or not targets in the plans are being met;*
- *The actual amount of water saved; and*
- *If the targets are not being met, an explanation as to why any of the targets are not being met, including any progress on that particular target.]*

Appendix E contains a copy of the resolution of the Board of Directors of the Poca Agua Power Company adopting this water conservation plan. The resolution designates responsible officials to implement and enforce the water conservation plan.

Appendix F contains a copy of a letter to the chairman of the Region C Water Planning Group to inform the planning group of this water conservation plan.

This plan will be reviewed and updated every five years.

Appendix A
List of References

List of References

1. Texas Commission on Environmental Quality: "Water Conservation Plans for Industrial or Mining Use," *Texas Administrative Code* Title 30 Part I Subchapter A §288.3, effective December 6, 2012.

2. Texas Water Development Board: *Best Management Practices for Industrial Water Users*, Austin, [Online] Available URL: https://www.twdb.texas.gov/conservation/BMPs/Ind/doc/IndMiniGuide.pdf, February 2013.

3. Texas Commission on Environmental Quality: "Definitions," *Texas Administrative Code* Title 30 Part I Subchapter A §288.1, effective August 16, 2018.

4. Texas Water Development Board and Texas Commission on Environmental Quality in consultation with Water Conservation Advisory Council: *Guidance and Methodology for Reporting on Water Conservation and Water Use*, Austin, [Online] Available URL: http://www.twdb.texas.gov/conservation/doc/SB181Guidance.pdf, December 2012.

Appendix B

Texas Commission on Environmental Quality Rules on Water Conservation Plans for Industrial or Mining Water Use

SUBCHAPTER A: WATER CONSERVATION PLANS
§§288.1 - 288.7
Effective August 16, 2018

§288.1. Definitions.

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly indicates otherwise.

(1) Agricultural or Agriculture--Any of the following activities:

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

(B) the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or non-soil media by a nursery grower;

(C) raising, feeding, or keeping animals for breeding purposes or for the production of food or fiber, leather, pelts, or other tangible products having a commercial value;

(D) raising or keeping equine animals;

(E) wildlife management; and

(F) planting cover crops, including cover crops cultivated for transplantation, or leaving land idle for the purpose of participating in any governmental program or normal crop or livestock rotation procedure.

(2) Agricultural use--Any use or activity involving agriculture, including irrigation.

(3) Best management practices--Voluntary efficiency measures that save a quantifiable amount of water, either directly or indirectly, and that can be implemented within a specific time frame.

(4) Conservation--Those practices, techniques, and technologies that reduce the consumption of water, reduce the loss or waste of water, improve the efficiency in the use of water, or increase the recycling and reuse of water so that a water supply is made available for future or alternative uses.

(5) Commercial use--The use of water by a place of business, such as a hotel, restaurant, or office building. This does not include multi-family residences or agricultural, industrial, or institutional users.

(6) Drought contingency plan--A strategy or combination of strategies for temporary supply and demand management responses to temporary and potentially recurring water supply shortages

and other water supply emergencies. A drought contingency plan may be a separate document identified as such or may be contained within another water management document(s).

(7) Industrial use--The use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, and the development of power by means other than hydroelectric, but does not include agricultural use.

(8) Institutional use--The use of water by an establishment dedicated to public service, such as a school, university, church, hospital, nursing home, prison, or government facility. All facilities dedicated to public service are considered institutional regardless of ownership.

(9) Irrigation--The agricultural use of water for the irrigation of crops, trees, and pastureland, including, but not limited to, golf courses and parks which do not receive water from a public water supplier.

(10) Irrigation water use efficiency--The percentage of that amount of irrigation water which is beneficially used by agriculture crops or other vegetation relative to the amount of water diverted from the source(s) of supply. Beneficial uses of water for irrigation purposes include, but are not limited to, evapotranspiration needs for vegetative maintenance and growth, salinity management, and leaching requirements associated with irrigation.

(11) Mining use--The use of water for mining processes including hydraulic use, drilling, washing sand and gravel, and oil field re-pressuring.

(12) Municipal use--The use of potable water provided by a public water supplier as well as the use of sewage effluent for residential, commercial, industrial, agricultural, institutional, and wholesale uses.

(13) Nursery grower--A person engaged in the practice of floriculture, viticulture, silviculture, and horticulture, including the cultivation of plants in containers or nonsoil media, who grows more than 50% of the products that the person either sells or leases, regardless of the variety sold, leased, or grown. For the purpose of this definition, grow means the actual cultivation or propagation of the product beyond the mere holding or maintaining of the item prior to sale or lease, and typically includes activities associated with the production or multiplying of stock such as the development of new plants from cuttings, grafts, plugs, or seedlings.

(14) Pollution--The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the state that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

(15) Public water supplier--An individual or entity that supplies water to the public for human consumption.

(16) Regional water planning group--A group established by the Texas Water Development Board to prepare a regional water plan under Texas Water Code, §16.053.

(17) Residential gallons per capita per day--The total gallons sold for residential use by a public water supplier divided by the residential population served and then divided by the number of days in the year.

(18) Residential use--The use of water that is billed to single and multi-family residences, which applies to indoor and outdoor uses.

(19) Retail public water supplier--An individual or entity that for compensation supplies water to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants when that water is not resold to or used by others.

(20) Reuse--The authorized use for one or more beneficial purposes of use of water that remains unconsumed after the water is used for the original purpose of use and before that water is either disposed of or discharged or otherwise allowed to flow into a watercourse, lake, or other body of state-owned water.

(21) Total use--The volume of raw or potable water provided by a public water supplier to billed customer sectors or nonrevenue uses and the volume lost during conveyance, treatment, or transmission of that water.

(22) Total gallons per capita per day (GPCD)--The total amount of water diverted and/or pumped for potable use divided by the total permanent population divided by the days of the year. Diversion volumes of reuse as defined in this chapter shall be credited against total diversion volumes for the purposes of calculating GPCD for targets and goals.

(23) Water conservation coordinator--The person designated by a retail public water supplier that is responsible for implementing a water conservation plan.

(24) Water conservation plan--A strategy or combination of strategies for reducing the volume of water withdrawn from a water supply source, for reducing the loss or waste of water, for maintaining or improving the efficiency in the use of water, for increasing the recycling and reuse of water, and for preventing the pollution of water. A water conservation plan may be a separate document identified as such or may be contained within another water management document(s).

(25) Wholesale public water supplier--An individual or entity that for compensation supplies water to another for resale to the public for human consumption. The term does not include an individual or entity that supplies water to itself or its employees or tenants as an incident of that employee service or tenancy when that water is not resold to or used by others, or an individual or entity that conveys water to another individual or entity, but does not own the right to the water which is conveyed, whether or not for a delivery fee.

(26) Wholesale use--Water sold from one entity or public water supplier to other retail water purveyors for resale to individual customers.

Adopted July 25, 2018 Effective August 16, 2018

§288.3. Water Conservation Plans for Industrial or Mining Use.

(a) A water conservation plan for industrial or mining uses of water must provide information in response to each of the following elements. If the plan does not provide information for each requirement, the industrial or mining water user shall include in the plan an explanation of why the requirement is not applicable.

(1) a description of the use of the water in the production process, including how the water is diverted and transported from the source(s) of supply, how the water is utilized in the production process, and the estimated quantity of water consumed in the production process and therefore unavailable for reuse, discharge, or other means of disposal;

(2) specific, quantified five-year and ten-year targets for water savings and the basis for the development of such goals. The goals established by industrial or mining water users under this paragraph are not enforceable;

(3) a description of the device(s) and/or method(s) within an accuracy of plus or minus 5.0% to be used in order to measure and account for the amount of water diverted from the source of supply;

(4) leak-detection, repair, and accounting for water loss in the water distribution system;

(5) application of state-of-the-art equipment and/or process modifications to improve water use efficiency; and

(6) any other water conservation practice, method, or technique which the user shows to be appropriate for achieving the stated goal or goals of the water conservation plan.

(b) An industrial or mining water user shall review and update its water conservation plan, as appropriate, based on an assessment of previous five-year and ten-year targets and any other new or updated information. The industrial or mining water user shall review and update the next revision of its water conservation plan every five years to coincide with the regional water planning group.

Adopted November 14, 2012 Effective December 6, 2012

Appendix C
Water Use Diagram

Water Use Diagram
Poca Agua Steam Electric Power Station

[Insert water use diagram here. Show all water uses, sources, and flowrates.]

Appendix D
Water Conservation Implementation Report

Water Conservation Implementation Report
Poca Agua Steam Electric Power Station

[Insert water conservation implementation report here. The implementation report must include the following:

- *The list of dates and descriptions of the conservation measures implemented;*
- *Data about whether or not targets in the plans are being met;*
- *The actual amount of water saved; and*
- *If the targets are not being met, an explanation as to why any of the targets are not being met, including any progress on that particular target.]*

Appendix E
Board Resolution Adopting the Water Conservation Plan

[Insert Board resolution adopting the water conservation plan.]

Appendix F
Letter to the Region C Water Planning Group

[Insert letter to the Region C Water Planning Group.]