Appendix E

Applicant's Environmental Report

Operating License Renewal Stage

Comanche Peak Nuclear Power Plant

Units 1 and 2

October 2022

Table of Contents

List of Tables

List of Figures

List of Attachments

Abbreviations, Acronyms, and Symbols

§	Section
°C	degrees Celsius
°F	degrees Fahrenheit
AADT	average annual daily traffic
AD	anno Domini—with respect to time period
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ALWR	advanced light water reactor
AM	accident management
APE	area of potential effect
AQCR	air quality control region
BC	before Christ—with respect to time period
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BOD	biological oxygen demand
BP	before present – with respect to time period
BRA	Brazos River Authority
BTA	best technology available
Btu	British thermal unit
ca.	circa
CAA	Clean Air Act
CCRS	closed-cycle recirculating system
CCW	component cooling water
CCWS	component cooling water system
CDF	core damage frequency
CDP	census-designated place
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLB	current licensing basis
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent

COLA	combined license application
CPI	containment performance improvement
CP PowerCo	Comanche Peak Power Company, LLC
CPNPP	Comanche Peak Nuclear Power Plant
CVCS	chemical and volume control system
CWA	Clean Water Act (Federal Water Pollution Control Act)
CWIS	cooling water intake structure
CWS	circulating water system
CZMA	Coastal Zone Management Act
DBA	design-basis accident
dBA	A-weighted decibels
DDT	dichlorodiphenyltrichloroethane
DECON	dismantling and decontamination, one of three NRC decommissioning strategies
DO	dissolved oxygen
DOE	U.S. Department of Energy
DSM	demand-side management
EA	environmental assessment
EAB	exclusion area boundary
ECCS	emergency core cooling system
EFH	Essential Fish Habitat
EIS	environmental impact statement
ENTOMB	permanent entombment on site, one of three NRC decommissioning strategies
EPA	U.S. Environmental Protection Agency
EPP	emergency preparedness plan
EPRI	Electric Power Research Institute
ER	environmental report
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FDS	filter demineralizer system
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission

FES	final environmental statement
FPPA	Farmland Protection Policy Act
fps	feet per second
FR	Federal Register
FSAR	final safety analysis report
FWAT	flow-weighted average temperature
gal/kWh	gallons per kilowatt hour
GEIS	NUREG-1437, Revision 1, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GHG	greenhouse gas
GPI	Groundwater Protection Initiative
gpd	gallons per day
gpm	gallons per minute
gpm_a	average gallons per minute for the month
GPP	groundwater protection program
gpy	gallons per year
GWd/MTU	gigawatt-days per metric ton of uranium
GWPS	gaseous waste processing system
GWR	gaseous waste release
HAP	hazardous air pollutant
HAPC	habitat areas of particular concern
HUD	U.S. Department of Housing and Urban Development
HUC	hydrologic unit code
I-20	Interstate 20
I-35	Interstate 35
I-35W	Interstate 35W
IPA	integrated plant assessment
IPE	individual plant examination
IPEEE	individual plant examination of external events
ISFSI	independent spent fuel storage installation
km	Kilometer
kV	kilovolt
LAR	license amendment request
Ldn	day-night 24-hour average (noise)

LERF	large early release frequency
lg	magnitude short period surface wave (earthquakes)
LLMW	low-level mixed waste
LLRF	large late release frequency
LLRW	low-level radioactive waste
LLW	low-level waste
LOCA	loss of coolant accident
LOS	level of service
LR	license renewal
LRA	license renewal application
Luminant	Luminant Generation Company, LLC
LWPS	liquid waste processing system
mb	Short period body-wave magnitude (earthquakes)
MB	maximum benefit
mb_lg / mblg	magnitude short period surface wave (earthquakes)
MBTA	Migratory Bird Treaty Act
md	magnitude duration (earthquakes)
MDCT	mechanical draft cooling towers
MG	million gallons
mg/L	milligram per liter
MGD	millions of gallons per day
MGM	millions of gallons per month
MGY	millions of gallons per year
ml	local magnitude (earthquakes)
MM	modified Mercalli intensity (seismic intensity scale)
MMBtu	million British thermal units
mph	miles per hour
mrem/year	milli roentgen equivalent man/year
MRLC	Multi-Resolution Land Characteristics Consortium
msl	mean sea level
MW	megawatts
MWD/MTU	megawatt days per metric ton uranium
MWe	megawatts electric
Mwr	magnitude regional (earthquakes)

MWt	megawatts thermal
NA	not available/not applicable
NAAQS	national ambient air quality standards
NAVD88	North American Vertical Datum 1988
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NG	National Guard
NGCC	natural gas-fired combined-cycle
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NUREG	U.S. Nuclear Regulatory Commission technical report designation
NWI	National Wetlands Inventory
NWS	National Weather Service
OCA	owner-controlled area
ODCM	offsite dose calculation manual
OL	operating license
OSHA	Occupational Safety and Health Administration
P2	pollution prevention
Pb	lead
pc/h	passenger cars per hour
PCB	polychlorinated biphenyl

pCi/l	picoCuries per liter
PEO	period of extended operation
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
PM	particulate matter
PMF	probable maximum flood
PRA	probabilistic risk assessment
psi	pounds per square inch
PV	photovoltaic
PWR	pressurized water reactor
PWS	public water system
RCRA	Resource Conservation and Recovery Act
RCS	reactor coolant system
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
ROL	renewed operating license
ROW	right-of-way
RWST	refueling water storage tank
SAFSTOR	safe storage, one of three NRC decommissioning strategies
SAMDA	severe accident mitigation design alternatives
SAMA	severe accident mitigation alternative
SAP	Severe Accident Program
SAR	safety analysis report
SBO	station blackout
SCP	Squaw Creek Park
SCR	Squaw Creek Reservoir
SCWD	Somervell County Water District
SERF	small early release frequency
SHPO	state historic preservation officer
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMITTR	surveillance, monitoring, inspections, testing, trending, and recordkeeping
SMR	small modular reactor

SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasure
SPU	stretch power uprate
SNF	spent nuclear fuel
SSA	sole source aquifer
SSC	systems, structures, and components
SSI	safe shutdown impoundment
SSWS	station service water system
STC	source term category
SWPPP	stormwater pollution prevention plan
TEDE	total effective dose equivalent
TCEQ	Texas Commission on Environmental Quality
TGLO	Texas General Land Office
THC	Texas Historical Commission
THL	Texas horned lizard
THPO	tribal historic preservation officer
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TSS	total suspended solids
TWC	Texas Water Commission
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
TXNDD	Texas Natural Diversity Database
USACE	U.S. Army Corps of Engineers
US-APWR	U.S. Advanced Pressurized Water Reactor
USC	U.S. Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Vistra OpCo	Vistra Operations Company, LLC
VOC	volatile organic compound
WWTP	Wastewater treatment plant

1.0 INTRODUCTION

1.1 Purpose of and Need for Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Vistra Operations Company LLC (Vistra OpCo) operates Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 pursuant to NRC operating licenses (OLs) NPF-87 and NPF-89, respectively. The current Unit 1 OL will expire at midnight on February 8, 2030, and the current Unit 2 OL will expire at midnight on February 2, 2033. CPNPP is located on Squaw Creek Reservoir (SCR) in Somervell County, Texas, about 5 miles north-northwest of Glen Rose, Texas, and about 40 miles southwest of Fort Worth in north-central Texas.

Vistra OpCo has prepared this environmental report (ER) in conjunction with its application to the NRC for a renewal of the CPNPP OLs, as provided by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application—Environmental Information [10 CFR 54.23], and
- Title 10, Energy, CFR, Part 51, Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)]

The NRC has defined the purpose and need for the proposed action, renewal of the OLs for nuclear power plants such as CPNPP, as follows (NRC 2013a):

> *The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decision-makers, such as State, utility, and, where authorized, Federal agencies (other than the NRC). Unless there are findings in the safety review required by the Atomic Energy Act or the NEPA [National Environmental Policy Act] environmental review that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.*

The renewed OLs (ROLs) would allow an additional 20 years of operation for the CPNPP units beyond their current licensed operating periods. The renewed license for CPNPP Unit 1 would expire at midnight on February 8, 2050, and the renewed license for CPNPP Unit 2 would expire at midnight on February 2, 2053.

Vistra OpCo has prepared Table 1.1-1 to verify conformance with regulatory requirements. Table 1.1-1 indicates the sections in the CPNPP license renewal (LR) ER that respond to each requirement of 10 CFR 51.53(c).

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 1 of 3)

Description	Requirement	ER Section(s)
Environmental Report—General Requirements [10 CFR 51.45]		
Description of the proposed action	10 CFR 51.45(b)	2.1
Statement of the purposes of the proposed action	10 CFR 51.45(b)	1.1
Description of the environment affected	10 CFR 51.45(b)	3.0
Impact of the proposed action on the environment	10 CFR 51.45(b)(1)	4.0
Adverse environmental effects which cannot be avoided should the proposal be implemented	10 CFR 51.45(b)(2)	6.3
Alternatives to the proposed action.	10 CFR 51.45(b)(3)	2.6, 7.0, 8.0
Relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity	10 CFR 51.45(b)(4)	6.5
Irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented	10 CFR 51.45(b)(5)	6.4
Analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects	10 CFR 51.45(c)	2.6, 4.0, 7.0, 8.0
Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and description of the status of compliance with these requirements	10 CFR 51.45(d)	9.1
Status of compliance with applicable environmental quality standards and requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements	10 CFR 51.45(d)	9.5
Alternatives in the report including a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements	10 CFR 51.45(d)	9.7
Information submitted pursuant to 10 CFR 51.45(b) through (d) and not confined to information supporting the proposed action but also including adverse information	10 CFR 51.45(e)	4.0, 6.3, 7.0, 9.3, 9.5

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 2 of 3)

Description	Requirement	ER Section(s)
Operating License Renewal Stage [10 CFR 51.53(c)]		
Description of the proposed action including the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21. The report must describe in detail the affected environment around the plant, the modifications directly affecting the environment or any plant effluents, and any planned refurbishment activities	10 CFR 51.53(c)(2)	2.1, 2.3, 2.4, 3.0, 4.0
Analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for applicable Category 2 issues, as discussed below	10 CFR 51.53(c)(3)(ii)	4.0
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.5.1
Groundwater Resources		
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.5.2
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute [gpm])	10 CFR 51.53(c)(3)(ii)(C)	4.5.3
Groundwater quality degradation (plants with cooling ponds at inland sites)	10 CFR 51.53(c)(3)(ii)(D)	4.5.4
Radionuclides released to groundwater	10 CFR 51.53(c)(3)(ii)(P)	4.5.5
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	4.6.1
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	4.6.2
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.6.3

Table 1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 3 of 3)

Description	Requirement	ER Section(s)
Terrestrial Resources		
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	4.6.4
Effects on terrestrial resources (non-cooling system impacts)	10 CFR 51.53(c)(3)(ii)(E)	4.6.5
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat	10 CFR 51.53(c)(3)(ii)(E)	4.6.6
Historic and Cultural Resources		
Historic and cultural resources	10 CFR 51.53(c)(3)(ii)(K)	3.8, 4.7
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river)	10 CFR 51.53(c)(3)(ii)(G)	4.9.1
Electric shock hazards	10 CFR 51.53(c)(3)(ii)(H)	4.9.2
Environmental Justice		
Minority and low-income populations	10 CFR 51.53(c)(3)(ii)(N)	3.11.2, 4.10.1
Cumulative Impacts		
Cumulative impacts	10 CFR 51.53(c)(3)(ii)(O)	4.12
Postulated Accidents		
Severe accidents	10 CFR 51.53(c)(3)(ii)(L)	4.15.2
All Plants		
Consideration of alternatives for reducing adverse impacts for all Category 2 license renewal issues	10 CFR 51.53(c)(3)(iii)	7.3
New and significant information regarding the environmental impacts of license renewal of which the applicant is aware	10 CFR 51.53(c)(3)(iv)	4.0, 5.3

1.2 Environmental Report Scope and Methodology

NRC regulations for domestic licensing of nuclear power plants require reviews of environmental impacts from renewing an OL. NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled, "Applicant's Environmental Report—Operating License Renewal Stage." In determining what information to include in the CPNPP LR applicant's ER, Vistra OpCo has relied on NRC regulations and the following supporting documents that provide additional insight into the regulatory requirements:

- *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC 2013a), and referenced information specific to transportation (NRC 1999)
- NRC supplemental information in the *Federal Register* (FR) (78 FR 37282)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses* (NRC 1996a)
- *Regulatory Guide 4.2, Supplement 1, Revision 1, Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications* (NRC 2013b)

1.3 Comanche Peak Nuclear Power Plant Licensee and Ownership

Vistra OpCo (operator) is acting on its own behalf and for Comanche Peak Power Company, LLC (CP PowerCo) (owner) by submitting this application. Vistra OpCo is a Delaware limited liability company, which is in turn wholly owned by the ultimate parent Vistra Corp (Vistra), a corporation formed under the laws of the State of Delaware with principal executive offices in Irving, TX. See Section 1 of the LRA for additional details regarding the organization of the applicant.

Vistra OpCo is the current licensed operator of CPNPP Units 1 and 2 (Facility Operating License No. NPF-87, Facility Operating License No. NPF-89), which are the subject of the LRA. Vistra OpCo will continue as the licensed operator for the ROLs and CP PowerCo will continue as the owner.

2.0 PROPOSED ACTION AND DESCRIPTION OF ALTERNATIVES

2.1 The Proposed Action

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the proposed action. The proposed action is to renew for the first time, and for an additional 20-year period, the OLs for CPNPP Units 1 and 2, which would preserve the option for Vistra OpCo to continue operating CPNPP and provide reliable high-capacity factor baseload power for the proposed LR operating term. For CPNPP Unit 1, the proposed action would extend the OL from February 8, 2030, to February 8, 2050. For CPNPP Unit 2, the proposed action would extend the OL from February 2, 2033, to February 2, 2053.

Vistra OpCo does not anticipate any LR-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. The relationship of refurbishment to LR is described in Section 2.3.

Changes to surveillance, monitoring, inspections, testing, trending, and recordkeeping (SMITTR) would be implemented as a result of the 10 CFR Part 54 aging management review for CPNPP. Potential SMITTR activities are described in Section 2.4. No plant upgrades to support extended operations that could directly affect the environment or plant effluents are planned to occur during this period of extended operation (PEO).

2.2 General Plant Information

The ER must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures. This report must describe in detail the affected environment around the plant and the modifications directly affecting the environment or any plant effluents. [10 CFR 51.53(c)(2)]

The CPNPP site is situated on a peninsula located on the southwestern bank of the SCR, which is contained completely within the bounds of the CPNPP site (Luminant 2013b, Section 2.2.1.1).

CPNPP Units 1 and 2 are located in Somervell County in north central Texas and are approximately 65 miles southwest of the Dallas-Fort Worth metropolitan area. In addition, the SCR, utilized for station cooling, extends northward into Hood County. The nearest community, Glen Rose, is located within 5 miles of the site, while Canyon Creek, Granbury, Pecan Plantation, and Tolar are located within 10 miles of the site. Table 3.11-1 provides a list of communities located within a 50-mile radius of CPNPP and their respective distances from site. Arlington, Fort Worth, and Grand Prairie are the major population centers (population greater than 100,000) within 50 miles of CPNPP (Table 3.11-1).

The prominent structures, housed facilities and equipment associated with each of the units include: the containment building (which houses the nuclear steam supply system including the

reactor, steam generators, reactor coolant pumps, and related equipment), the turbine building (where the turbine generator and associated main condensers are located), the auxiliary building, safeguard building, diesel generator building, and the fuel building (where the spent fuel storage pool and storage facilities for new fuel are located). Prominent features beyond the power block area include the circulating water intake structure, service water intake structure, discharge tunnel, evaporation ponds, sewage treatment plant, technical and administrative support facilities, firing range, meteorological towers, 345-kilovolt (kV) and 138 kV switchyards. Auxiliary building including control room, fuel building, service water intake structure, circulating water intake structure, and circulating water discharge structure are shared by both units. The tallest structures on the site, particularly the reactor domes (approximately 260.5 feet high) are visible from the Dinosaur Valley State Park and Oakdale Park (Luminant 2013b, Section 4.4.1.4). Figure 3.1-1 shows the general features of the facility and the exclusion area boundary (EAB).

As discussed in Section 3.1.2, CPNPP maintains Squaw Creek Park (SCP) within the site boundary and controls public access to the park and reservoir via County Road 213. The portion of the SCR within the EAB is subject to the waterway exclusion provided in 10 CFR Part 100.3. Consistent with that regulation, appropriate and effective arrangements are in place to control traffic on the reservoir to protect the public health and safety in case of emergency.

2.2.1 Reactor and Containment Systems

2.2.1.1 Reactor System

As shown in Figure 3.1-1, CPNPP is a two-unit (Units 1 and 2) plant. The Unit 1 OL was issued on April 17, 1990. The Unit 2 OL was issued on April 6, 1993. The nuclear steam supply system (NSSS) for each unit is a pressurized water reactor (PWR), which along with the design and fabrication of the initial cores, was supplied by Westinghouse Electric Corporation . CPNPP Units 1 and 2 are essentially identical units (NRC 1981, Section 5.8.2.3). Each of the two generating units consists of one PWR, four steam generators, one steam turbine-generator, a heat dissipation system, and associated auxiliary and engineered safeguards (NRC 1981, Sections 1.1).

The reactor core, inside the reactor pressure vessel, consists of uranium dioxide (UO_2) fuel pellets and control rods. The reactor coolant is water under high pressure containing a low concentration of boron to control reactor core reactivity. The coolant flows upward through the reactor core, then from the reactor vessel to the steam generator where it gives up its heat. Heat given up by the reactor coolant is transferred in the steam generator to the main steam/condensate system, causing the secondary coolant to boil. Steam from the boiling secondary coolant is routed to the turbine generator. As the steam passes through the turbine-generator it gives up its energy, causing the turbine to rotate and generate electric power. As the steam releases its energy, its pressure is reduced until it leaves the turbine generator at a partial vacuum. It is then cooled in the main condenser and the condensed water is pumped back to the steam generator. The condenser is arranged such that the steam condensing on the

outside of the tubes can transfer its heat to the water from the cooling reservoir flowing inside the tubes.

Each unit was initially licensed to generate net electrical output of 1,150 megawatts electric (MWe). In 2007, CPNPP submitted an application to the NRC in support of CPNPP Units 1 and 2 stretch power uprate (SPU). The SPU license amendment was approved by the NRC in June 2008 (NRC 2008a). The SPU increased the power output from 3,411 megawatts thermal (MWt) to 3,612 MWt, an increase of 5.9 percent (Luminant 2007). CPNPP is currently licensed for maximum enrichment of 5 percent by weight of U-235.

As part of the SPU, high-pressure turbines at both units were replaced. This did not change the method of generating electricity or the method of handling any influents from the environment or non-radiological effluents to the environment. (NRC 2008b) CPNPP evaluates the impact of the SPU on radiological effluents in Section 2.2.6. No additional power uprates, or measurement uncertainty uprates are planned at this time.

The reactor core is a multi-regions core composed of slightly enriched uranium dioxide pellets enclosed in pressurized, cold worked, Zircaloy-4 or ZIRLO® high performance fuel cladding material tubing, which is plugged, and seal welded at the ends to encapsulate the fuel. Zircaloy-4 and ZIRLO clad have a high corrosion resistance to the coolant, fuel, and fission products. All fuel rods are pressurized with helium during fabrication. The basic fuel assembly consists of the control rod guide thimbles attached to the grids and the top and bottom nozzles. The fuel assemblies are designed to accept control rod insertions in order to provide the required reactivity control for power operations and reactivity shutdown conditions. The fuel rods are supported at intervals along their length by grid assemblies which maintain the lateral spacing between the rods throughout the design life of the assembly. The fuel rods are held by the grids in the assembly to provide for very stiff support.

CPNPP utilizes Westinghouse fuel assembly with VANTAGE + fuel design. The fuel rods are loaded into the fuel assembly structure so that there is clearance between the fuel rod ends and the top and bottom nozzles. All fuel assemblies in the core are functionally identical. Each fuel assembly contains 264 fuel rods of 0.360-inch nominal outer diameter, 24 guide thimble tubes, and one instrumentation tube in a 17 x 17 array supported by eight spacer grids, three intermediate flow mixer grids, and one debris-filtering protective grid in the fuel assembly structure. The reactor core is comprised of an array of fuel assemblies which have different fuel enrichments. The initial loading of fuel into the core is designed so that fuel assemblies with the highest enrichment are placed in the outer region of the core while the two groups of fuel assemblies with lower enrichment are selectively arranged in the central region. During refueling operations, a portion of the fuel is discharged, and new fuel is loaded into the core. The fuel in the reactor core is arranged to achieve an acceptable power distribution.

Reactivity control is provided by two independent systems, neutron absorbing rods and the chemical and volume control system (CVCS) which varies boric acid concentration to control long term reactivity changes. The CVCS regulates the concentration of a chemical neutron

absorber (boron) in the reactor coolant to control reactivity changes resulting from the change in reactor coolant temperature between cold shutdown and hot full-power operation, burnup of fuel and burnable poisons, buildup of fission products in the fuel, and xenon transients. The CVCS compensates for long term reactivity changes and can make the reactor subcritical without the benefit of the control element drive system. The rod cluster control assemblies provide reactivity control for shutdown, reactivity changes due to coolant temperature changes in the power range, reactivity changes associated with the power coefficient of reactivity, and reactivity changes due to void formation.

Burnable absorbers may also be used for reactivity control. The most effective reactivity control components are the full-length rod cluster control assemblies and their corresponding control rod drive mechanisms which are the only moving parts in the reactor.

Control rod assemblies are inserted into the guide thimbles of the fuel assemblies. The absorber sections of the control rods are fabricated from silver-indium-cadmium and sealed in stainless steel tubes. Neutron control for slow transients is provided by means of boric acid in solution in the reactor coolant system (RCS).

The reactor core fuel loading and programming is designed to yield a minimum core average burnup of 10,000 megawatt-days per metric ton of uranium (MWD/MTU) and lead rod average burnup of 62,000 MWD/MTU for 18 months fuel cycle. There are no plans to increase the maximum enrichment of fuel beyond 5 percent and average burnup beyond 62,000 MWD/MTU during the proposed LR operating term.

2.2.1.2 Containment System

The containment is a steel-lined, reinforced concrete structure which consists of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit. The interior steel liner is constructed with carbon steel plate for leak tightness. The containment building completely encloses the reactor and the RCS. An interior structure within the containment building supports and provides shielding for the reactor, its steam generators, and other components of the NSSS. The containment superstructure is independent of the adjacent interior and exterior structures. Sufficient space is provided between the containment and the adjacent structures to prevent contact under all combinations of loadings. The containment is designed to withstand the pressures and temperatures resulting from a spectrum of loss of coolant accidents (LOCAs) and secondary system breaks. Together with its engineered safety features, each containment structure is designed to safely sustain internal and external environmental conditions that may reasonably be expected to occur during the life of the plant, including both short- and long-term effects following a LOCA.

The containment has a height of 260.5 feet above grade level. The cylindrical part of the structure consists of 4.5 feet thick walls and is 195 feet measured from the top of foundation mat to the dome spring line. The dome consists of 2.5-foot-thick concrete with an inside diameter of 135 feet.

Access to the containment structure is provided by a personnel airlock, an emergency airlock, and an equipment hatch. The primary shield wall (reactor cavity), a heavily reinforced concrete cylinder, is situated at the approximate center of the containment vessel and extends up from the interior base slab to surround the reactor vessel. This reactor cavity structure provides support for the reactor vessel. During normal operation, the primary shield wall provides biological shielding for maintenance inspection.

2.2.2 Maintenance, Inspection, and Refueling Activities

Various programs and activities at the site maintain, inspect, test, and monitor the performance of plant equipment and are detailed throughout the final safety analysis report (FSAR). These programs and activities include, but are not limited to, those implemented to achieve the following:

- Meet the requirements of 10 CFR Part 50, Appendix R (Fire Protection), Appendix B (Quality Assurance), Appendices G and H (Reactor Vessel).
- Meet the requirements of 10 CFR 50.55a Codes and Standards, which invoke the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI, In-service Inspection and Testing Requirements.
- Meet the requirements of 10 CFR 50.65, the maintenance rule.
- Maintain water chemistry in accordance with Electric Power Research Institute (EPRI) guidelines.

Additional programs include those implemented to meet technical specification surveillance requirements; those implemented in response to NRC generic communications; and various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components.

Maintenance activities conducted at CPNPP include inspection, testing, and surveillance to maintain the current licensing basis (CLB) of the plant and ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of a major component. CPNPP refuels each of the nuclear units on an 18-month schedule, resulting in at least one refueling every year and two refuelings every third year.

2.2.3 Cooling and Auxiliary Water Systems

The cooling system at CPNPP consists of two major components: the circulating-water system and the station service water system (SSWS). The circulating water is withdrawn from the SCR through an intake structure containing eight water pumps; it is pumped through the condensers and various heat exchangers and then returned to SCR through a submerged discharge tunnel. A dam across an arm of the SCR forms a separate water impoundment called a safe shutdown impoundment (SSI). Service water is withdrawn from the SSI. (NRC 1981, Section 4.2.2.1)

As stated in the FSAR the SSI is designed and constructed to withstand the most severe postulated natural phenomena. The water level of the SSI is maintained by an equalization channel between the SSI and the SCR. The SSI is designed to serve as the ultimate heat sink of the CPNPP and acts to dissipate heat rejected by the SSWS during post-accident shutdown and normal cooldown conditions. It is sized to provide adequate cooling capacity for the CPNPP in accordance with the requirements of NRC Regulatory Guide 1.27.

The ultimate heat sink has the capability to ensure either the simultaneous shutdown and cooldown of both units or the shutdown and cooldown of one unit simultaneously with the dissipation of post-accident heat from the other unit.

The purpose of SSI is to provide once-through cooling water for dissipating reactor heat and to allow an orderly shutdown of the plant. The SSI and SCR are connected by an equalization channel immediately southwest of the SSI dam. For all operating conditions, station service water is taken from the SSI through an intake structure containing four pumps. The water is pumped through various safety related cooling systems and then returned to the SSI through a discharge-chute structure. (NRC 1981, Section 4.2.2.1)

SCR is supplied with makeup water from Lake Granbury.

The typical water balance at CPNPP is shown in Figure 2.2-1.

2.2.3.1 Circulating Water System

CPNPP draws water from and discharges to the SCR. Cooling water for the main condensers is provided by the circulating water system. The circulating water system intake structure is located north of the plant on the SCR. The heated water of the circulating water system is discharged to the SCR via a discharge tunnel at a point southeast of the plant.

Cooling water for normal plant operation of both units is withdrawn from the SCR by eight circulating water pumps with 275,000 gpm capacity each. Maximum design flow is 2,200,000 gpm. All pumps are located on the circulating water intake structure. The number of pumps needed is adjusted seasonally, with three pumps operating during cooler months and four pumps operating during mild or warmer months. The plant can operate at reduced loads operating two or three pumps per unit. Each pump has propeller blades which extend to elevation 758 feet and to a minimum submergence requirement of 12 feet. The circulating water pumps are not required for plant shutdown.

Water from the SCR flows to the eight circulating water pumps (both units) through heavy, steel bar trash racks and 12 traveling screens. Circulating water pumps are located downstream of the traveling water screens to convey screened flow to the condensers. Circulating water is withdrawn through a single screenhouse with twelve intake bays. Each bay is 11 feet, 2 inches wide and has a vertical traveling water screen. A trash rack is located along the upstream face of the structure. The trash rack consists of 4 inches x 1/2-inch-wide steel bars with a 2-inch clear spacing. Twelve 10-foot-wide traveling water screens are located downstream from the

trash racks. The screens have 3/8-inch square mesh openings. The screens are on a timed rotation schedule and are cleaned with a high-pressure front spray wash. The screens are typically timed to rotate every four hours or can be set to rotate automatically based on differential pressures across the screen due to high debris loading. The screens are set for continuous operation when temperatures reach below 38 degrees Fahrenheit (°F).

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 1,200 gpm of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens.

The trash racks remove any heavy debris from the intake water while the traveling screens remove smaller debris which can also be present. The backwash water is filtered and returned to the reservoir. For maintenance purposes, each screen well is provided with stop logs to allow dewatering of any individual screen well. For each unit, the water from six screen wells flows to a common suction pit. Four motor-driven, vertical, centrifugal, mixed flow, circulating water pumps take suction from this pit. This system is duplicated for operation of the second unit.

The circulating water system supplies approximately 1,100,000 gpm of cooling water to each unit. This flow is sufficient to remove the heat from the main condenser, the two auxiliary condensers, the turbine plant cooling water heat exchanger, the three-condenser exhausting vacuum pump heat exchangers, and five non-safety ventilation chillers.

The total heat removed amounts to approximately 8.8 x 10^9 British thermal units (Btu)/hour, of which about 8.4 x 10^9 Btu/hour is removed from the main condenser. The circulating water system is supplied by the SCR, which provides water at a design temperature of 95°F. The expected discharge temperature is an approximately 15°F temperature rise above the inlet temperature of SCR. The system is designed to operate with the water in the SCR at its lowest elevation of 770 feet.

Cooling water is returned to the SCR via a tunnel discharging into an open structure, circulating water discharge structure. The discharge structure is located at an adequate distance from the circulating water intake structure to ensure sufficient water mixing and evaporative cooling. This discharge structure greatly reduces the velocity of the circulating water from the pipeline to the end of the structure where the water flows into the reservoir. The discharge velocity is approximately 9.8 feet per second (fps). The low discharge velocity encourages stratification of the heated circulating water. This in turn promotes dissipation of the rejected heat by evaporation and heat transfer to the atmosphere. This mechanism involves the minimum amount of reservoir water in the heat dissipation process.

The circulating water is shock treated with a solution of sodium hypochlorite and sodium bromide to reduce organic fouling by controlling organic and biological growth. Sodium hypochlorite and sodium bromide are drawn from storage tanks and distributed to the circulating water at the intake bays.

At periodic intervals, chlorine will be injected into the circulating-water system to prevent the growth of algae and bacterial slime on the surfaces of the circulating-water tunnel and the condensers (NRC 1981). The chlorine dosage will be adjusted in accordance with the Texas Pollutant Discharge Elimination System (TPDES) permit to restrict the total residual chlorine concentration to a daily maximum of 0.2 milligrams per liter (mg/L) and 880 pounds/day. Effluent limitations for Outfall 001 (Circulating Water discharge) free available chlorine are 0.2 mg/L daily average, with a daily maximum of 0.5 mg/L and 1,101 pounds/day.

The circulating water system is not required for emergency cooldown or for operation of the engineered safeguard systems or for cooling during shutdown; instead, the SSWS system and the related SSI fulfill these functions.

2.2.3.2 Station Service Water and Component Cooling Water Systems

Cooling water is withdrawn from the SSI by four 17,000-gpm capacity service water pumps. All pumps are located in the service water intake structure, a seismic Category I building. Cooling water is returned to the SSI through the service water discharge canal. The discharge canal is located at a sufficient distance from the service water intake structure to ensure adequate water mixing and evaporative cooling.

The SSWS removes heat from the component cooling water system (CCWS) heat exchangers and from the emergency diesel generators. The SSWS supplies cooling water to the safety injection (SI), centrifugal charging pump lube oil coolers, and the containment spray pump bearing oil coolers. In conjunction with the CCWS, the SSWS supplies cooling water to meet the plant cooling requirements during normal operation, shutdown, and during or after a postulated LOCA of either unit. The required cooling water is taken from the SSI, which is the ultimate heat sink. The SSWS also acts as a backup water supply for the auxiliary feedwater system if the condensate storage tank is depleted.

The SSI contains a water supply for a minimum of 30 days of reactor decay heat removal, without outside makeup. The SSWS is designed to properly operate with water in the SSI at the lowest level during this period of time.

The SSWS has a separate system which injects sodium hypochlorite and sodium bromide to control organic fouling. The quality of the SSI water is very similar to that of SCR water. A chemical addition system is used to control corrosion and fouling in the service water system to protect the carbon steel pipe. A coordinated chemical treatment program with phosphate, organic phosphate, and a copolymer is used in addition to the existing biocide treatments for this added corrosion protection.

The SSWS of each of the units is completely independent and redundant. Each unit has two fully independent trains, either of which can supply the required cooling waterflow. The pumps and heat exchangers of each train can be aligned with the other train in the event of a component failure.

The CCWS is a closed system. It is designed to remove residual heat from the RCS, cool the letdown flow to the CVCS, cool safety-feature heat loads, and dissipate rejected heat from various plant components.

The CCWS is normally required to be operating during all phases of plant operation including startup, power operation, shutdown, refueling, and the injection and recirculation phases following a LOCA.

Both the SSWS and CCWS have two flow loops with redundant pumps, heat exchangers, and piping arrangements. The system is designed to meet the required safety function so that no single failure impairs cooling of essential equipment.

2.2.3.3 Thermal Effluent Dispersion

CPNPP performed a thermal discharge study in August 2007 to study the impact of SPU. The uprate resulted in a small increase in temperature at the intake and discharge locations. The increase in the average temperature rise at the intake is 5.6 percent or an increase of 13.2°F. This increase can be compared to the overall increase in the waste heat load to the SCR due to the SPU, which is 6.2 percent. For the purpose of the study, the base case temperature was set to 95°F. The number of days above 95°F would increase from 67 days to 74 days one year out of every 40 years. The increase in evaporation due to the 3,612 MWt uprate is 2.1 million gallons per day (MGD), or 4.2 percent of the current rate. This increase can be compared to the overall increase in the waste heat load of 6.2 percent. That the increase in evaporation is less than, but similar to, the increase in waste heat load is understandable since only a portion of the increased waste heat load is transferred to the atmosphere through evaporative losses. The remaining waste heat load is transferred to the atmosphere by conduction and radiative heat transfer.

As noted in the thermal discharge study, maximum discharge temperature increased from 109°F to111°F and average discharge temperature increased from 95.3°F to 96.6°F at outfall 001. CPNPP is currently permitted by the TPDES permit for discharge at daily average temperature of 113°F and daily maximum temperature of 116°F. Therefore, impacts to thermal discharge analysis due to the SPU were bounded by the thermal discharge study performed as part of the TPDES permit.

2.2.3.4 Municipal Water Supply System

CPNPP potable and sanitary water system is designed to provide water for toilets, sinks, showers, and drinking purposes in all permanent personnel areas of the plant site, as required; water for emergency eyewash and showers, as required; water to fire protection hoses for various onsite buildings; and water to fill and to provide normal makeup to the fire water storage tanks.

The distribution system that provides potable water to the plant and associated support structures and buildings for both Unit 1 and 2 is supplied by the Somervell County Water District (SCWD) public water system (PWS), which started in 2012.

A small quantity (35,900 gallons, less than 1 gpm, in 2020) of groundwater is pumped to be used primarily for potable and sanitary purposes at the recreation training facility. Groundwater withdrawals are discussed in detail in Section 3.6.

Backflow preventers are installed on potable water lines to protect the water supply from a potential contamination source classified as a "high health hazard." Texas Commission on Environmental Quality (TCEQ) requires annual testing of backflow prevention devices by state-certified testers. Backflow preventers are tested and certified annually, and documentation of the certification is kept in the environmental files with a copy sent to SCWD for recordkeeping purposes. CPNPP performs testing of the SCWD supply and the supply to the fire water storage tanks inside the protected area.

The potable and sanitary water system is designed without interconnection with, and is physically separated from, any radioactive sources, thus precluding the possibility of radioactive contamination. It is completely separated from the laundry and hot shower portion of the liquid waste processing system (LWPS). Wastes produced by the potable and sanitary water system contain no radioactive materials and can therefore be safely treated in the domestic waste treatment facility.

Because the system is common to both units and is independent of their operation, a shutdown of either or both units does not affect the supply of potable water. In case of water contamination (radiological or otherwise) or an event where the piping is forced out of service, potable water can be trucked to the site and distributed in portable containers.

2.2.3.5 Fire Protection Water Supply System

The fire protection water supply system capacity was designed using National Fire Protection Association (NFPA) 13 and NRC branch technical position Auxiliary Power Conversion Systems Branch 9.5-1 Appendix A as guidance. The capacity is based on supplying water to the largest fixed extinguishing system and the necessary adjacent hose stations with the shortest portion of the fire protection yard-loop out of service. (Luminant 2020a, Section 6.3.2)

Two dedicated 100-percent capacity, atmospheric fire water storage tanks are provided to supply water to the fire protection water supply system. Each storage tank has a nominal capacity of 524,500 gallons. The tanks are interconnected to facilitate suction from either or both tanks. Refill capability with a separate pump which takes suction from the SSI is provided to allow either tank to be refilled within eight hours after using its contents to extinguish a fire. (Luminant 2020a, Section 6.3.2)

The station fire main system, including the associated pumps, piping, and valves, is shared by the two CPNPP units.

2.2.4 Meteorological Monitoring Program

The CPNPP onsite meteorological monitoring system is designed to provide meteorological data to support offsite radiological dose assessment. 10 CFR Part 50 Appendix E, entitled "Emergency Planning and Preparedness for Production and Utilization Facilities," requires licensees to provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Therefore, a reliable meteorological program capable of rapidly providing valid meteorological information is required to assess actual or potential consequences of a radiological emergency condition. This is accomplished by measuring, recording, and storing wind direction, wind speed, and temperature at various elevations and precipitation.

The CPNPP meteorological monitoring system, including instrumentation package, meets the criteria of Regulatory Guide 1.23 with the exception of calibration requirements of wind speed and direction sensors, which are calibrated once every 12 months instead of semiannually, as required by Regulatory Guide 1.23. As discussed in CPNPP's offsite dose calculation manual (ODCM), the onsite controls have been shown to meet the accuracy and data recovery recommendations of Regulatory Guide 1.23. (CPNPP 2014)

The CPNPP meteorological monitoring system includes two onsite meteorological towers, the primary tower, and the backup tower. The locations of the two meteorological towers are shown in Figure 3.1-1. The primary meteorological tower is located east of the Unit 1 and Unit 2 reactor buildings, and is a 60-meter (m), guyed, open lattice type, constructed to withstand and rotate fewer than 2.01 degrees in 100 miles per hour (mph) uniform horizontal wind load. The instrument elevator and instrumentation booms are located on the 10-m and 60-m levels. These booms are oriented to the west. The aspirated temperature shields at 10 m and 60 m are oriented laterally to the north. The primary tower instrument translators are located in an environmentally controlled building approximately 70 feet west-northwest of the primary tower.

The backup meteorological tower is located 75 feet east-northeast of the primary tower. The backup tower is a 10-m free standing open lattice type tower with an instrumentation boom located on top of the tower at 10 m. The aspirated temperature shield is oriented laterally to the north to further minimize the effects of direct sunlight on the measured temperature. In addition, the backup tower field instrumentation is located in the same environmentally controlled instrument building as the primary tower.

The recording of meteorological data from the primary tower is accomplished by utilizing two digital and one auxiliary digital paperless recording systems. The recording of meteorological data from the backup tower consists of one digital and one auxiliary digital paperless recording system.

Meteorological data from both towers are provided to the meteorology and plant computers. Signals from both meteorological towers are transmitted through shielded twisted pair cable to the digital to analog converter of the meteorological system receiver located in the Unit 1 plant

computer room. Digital output of the meteorology and plant computers is displayed in the Unit 1 plant computer and control room, as well as the technical support center and emergency operation facility, where meteorological data consistent with the requirements of NUREG-0696 are displayed.

The meteorology computer is designed to provide digital readout of meteorological data received from the primary and backup towers for all parameters. Both 15-minute and hourly averaged data are generated. The 15-minute averaged data are derived from the meteorological parameters that are sampled every 5 seconds (except precipitation which is a totalized value). The hourly averaged data are derived from the 15-minute averages. The 15-minute averaged data and the hourly averaged data can be stored internally in the computer for a period of up to 10 years. This data averaging methodology meets the requirements of Regulatory Guide 1.23.

The plant computer is designed to a provide digital readout of 15-minute averaged data from the primary meteorological tower. The 15-minute averaged data are based on a 5-second sampling rate. Trending data for the previous week are also available from the plant computer.

To assure data quality and accuracy, a comprehensive calibration of the meteorological station components is performed at 6-month intervals. The procedure includes close visual inspection of all instrument sensors for wear, electronic component calibration, ambient temperature, and dewpoint comparison using mercury-type thermometers, and calibration of recorders.

Normal maintenance includes a comprehensive inspection of the station's electronic and mechanical equipment as part of an ongoing operation and maintenance program. Inspections are performed on a weekly frequency, as a minimum, but on average two operational inspections are performed per week. Station operating procedures call for, among other things, a manual check of the zero and full-scale positioning of the analog recorders, as well as a verification of the associated direct current (DC) voltages displayed by the digital panel meter for the primary recording system.

The meteorological variables which are monitored include wind speed, wind direction, ambient temperature, temperature difference with height (Delta-T), sigma theta, and precipitation. The meteorological variables monitored at CPNPP are listed in Table 2.2-1.

Based on the previous 5 years (2016–2020), the meteorological data recovery rate at CPNPP has been greater than 90 percent. (Luminant 2017a; Luminant 2018a; Luminant 2019; Luminant 2020b; Luminant 2021a) Meteorology and air quality at CPNPP are discussed in detail in Section 3.3.

2.2.5 Power Transmission System

2.2.5.1 In-Scope Transmission Lines

Based on NRC Regulatory Guide 4.2 (NRC 2013b, Section 2.2), transmission lines subject to evaluation of environmental impacts for license renewal are those that connect the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system and power lines that feed the plant from the grid during outages. All in-scope transmission lines are located completely within the CPNPP site boundary, as shown in Figure 2.2-2.

The CPNPP output is connected to the 345-kV transmission system via the 345-kV switchyard. The startup and shutdown power for the units are derived from the 138-kV and 345-kV switchyards. The CPNPP switchyards are located approximately 600 feet west of the turbine building. The locations of the 138-kV and 345-kV switchyards are shown in Figure 3.1-1.

The onsite electric system includes power supplies, distribution equipment, and instrumentation and control to supply power to the unit auxiliary loads (normal and safety-related) during startup, normal operation, and normal and emergency shutdown. Connection of the generator outputs to the 345-kV switchyard is via isolated-phase bus (generator main leads), step-up transformers, and transmission lines.

The preferred power sources supply power to the Class 1E buses during plant startup, normal operation, emergency shutdown, and upon a unit trip. These sources originate as part of the 138-kV and 345-kV offsite power systems and supply power to the 6900-V Class 1E auxiliary bus systems through startup transformers.

There are no interconnections between the 138-kV switchyard and the 345-kV switchyard at the CPNPP site. The 138-kV switchyard is physically and electrically independent of the 345-kV switchyard. The 345-kV and the 138-kV switchyards each consist of a two-bus arrangement. Transmission circuits terminate on one or both buses in the switchyards. Power can be supplied to each switchyard from any of their respective transmission circuits.

Two separate and physically independent startup transformers provide startup, preferred and alternate shutdown power to the safety-related auxiliaries of the units on an immediate basis. One transformer is connected to the 345-kV switchyard while the second transformer is connected to the 138-kV switchyard; these transformers are connected to the safety-related 6,900-V auxiliary bus systems and, as such, provide two independent means of supplying the safety-related equipment from the offsite power system without relying on the main generator.

Two station service transformers provide power to the non-safety-related auxiliaries. These transformers are connected to the 345-kV switchyard. One transformer is connected to the non-safety-related 6,900-V auxiliary buses of one unit while the second transformer is connected to the non-safety-related 6,900-V buses of the other unit. In addition, the 25-kV plant support power loop, fed from the 138-kV switchyard, supplies power to non-safety-related equipment.

2.2.5.2 Vegetation Management Practices

The in-scope transmission lines are within CPNPP site boundary, as shown in Figure 2.2-2. The transmission lines cross the CPNPP industrial area, where vegetation is sparse and minimal vegetation management is required.

2.2.5.3 Avian Protection

Threatened and endangered species potentially occurring near CPNPP, or within counties occurring within a 6-mile radius of CPNPP, are described in Section 3.7.8. As discussed in Section 3.7.7.2, CPNPP implements deterrents to keep birds away from some operational areas; given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures pose a minimal bird collision hazard.

2.2.5.4 Public

As presented in Section 2.2.5.1, all in-scope transmission lines are located completely within CPNPP owned property and controlled by Vistra OpCo. Therefore, the public does not have access to this area and, as a result, no induced shock hazards exist for the public.

2.2.5.5 Plant Workers

The GEIS suggests that occupational safety and health hazard issues are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC 2013a, Section 3.9.5.1).

CPNPP maintains the safety specific policies for all work conducted at electrical transmission locations. Transmission line maintenance activities at CPNPP are controlled by plant procedures. CPNPP has rigid procedure requirements that control the use of man lift and cranes near electrical transmission lines to prevent shock. Compliance with the National Electrical Safety Code (NESC) clearance standards is maintained by CPNPP's procedure-driven design control process and the design attribute review. This process documents evaluations of changes that would potentially affect the electrical shock hazard of the in-scope transmission lines.

2.2.6 Radioactive Waste Management System

The waste processing systems (WPS) are designed to process liquid, gaseous, and solid waste while achieving the lowest reasonable radioactive release to the environment. Liquid and gaseous wastes to be recycled within the plant are first segregated from those to be processed or shipped offsite. Segregation of wastes is consistently maintained in the subsystems to ensure proper handling. The WPS, with the exception of the equipment associated with the reactor coolant drain tanks, are completely shared. The reactor coolant drain tanks and associated equipment are located inside their respective containment structures.

CPNPP uses liquid, gaseous, and solid radioactive waste processing systems to collect and process the liquid, gaseous, and solid wastes that are the byproducts of the operation of CPNPP. These systems process radioactive liquid, gaseous, and solid effluents to maintain levels as low as reasonably achievable (ALARA) before they are released to the environment. The WPS meets the design objectives of 10 CFR Part 50, Appendix I, and controls the processing, disposal, and release of radioactive liquid, gaseous, and solid wastes.

The ODCM for CPNPP describes the methods used for calculating the concentration of radioactive material in the environment and the estimated potential offsite doses associated with liquid and gaseous effluents from CPNPP. The ODCM also specifies controls for release of liquid and gaseous effluents to ensure compliance with the NRC regulations. (CPNPP 2014, ODCM) The quantity of liquid and gaseous effluents released, and amount of solid radioactive waste shipped from CPNPP is reported in the annual radioactive effluent release report.

Fuel assemblies are removed from the core once they have achieved the desired fuel burnup. The spent fuel is currently stored onsite in the spent fuel pools in the fuel handling building or in dry cask storage containers at the onsite independent spent fuel storage installation (ISFSI). Spent fuel is stored in the CPNPP ISFSI under a general license. ISFSI license information is provided in Table 9.1-1.

2.2.6.1 Liquid Waste Processing System

The CPNPP LWPS services both units with shared components. The LWPS is designed to control, collect, process, handle, store, and dispose of liquid radioactive waste generated as the result of normal operation, including anticipated operational occurrences from LWPS equipment malfunction, excessive leakage in RCS equipment, and excessive leakage in auxiliary system equipment.

The system design considers potential population and occupational exposures and ensures that quantities of radioactive releases to the environment meet the requirements specified in 10 CFR Parts 20 and 50 and the dose design objectives specified in Appendix I of 10 CFR Part 50, during both normal and anticipated operational occurrences.

The LWPS collects and processes potentially radioactive wastes for recycle or disposal during the normal mode of operation. Provisions are made to sample and analyze fluids before they are discharged. Based on this analysis, these wastes are either released under controlled conditions via the circulating water discharge canal or retained for further processing. The circulating waterflow serves to reduce the concentration of radioactivity in the plant effluent by diluting the LWPS discharges.

Normally, radioactive liquids discharged from the RCS are recycled or processed by the boron recycle system, thereby limiting inputs into the LWPS. Water in the recycle holdup tank that needs to be processed is sent to the filter/demineralizer system. This limits input to the LWPS and results in processing of relatively small quantities of generally low-activity level wastes.

The LWPS is designed to segregate different effluents from equipment leaks and drains according to their chemical and radiochemical properties. In addition, interconnecting piping is available to allow for operating flexibility and provide for efficient utilization of purification equipment.

The LWPS is arranged to recycle as much reactor grade water entering the system as possible. This is implemented by the segregation of equipment drains and waste streams, which prevents the intermixing of liquid wastes. The LWPS consists mainly of two sub-systems designated as drain channel A and drain channel B. Drain channel A is connected to drain channel B and processed for release through the filter demineralizer system (FDS). A drain system is also provided inside the containment to collect drains and leaks and transfer them to an appropriate tank. Capability for handling and storage of spent demineralizer resins is also provided.

Instrumentation and controls necessary for the operation of the LWPS are located on a control board in the auxiliary building. Any alarm on this control board is relayed to the main control board in the control room.

Contaminated equipment leak-offs and drains are collected in the floor drain tanks of the drain channel B system, processed to within limits for release via the FDS system, and then released via the circulating water system to SCR.

Reactor Coolant Drain Tank Subsystem

Recyclable reactor-grade effluents enter this subsystem from equipment leaks and drains, valve leak-offs, pump seal leak-offs, loop drain leak-offs, and from other deaerated tritiated water sources inside the containment. This liquid may be processed by the boron recycle system rather than by the LWPS.

Drain Channel C Subsystem

Drain channel C is provided to collect and process waste effluents from onsite laundry, personnel decontamination showers and sinks, and surface decontamination. These liquids may be collected in the laundry and hot shower tank. The liquid collected in the laundry and hot shower tank is pumped through the laundry and hot shower tank strainer and filter to one of the two 5,000-gallon waste monitor tanks. The wastewater is then sampled to determine if the liquid is to be discharged or reprocessed through the FDS or the waste evaporator. With the use of the FDS the laundry holdup monitor tanks may also receive effluent.

Blowdown from the steam generators of each unit is cooled, filtered, demineralized, and returned to the condenser or heater drain tank for reuse as secondary coolant. This blowdown processing system is in operation continuously so that no releases are made from the blowdown system.

Discharges from the turbine building sumps are routed to the WMS. These discharges are normally routed to the low volume waste treatment facilities. However, when radioactivity is present above specified levels, the discharges are diverted to the co-current waste treatment

facilities. These facilities are also part of the WMS. After batching, these wastes are sampled for radioactivity and if required, treated for conventional pollutants, and discharged to the circulating water discharge canal.

CPNPP does not anticipate any increase in liquid waste releases beyond current operations, during the proposed license renewal operating period.

2.2.6.2 Gaseous Waste Processing System

The gaseous waste systems are designed to collect, process, store and release gaseous wastes generated due to plant operations including anticipated operational occurrences. The systems are designed to assure that the release of gaseous effluents from the plant and expected offsite doses are ALARA as defined in the design objectives in Appendix I of 10 CFR Part 50. The gaseous systems have sufficient capacity and redundancy to meet discharge concentration limits of 10 CFR Part 20 during periods of design basis fuel leakage.

The design of the gaseous waste processing system (GWPS) is based on continuous operation of the NSSS assuming that fission products associated with 1 percent of the core power generation are available for leakage from the fuel into the coolant. This condition is assumed to exist over the life of the plant.

The GWPS is shared between both units. The main flow path in the GWPS is a closed loop comprised of two waste gas compressors, two catalytic hydrogen recombiners, eight gas decay tanks for normal power service and two gas decay tanks for service at shutdown and startup. The eight gas decay tanks used for normal power service can also be used to function as shutdown gas decay tanks at shutdown and startup. The system also includes a gas decay tank drain pump, four gas traps, and a waste gas drain filter. All of the equipment is located in the auxiliary building.

The GWPS stores fission gases removed from the RCS. This reduces the escape of fission gases from the RCS during maintenance operations or through equipment leakage. These gases should be contained as long as practical, thus the discharges from the GWPS to the environment for normal plant operation should occur infrequently. The GWPS also provides capacity for holdup of gases generated during reactor shutdown. A portion of the gas from shutdowns is typically contained in one of the shutdown gas decay tanks.

Operation of the system is such that fission gases are distributed throughout the eight normal operation gas decay tanks. Separation of the GWPS gaseous inventory in several tanks reduces the amount of fission gases that would be released in the event of a gas decay tank rupture.

The primary location from which radioactive gases are removed from the RCS is the volume control tank. Smaller quantities are received via the vent connections, from the reactor coolant drain tank, the pressurizer relief tank, and the recycle holdup tanks. The waste and recycle evaporator gas strippers are normally vented to the auxiliary building exhaust.

During normal power operation, nitrogen gas and fission gases are typically circulated around the GWPS loop by one of the two compressors. Hydrogen gas is introduced to the volume control tank where it is mixed with fission gases stripped from the reactor coolant by the action of the volume control tank letdown line nozzle spray. The gas stream may then be vented from the volume control tank into the circulating nitrogen stream in the waste gas system, at the compressor suction.

The resulting mixture of nitrogen, hydrogen and fission gases is pumped by one of the compressors to one of the two catalytic hydrogen recombiners where enough oxygen is added to react with and reduce the hydrogen to a low residual level. Water vapor formed in the recombiner by the hydrogen-oxygen reaction is condensed and removed, and the cooled gas stream (now composed primarily of nitrogen and fission gases) is discharged from the recombiner, routed through a gas decay tank, and sent back to the compressor suction to complete the loop circuit. Depending on gas decay tank pressure the waste gas may be pumped by the compressor to a gas decay tank prior to processing by the hydrogen recombiner.

CPNPP evaluated the impacts of the SPU on gaseous radioactive wastes. Gaseous radioactive wastes are activation gases and fission product radioactive noble gases, which come from radioactive system leakage, process operations including volume control tank venting, gases used for tank cover gas, and gases generated in the radiochemistry laboratory. The SPU did not significantly increase the inventory of gases normally processed in the gaseous waste management system as there was no change to plant system functions and no change to the gas volume inputs. (NRC 2008b)

The activity of radioactive gaseous nuclides in the waste gas system increased as a result of the SPU. This is due to the increased levels of gases in the RCS and the actions performed in the volume control tank. However, the operation of the waste gas system continues to allow for decay of the short-lived radionuclides. Tritium remained the largest component of the gaseous effluents, the largest contributor being from evaporation from the spent fuel pools. The SPU resulted in an increase (approximately 9.5 percent for noble gases, 6.6 percent for 1-131, and 6.5 percent for long-lived activity) in the equilibrium radioactivity in the reactor coolant, which in turn increases the activity in the gaseous waste disposal systems and the activity released into the atmosphere (estimated to increase by 9.5 percent for noble gases, 6.5 percent for particulates including tritium, and 12.6 percent for iodines). (NRC 2008b)

The evaluation shows that even with the small increase in the gaseous radioactivity being discharged into the environment, the projected dose to the maximally exposed member of the public, while slightly increased, has been and will remain well below the ALARA criteria in Appendix I to 10 CFR Part 50. (NRC 2008b)

CPNPP does not anticipate any increase in gaseous waste releases (GWRs) beyond current operations during the proposed LR operating period.

2.2.6.3 Solid Waste Management System

The solid waste management system is designed to control, collect, condition, handle, process, package, and temporarily store, prior to offsite shipment, solid radioactive waste generated as a result of normal operation, including anticipated operational occurrences.

Connections have been provided to allow for the bulk disposal of wastes to a truck mounted or mobile waste processing system. These connections supply waste from the chemical drain tank, waste conditioning tank, the NSSS spent resin transfer system, and the steam generator blowdown spent resin transfer system.

While the SPU slightly increased the activity level of radioactive isotopes in the RCS and the volume of radioactive liquid generated from leakage and planned drainage, there has been only a minimal effect on the generation of radioactively contaminated sludge and resin solids processed as radwaste. (NRC 2008b)

The CPNPP's process control program contains or refers to the current formulas, sampling, analyses, tests, and determinations made to ensure that processing and packaging of wet solid radioactive waste based on demonstrated processing of actual or simulated wastes will be accomplished in such a way to ensure compliance with federal and state regulations, burial site criteria, and other requirements governing the disposal of radioactive waste.

Waste processing is performed by a mobile processing vendor. The Vistra OpCo process control program requires that the vendor operate in accordance with a process control program and procedures which have been reviewed and approved by Vistra OpCo. Additionally, any vendor selected to provide waste processing services or products used to achieve the 10 CFR Part 61 stability requirements shall have documentation demonstrating compliance with 10 CFR Part 61 stability requirements.

CPNPP does not anticipate any increase in solid waste releases beyond current operations, during the proposed license renewal operating period.

2.2.6.3.1 Spent Resin Handling Operations

Resin may be disposed of by use of a vendor-supplied mobile system via the bulk disposal connection. When sufficient resin has accumulated to warrant disposal, the spent resin storage tank is pressurized with nitrogen, and resin is transferred to the bulk disposal connection. Upon completion of transfer, the spent resin storage tank is vented to the plant vent, and flush water is pumped through all lines to ensure resin removal is complete.

Normally, resin from the primary system demineralizers is transported to and stored in the spent resin storage tank prior to being packaged for disposal. The spent resin sluice portion of the LWPS consists of a spent resin sluice filter, spent resin sluice pump, and the spent resin storage tank. The resin sluice water, after being directed to an ion exchange vessel by the sluice pump, is returned to the spent resin storage tank for reuse. Thus, sluicing of spent resin

from primary plant demineralizers is normally accomplished without generating a large volume of additional liquid waste.

2.2.6.4 Ultimate Disposal Operations

Radioactive wastes are stored in a designated staging area prior to shipment. Shipment of the radioactive waste originates from the staging area. All waste that is processed at CPNPP for disposal is packaged in strong, tight containers meeting all applicable DOT, NRC, and burial site requirements pertaining to the storage, shipment, and burial of radioactive waste.

All shipments and notifications are made in accordance with the state, NRC, and DOT regulations, and appropriate CPNPP procedures. As discussed earlier, quantity of radioactive waste shipped from CPNPP is reported in the annual monitoring report in accordance with the ODCM.

2.2.6.5 Low Level Mixed Waste

Mixed waste is radioactive waste that contains or consists of waste constituents that the U.S. Environmental Protection Agency (EPA) lists as hazardous waste. Therefore, any mixed waste is under regulatory requirements of NRC and EPA. Since burial sites are not allowed to receive mixed waste, any such waste generated will have to be stored indefinitely. CPNPP makes every effort to minimize or eliminate generation of mixed waste, when possible, by minimizing the use of hazardous material in the RCA and reviewing possibility of utilizing an alternate non-hazardous substitute material, if available.

CPNPP does not have conditional exemption for low level mixed waste (LLMW) in accordance with 40 CFR Part 266, Subpart N. CPNPP currently has a few partially filled mixed waste containers in the accumulation area but has not generated any new mixed waste in the last 10 years.

2.2.6.6 Low Level Radioactive Waste

Low level radioactive waste is classified as Class A, Class B, or Class C (minor volumes are classified as greater than Class C). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. CPNPP has contracts with Waste Control Specialists and Energy Solutions for disposal of low-level radioactive waste.

In 2020, low-level waste (LLW) was shipped to the Waste Control Specialists facility in Andrews, TX, for burial or disposal (Luminant 2021a, Table 9.10). Currently, CPNPP has no waste greater than Class C stored . Disposal of greater than Class C waste is the responsibility of the federal government.

2.2.7 Nonradioactive Waste Management System

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. Solid and hazardous wastes in Texas are regulated and administered by the TCEQ (EPA

2021a). CPNPP generates nonradioactive waste as a result of plant maintenance, cleaning, and operational processes that occur at the site. Nonradioactive waste commonly generated at CPNPP includes used oil, spent resin, sewer liquid, e-waste, used oil filters, universal waste (e.g., used lamps containing low quantity mercury, paint-related materials, used batteries/non-polychlorinated biphenyl (PCB) ballasts, etc.), expired chemicals (hazardous and non-hazardous), spent solvents, used anti-freeze, and asbestos.

Various nonradioactive wastewater management and disposal activities are conducted at CPNPP. CPNPP Units 1 and 2 cooling water and auxiliary equipment cooling water is treated by chlorination with biofouling control, to prevent growth of algae and bacterial slime on the surfaces of the circulating water tunnel and the condensers (NRC 1981).

Domestic wastewater is discharged from a treatment facility that employs extended aeration and activated sludge return for treatment. The facility is a single, integral, above-ground installation consisting of a surge basin, grinder pumps, aeration basin, circular clarifier, aerobic digester, and a sludge holding basin.

Low Volume Waste

The low volume waste (LVW) treatment facilities provide collection, treatment, and discharge of normally non-radioactive wastewaters. The non-radioactive low-volume waste sources from secondary support systems include equipment, floor, laboratory, and sample drains; water treatment wastes from demineralizer regeneration, reverse osmosis systems operation, condensate polisher system and other miscellaneous water treatment blowdown and backwash operations; periodic drainage and flushing of various system components. These low-volume waste sources are routed to a low-volume waste management system and discharged via the low volume waste outfall (Outfall No. 004) in accordance with the regulatory requirements of the TCEQ and the TPDES permits.

The WMS consists of the following components: a surge basin, oil/water separator, clarifier blowdown and condensate polisher decant basins, three separate interconnected low volume waste retention ponds with double synthetic liners and leachate collection systems. The complete WMS provides for monitoring and management of process wastewater to comply with TPDES permit parameters for oil and grease, total suspended solids (TSS), pH, and visible floating solids or foam for Outfall 004.

The LVW settling ponds consist of two 1.75 million gallons (MG) capacity lined settling ponds and a 6.7 MG capacity emergency settling pond. The 1.75 MG settling ponds are sized for average water flow of approximately 455,000 gallons per day (gpd) to be turned over in accordance with the ODCM limits and wastewater discharge permit (batch or continuous flow). These ponds are lined with a double synthetic liner with a leachate collection system.

The treated non-radioactive low-volume wastes are normally commingled with the wastes which are potentially low-level radioactive and are discharged via the Low Volume Waste Outfall to the

condenser cooling water. The commingled waste stream is sampled prior to mixing with cooling water for compliance with the appropriate effluent limitations.

Hazardous Waste

Hazardous waste commonly generated at CPNPP includes metal cleaning waste, oil contaminated with Freon when collected from chiller units, ignitable liquids, and laboratory packs. CPNPP maintains a pollution prevention (P2) plan as required by TCEQ. One of the goals of the P2 plan is maintain hazardous waste generation and disposal at or below 2,500 pounds total annually (single outage year) or 3,500 pounds total annually (dual outage year) for three targeted hazardous waste streams (ignitable fluids, torex water waste, and Freon-contaminated waste oil) and waste generation and disposal at or below 1,200 pounds for all other hazardous waste. CPNPP waste generation will be minimized via current site processes, as applicable.

CPNPP also maintains a hazardous waste contingency and emergency procedure plan to supplement the existing spill prevention control and countermeasure (SPCC) plan and is prepared in addition to the CPNPP emergency preparedness plan (EPP) to address required contingency planning and emergency procedures for hazardous waste, as required by EPA RCRA 40 CFR Part 264, Subpart D, and Texas Administrative Code (TAC) 335.151–157. This plan is designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned releases of hazardous waste or hazardous waste constituents to air, soil, or surface water from incidents that are not of a sufficient magnitude to be classified within the scope of the EPP. These incidents would not be expected to degrade the level of safety of the plant or to be released offsite. In the event a release of a hazardous waste escalates to a condition that would be classified in accordance with the CPNPP EPP, the EPP would be implemented. TCEQ and RCRA registration information is included in Table 9.1-1.

CPNPP is classified by the EPA and TCEQ as a small quantity generator of hazardous waste. This means that CPNPP can generate more than 200 pounds but less than 2,200 pounds of any type of hazardous waste in a month, never accumulate more than 13,200 pounds of hazardous waste onsite, and store hazardous waste for no more than 180 days or 270 days if the destination facility is located more than 200 miles (TCEQ 2021a). CPNPP maintains a log of approved waste vendors currently used to manage and dispose of hazardous and nonhazardous wastes, and recyclable wastes generated at CPNPP. Nonradioactive hazardous and recyclable waste quantities over the most recent 5 years (2016–2020) are provided in Table 2.2-2. Nonhazardous waste is estimated to be approximately 100,000 pounds annually. This does not include common trash or construction debris which is transported to a local municipal landfill via a trash collection vendor.

Because CPNPP ships hazardous materials that are regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in Title 49 of the CFR, including the requirement to possess a current hazardous materials certificate of registration. DOT registration information is included in Table 9.1-1.

For most hazardous waste records, regulations require that records be retained for at least 3 years from the date the hazardous waste for which the record pertains was last shipped offsite. The documentation generally includes description of waste, date of initial waste generation, description of the process that generated the waste, hazardous waste determination, all analytical data used to characterize Class 3 wastes including quality control data, and waste classification determination. (TAC 2021)

Table 2.2-1 Meteorological Parameters Monitored at CPNPP

Parameter	Primary Tower (elevation level)	Backup Tower (elevation level)
Wind Speed	10 m, 60 m	10 m
Wind Direction	10 m, 60 m	10 m
Ambient Air Temperature	10 m, 30 m, 60 m	10 m
Ambient Dewpoint Temperature	10 m, 60 m	10 m
Temperature Stability	10-30 m, 10-60 m	N/A
Precipitation	Surface	Surface

Table 2.2-2 Nonradioactive Waste Quantities at CPNPP

Year	Hazardous Waste (pounds)	Recycle Waste (pounds)
2016	1,080	243,938
2017	4,425	148,394
2018	1,620	90,633
2019	1,910	309,766
2020	640	248,050

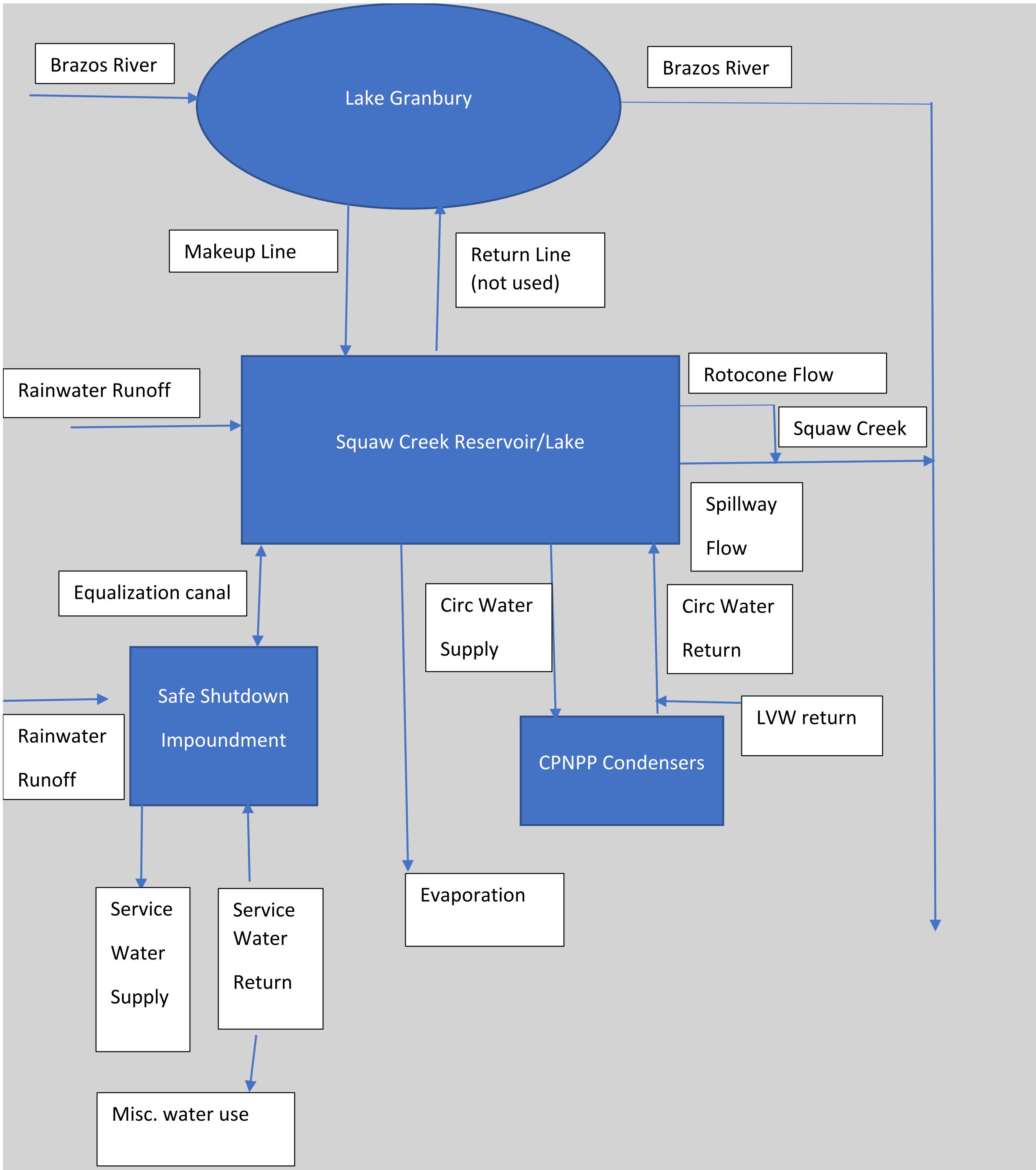


Figure 2.2-1 CPNPP Typical Water Balance

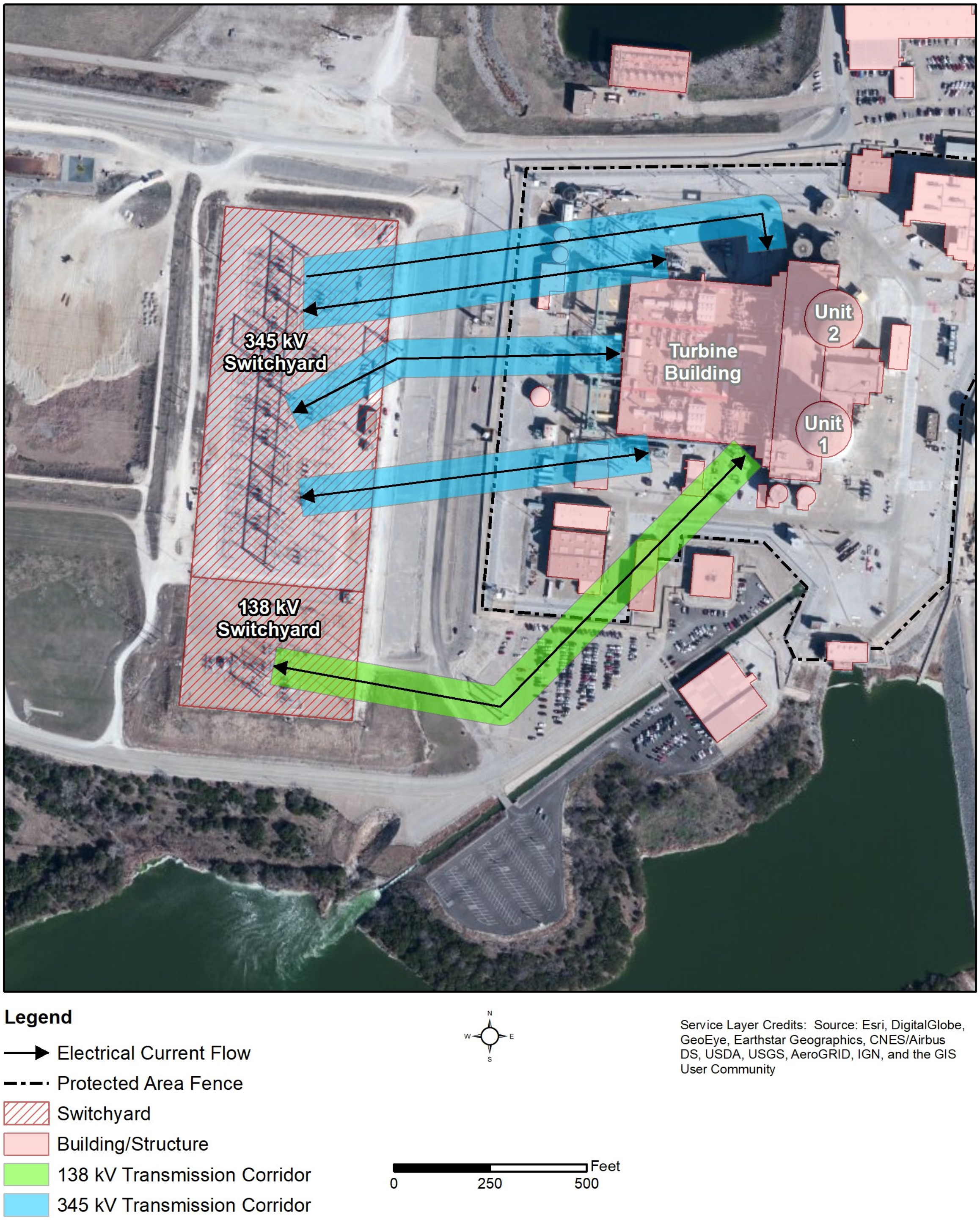


Figure 2.2-2 In-Scope Transmission Lines

2.3 Refurbishment Activities

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plan to modify the facility or its administrative control procedures as described in accordance with § 54.21. If LR-related refurbishment is planned at a facility, the applicant's ER would include analysis for environmental impacts of the proposed refurbishment activity. [10 CFR 51.53(c)(3)(ii)].

Refurbishment activities are replacement and repair of major components which usually occur infrequently and possibly only once in the life of the plant systems (e.g., steam generator and vessel head replacement). The NRC considered such refurbishment activities to include replacement of reactor vessel heads, steam generators and pressurizers in PWRs, and replacement of recirculation piping systems in boiling water reactors. The NRC also acknowledges that licensees may undertake refurbishment activities for reasons of safety, economics, reliability, or efficiency (i.e., not just to support license renewal). Refurbishment activities to be undertaken to allow continued operation beyond the current license term would be LR-related refurbishment and would be addressed in the applicant's license renewal ER. Impacts from refurbishment activities outside of license renewal are assumed by NRC to have been accounted for in annual site evaluation reports, environmental operating reports, and radiological environmental monitoring program reports. (NRC 2013a, Sections 2.1.1 and 2.1.2)

The incremental aging management activities implemented to allow operation of a nuclear power plant during a renewal term were assumed to fall under one of two broad categories. One of these categories involves refurbishment actions, which usually occur infrequently and possibly only once in the life of the plant for any given item. The other category is SMITTR actions, most of which are repeated at regular intervals and schedules. (NRC 2013a, Section 2.1.1)

The NRC requirements for the renewal of OLs for nuclear power plants include preparation of an integrated plant assessment (IPA) [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to an aging management review. The objective of the IPA is to determine whether the detrimental effects of aging could preclude certain SSCs from performing in accordance with the CLB during the additional 20 years of operation requested in the LRA. An example of an SSC subject to aging is the reactor vessel.

The CPNPP's IPA, which Vistra OpCo conducted under 10 CFR Part 54 and is described in the body of the LRA, has identified no LR-related refurbishment or replacement actions needed to maintain the functionality of SSCs, consistent with the CLB, during the proposed period of extended operation. Vistra OpCo does not anticipate the continued operation of CPNPP to result in any environmental impact greater than SMALL.

2.4 Programs and Activities for Managing the Effects of Aging

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plans to modify the facility or its administrative control procedures as described in accordance with § 54.21. This report describes in detail the modifications directly affecting the environment or any plant effluents.

The programs for managing the effects of aging on certain structures and components within the scope of LR at the site are described in the body of the LRA. The evaluation of structures and components required by 10 CFR 54.21 identified the activities necessary to manage the effects of aging on structures and components during the proposed LR operating term.

2.5 Employment

The non-outage workforce at the CPNPP site consists of approximately 1,159 full-time permanent and non-outage contract employees (Table 2.5-1). Overall plant staffing levels have been reduced since initial licensing due to increased efficiencies in Vistra OpCo's operations and general staff attrition and retirement. There are no plans to add additional permanent employees to support plant operations during the proposed LR operating term, and as noted in Section 2.3, no LR-related refurbishment activities have been identified. Nor are there plans to add additional permanent operational staff to support SMITTR activities during the proposed LR operation period.

During refueling outages, which usually last approximately 28 days per unit, there are typically an additional 800 to 1,200 contract employees onsite. Refueling and maintenance outages for the two CPNPP units are on an 18-month cycle, resulting in at least one refueling every year and two refueling events every third year.

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 1 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Alabama (1)	Morgan (1)	Decatur	1
Arizona (4)	Maricopa (4)	Avondale	1
		Buckeye	2
		Phoenix	1
Arkansas	Union (1)	Smackover	1
California (2)	Orange (1)	Fullerton	1
	San Diego (1)	Oceanside	1
Colorado (1)	Douglas (1)	Parker	1
Florida (7)	Citrus (1)	Hernando	1
	Escambia (1)	Gonzalez	1
	Indian River (1)	Vero Beach	1
	Jackson (1)	Cottondale	1
	Pinellas (1)	West Lealman	1
	Seminole (1)	Oviedo	1
	St. Lucie (1)	Jensen Beach	1
Georgia (1)	Wayne (1)	Jesup	1
Idaho (1)	Bonneville (1)	Idaho Falls	1
Illinois (2)	Peoria (1)	Peoria	1
	Winnebago (1)	Loves Park	1
Iowa (1)	Linn (1)	Cedar Rapids	1
Kansas (2)	Coffey (1)	Lebo	1
	Ellsworth (1)	Wilson	1
Kentucky (1)	Breckenridge (1)	Irvington	1
Louisiana (1)	Lafourche (1)	Raceland	1
Maryland (11)	Anne Arundel (1)	Severna Park	1
	Calvert (1)	Chesapeake Ranch Estates	1
	Montgomery (6)	Gaithersburg	1
		Montgomery Village	1
		North Bethesda	3
		Poolesville	1
	Prince George's (2)	College Park	2
	Worcester (1)	Berlin	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 2 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Mississippi (2)	Madison (1)	Madison	1
	Warren (1)	Vicksburg	1
Missouri (1)	Hickory (1)	Weaubleau	1
Nebraska (2)	Franklin (1)	Campbell	1
	Otoe (1)	Nebraska City	1
New Jersey (1)	Gloucester (1)	Sewell	1
North Carolina (3)	Mecklenburg (1)	Charlotte	1
	Union (1)	Waxhaw	1
	Wake (1)	Raleigh	1
Ohio (4)	Franklin (3)	Columbus	1
		Westerville	2
	Licking (1)	Johnstown	1
Oklahoma (2)	Payne (1)	Stillwater	1
	Stephens (1)	Duncan	1
Pennsylvania (8)	Allegheny (6)	Baldwin	1
		Cheswick	1
		Coraopolis	2
		Pittsburgh	1
		Tarentum	1
	Beaver (2)	Beaver	1
		Beaver Falls	1
South Carolina (3)	Lexington (1)	Red Bank	1
	Newberry (1)	Newberry	1
	Richland (1)	Blythewood	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 3 of 6)

State	County	City/Town	Full-Time Employees[a]
Texas (1,084)	Bell (1)	Belton	1
	Bosque (51)	Clifton	2
		Granfills Gap	1
		Iredell	6
		Kopperl	4
		Meridian	13
		Morgan	9
		Valley Mills	1
		Walnut Springs	15
	Brazoria (1)	Lake Jackson	1
	Burleson (1)	Caldwell	1
	Callahan (1)	Cross Plains	1
	Cherokee (1)	Jacksonville	1
Texas (cont.)	Collin (9)	Allen	1
		Frisco	4
		McKinney	1
		Plano	2
		Richardson	1
	Comanche (3)	Comanche	2
		De Leon	1
	Cooke (1)	Gainesville	1
	Coryell (1)	Gatesville	1
	Dallam (1)	Texline	1
	Dallas (32)	Coppell	1
		Dallas	6
		DeSoto	1
		Garland	1
		Grand Prairie	5
		Hutchins	1
		Irving	14
		Rowlett	1
		Sachse	2
	Denton (7)	Argyle	1
		Carrolton	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 4 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Texas (cont.)		Denton	2
		Little Elm	1
		The Colony	2
	Eastland (2)	Carbon	1
		Eastland	1
	Ellis (11)	Midlothian	8
		Red Oak	1
		Waxahachie	2
	Erath (51)	Bluff Dale	10
		Dublin	7
		Stephenville	34
	Fort Bend (1)	Richmond	1
	Freestone (2)	Fairfield	2
	Grayson (1)	Pottsboro	1
	Gregg (1)	Kilgore	1
	Hamilton (23)	Hico	23
	Harris (4)	Houston	1
		Kohrville	1
		Seabrook	2
	Henderson (1)	Gun Barrel City	1
	Hill (6)	Blum	3
		Covington	1
		Whitney	2
	Hood (355)	Cresson	7
		Granbury	318
		Lipan	7
		Tolar	23
	Hopkins (2)	Como	1
		Sulphur Springs	1
	Johnson (85)	Alvarado	3
		Burleson	11
		Cleburne	63
		Godley	1
		Grandview	1

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 5 of 6)

State	County	City/Town	Full-Time Employees[a]
Texas (cont.)		Joshua	2
		Keene	2
		Lillian	1
		Rio Vista	1
	Kaufman (1)	Kaufman	1
	Limestone (2)	Mexia	1
		Tehuacana	1
	Matagorda (1)	Bay City	1
	McLennan (4)	Crawford	1
		Ross	1
		Waco	1
		West	1
	Montgomery (3)	Montgomery	1
		New Caney	1
		Spring	1
	Palo Pinto (2)	Mineral Wells	1
		Palo Pinto	1
	Parker (24)	Aledo	8
		Millsap	1
		Weatherford	15
	Rusk (1)	Henderson	1
	Somervell (192)	Glen Rose	177
		Rainbow	15
	Tarrant (196)	Arlington	97
		Bedford	2
		Benbrook	17
		Crowley	7
		Euless	2
		Fort Worth	58
		Grand Prairie	1
		Grapevine	1
		Haltom City	1
		Hurst	1
		Keller	3

Table 2.5-1 CPNPP Employee Residence Information, February 2021 (Sheet 6 of 6)

State	County	City/Town	Full-Time Employees[(a)]
Texas (cont.)		Mansfield	4
		North Richland Hills	1
		Watauga	1
	Titus (1)	Mount Pleasant	1
	Webb (1)	Laredo	1
	Williamson (1)	Austin	1
	Wise (2)	Rhome	2
Virginia (1)	Alexandria (1)	Alexandria	1
	Arlington (1)	Arlington	1
	Fairfax (1)	Kingstowne	1
	Suffolk (1)	Suffolk	1
Washington (5)	Benton (1)	Richland	1
	Kitsap (4)	Bremerton	1
		Silverdale	2
		Poulsbo	1
Employees – Zip Codes Unable to Confirm			2
TOTAL			**1,159**

(USCB 2020a; USPS 2021)

a. Based on CPNPP staff assigned city/town zip code.

Note: CPNPP employee place of residence information is for Vistra OpCo permanent and non-outage contract staffing and does not include temporary refueling outage workers.

2.6 Alternatives to the Proposed Action

The proposed action as described in Section 2.1 is for the NRC to renew the CPNPP OLs for an additional 20 years. Because the NRC decision is to renew or not renew the existing CPNPP OLs, the only fundamental alternative to the proposed action is the no-action alternative, which would result in the NRC not renewing the CPNPP OLs. The no-action alternative does not provide a means for meeting current and future regional electricity needs. Because CPNPP provides a significant block of long-term baseload capacity, it is reasonable to assume that the decision not to renew the CPNPP OLs would involve replacement of its 2,460 MWe of generation. Vistra OpCo has considered a range of replacement power alternatives from which to select those alternatives to be further analyzed for replacement of CPNPP baseload power generation.

2.6.1 Alternatives Evaluation Process

Vistra OpCo developed the following set of evaluation criteria to review CPNPP replacement alternatives:

- The purpose of the proposed action (LR) is the continued generation of approximately 2,460 MWe net baseload power beyond CPNPP's current license term to meet future system generating needs.
- Alternatives evaluated in this ER would need to provide baseload generation.
- Alternatives considered must be fully operational by 2030, when Unit 1's OL expires (NRC 1990a), considering development of the technology, permitting, construction of the facilities, and connection to the grid.
- Alternatives must be electricity-generating sources that are technically feasible and commercially viable.

2.6.2 Alternatives Considered

Using a screening process based on the above criteria, Vistra OpCo considered the full range of alternatives considered in the GEIS in light of the need to meet the criteria.

The following generation sources were selected as reasonable replacement alternatives based on capability to provide reliable baseload power:

- CPNPP Units 3 and 4 utilizing approved advanced light water reactor (ALWR) technology with mechanical draft cooling towers.
- Small modular nuclear reactors with mechanical draft cooling towers located at the CPNPP site.
- Natural gas combined cycle units with mechanical draft cooling towers located at the CPNPP site.
- Combination of natural gas combined cycle units with mechanical draft cooling towers at the CPNPP site, an offsite wind farm, and offsite solar facilities.

The alternatives selected as reasonable replacement baseload generation alternatives are presented in Section 7.2.1.

Vistra OpCo determined the following generation alternatives were not considered reasonable replacements in comparison to renewal of the CPNPP OLs. Wind and solar are included in the list as unreasonable as a discrete generating alternative but are components of the combination alternative identified above.

- Purchased power
- Plant reactivation or extended service life
- Conservation and energy efficiency measures (demand-side management (DSM) programs)
- Wind
- Solar
- Geothermal
- Hydropower
- Biomass
- Fuel cells
- Wave and current energy
- Oil-fired plants
- Coal-fired plants

The alternatives not selected as reliable baseload generation for replacing the CPNPP generation are presented in Section 7.2.2.

3.0 AFFECTED ENVIRONMENT

CPNPP Units 1 and 2 are located in Somervell County in north central Texas on SCR. The SCR was established for station cooling and extends northward into Hood County. Plant property associated with the CPNPP site is approximately 7,700 acres.

3.1 Location and Features

One of the largest cities in the region, the city of Fort Worth in Tarrant County, is approximately 40 miles northeast of CPNPP. The closest city to CPNPP is Glen Rose in Somervell County, approximately 5 miles south-southeast (see Table 3.11-1). The coordinates for CPNPP Unit 1 are latitude 32° 17' 52.02" north and longitude 97° 47' 06.15" west. CPNPP Unit 2 is located at latitude 32° 17' 54.85" north and longitude 97° 47' 05.79" west. Figure 3.1-1 shows the CPNPP site boundary, facility structures, switchyards, and the EAB. Topographic features adjacent to CPNPP and within the site boundary are shown in Figure 3.1-2.

3.1.1 Vicinity and Region

The vicinity of CPNPP is defined as the area within a 6-mile radius of a center point established equidistant between the Unit 1 and Unit 2 containment structures. As seen in Figure 3.1-3, the CPNPP vicinity falls within the rural portions of both Hood and Somervell counties, and farmland and rural residential properties lie just outside of the CPNPP site boundary (NRC 2011, Section 2.1). Because of overall population size and proximity with nearby urban areas, Hood County has been designated to be in the Granbury micropolitan statistical area inside the Dallas-Fort Worth combined statistical area. In contrast, due to distance and less interaction with urban areas, Somervell County is not associated with any metropolitan or micropolitan statistical areas. (USCB 2020b) Hood County's reported population was 61,598 persons in 2020, up from 51,182 in 2010 and 41,100 in 2000. Somervell County's population has also increased during the same timeframe to, 9,205 persons in 2020, up from 8,490 in 2010, and 6,809 in 2000. (USCB 2021a; USCB 2022a)

Table 3.11-1 provides a list of communities located within a 50-mile radius of CPNPP. Within the vicinity, the city of Glen Rose is the county seat of Somervell County and the nearest city to CPNPP (TSL 2021). Glen Rose had 2,659 persons in 2020, which was an increase from 2010 (2,444) and 2000 (2,122). The city of Granbury is the largest city in Hood County and the county seat. The Granbury city center is located approximately 10 miles north of CPNPP (TSL 2021). Granbury's 2020 population was 10,958, which is an increase from its 2010 population (7,978) and 2000 population (5,718) (USCB 2021b; USCB 2022b).

The region of CPNPP is defined as the area within a 50-mile radius of the established CPNPP plant center point. As seen in Figure 3.1-4 and described in Table 3.11-2, all, or parts of 19 counties are located within the CPNPP region. According to Section 3.11 demographic analysis, the region is considered a high population area. One of the largest counties in the region,

Tarrant County, is home to the city of Fort Worth and located in the Dallas-Fort Worth metropolitan statistical area, within the Dallas-Fort Worth-Arlington combined statistical area (USCB 2020b). The population of Tarrant County was 2,110,640 in 2020, 1,809,034 in 2010, and 1,446,219 in 2000 (USCB 2021a; USCB 2022a).

As of 2020, there were three cities in the 50-mile region with populations over 100,000: Arlington, Fort Worth, and Grand Prairie. Ten additional communities within the 50-mile region have populations over 25,000: Burleson, Cedar Hill, Cleburne, Haltom City, Hurst, Mansfield, Midlothian, North Richland Hills, Waxahachie, and Weatherford. (USCB 2021b)

In Somervell County, the CPNPP site is situated along Squaw Creek, a tributary of the Paluxy River, which is a tributary of the Brazos River. As discussed in Section 3.2, the land around the CPNPP site is primarily rural and undeveloped, consisting of grasslands, deciduous and evergreen forests, and some agricultural cropland.

Figure 3.1-3 illustrates the farm-to-market (FM) local road and highway system located within the 6-mile vicinity of CPNPP in Hood and Somervell counties. (NRC 2011, Section 2.1) There are two highways in the vicinity, including U.S. Highway 67 (US 67), located south of the CPNPP site, and running generally northeast to southwest through the city of Glen Rose. The other is Texas State Highway (SH) 144, a north-south highway located east of CPNPP and SCR, connecting the city of Granbury in Hood County with US 67 in Somervell County. County Road (CR) 213 provides access within the site boundary on the east to the SCR and CP PowerCo-owned recreational SCP (see Figure 3.1-5). West of the SCR, FM 56 provides direct road access to CPNPP facilities via the main plant access road (see Figure 3.1-1). (USCB 2020b; USDOT 2020)

As seen in Figure 3.1-4, the Interstate 20 (I-20) transportation corridor (northwest of CPNPP) runs east-west across the state of Texas, connecting the cities in the region to the Dallas-Fort Worth metroplex. East of CPNPP, the Interstate 35W (I-35W) corridor runs north-south through the region. (USDOT 2020)

Running parallel to the plant access road is a CPNPP rail spur providing access to the plant. In Hood County, the rail line connects to the Fort Worth and Western Railroad main line at the city of Tolar (see Figure 3.1-1) (TXDOT 2021a). Within the region, access to the nearest Texas Amtrak passenger rail service and station is in the city of Cleburne (Amtrack 2021).

As depicted in Figure 3.1-3 and Figure 3.1-4, there are 12 private airports/heliport and one public airport within about 10 miles of CPNPP. Approximately 3.9 miles north, the privately owned Parker Airport is the nearest airfield to CPNPP. The Glen Rose Medical Center, approximately 4.5 miles southeast, has the nearest heliport to CPNPP. The Granbury Regional Airport is the nearest public airfield to CPNPP, approximately 10.3 miles north of the plant. The Dallas-Fort Worth International Airport, located approximately 60 miles northeast of CPNPP, is the nearest full-service commercial airport. (AirNav 2021)

3.1.2 Station Features

Located in north-central Texas, the CPNPP site falls in the Grand Prairie and North-Central Plains physiographic regions. The Grand Prairie physiographic region ranges in elevation from 450 to 1,250 feet and is characterized by low hills. The North-Central Plains physiographic region ranges from 900 to 3,000 feet in elevation and is characterized by low north-south ridges. (NRC 2011, Section 2.5.2.4)

The area within the CPNPP site boundary is approximately 7,700 acres. The CPNPP rail line and plant access road that connects to FM 56 are owned and controlled by CP PowerCo. CPNPP also maintains SCP within the site boundary and controls public access to the park and reservoir via CR 213. There are no other highways, railways, or navigable waterways that traverse or are immediately adjacent to the site.

The EAB portion of CPNPP is approximately 4,170 acres (see Figure 3.1-1). The portion of the SCR within the EAB is subject to the waterway exclusion provided in 10 CFR 100.3. Consistent with that regulation, appropriate and effective arrangements are in place to control traffic on the reservoir to protect the public health and safety in case of emergency.

CP PowerCo has acquired and will maintain surface ownership of all the land within the EAB. Accordingly, CP PowerCo has the authority to control all activities within the EAB, except for certain mineral exploration activities. While CP PowerCo has acquired mineral rights beneath all seismic Category 1 structures, portions of the remainder of the EAB are subject to certain outstanding mineral rights. The only outstanding mineral rights in the EAB for CPNPP, and surrounding areas, relate to the exploration for and production of oil, gas, and other subsurface minerals. As to the mineral rights within the EAB not owned by CP PowerCo, CP PowerCo will assure that the exercise of such mineral rights will pose no health and safety threat during plant operations.

A 6-inch natural gas pipeline, and a 26-inch crude oil pipeline traverse the EAB about 4,900 feet southwest of the CPNPP center point. CP PowerCo has granted the pipeline owners easements, which retain for CP PowerCo absolute control to control all such activities within the EAB, including ingress and egress for the purpose of maintaining the pipelines and their right-of-way (ROW).

CP PowerCo has acquired all the land that constitutes the site property with the exception of one small parcel east of the plant known as the Hopewell cemetery (see Figure 3.8-4). This parcel is outside the EAB however and fenced off.

CPNPP has one active agricultural lease agreement within the site boundary for approximately 4,070 acres of property. Permitted agricultural use includes hay production and cattle grazing.

CPNPP offers plant staff the opportunity to participate in seasonal controlled bow hunting of deer as part of the onsite deer management program (see Section 3.2). The nearest residents

to CPNPP are 0.8 miles southwest and 0.8 miles south-southwest of the center point and located outside the site boundary.

3.1.3 Federal, Native American, State, and Local Lands

As shown in Figures 3.1-5 and 3.1-6, there are a variety of national, state, and local parks, recreational areas, and wildlife habitats located in the CPNPP 50-mile region. As described in Table 3.1-1, there are eight public use lands within the six-mile vicinity of CPNPP. The closest to CPNPP is SCP. Public access is controlled by CPNPP, and the main recreational use is fishing from the SCR, either by making a reservation for boat access or from the banks of the reservoir. SCR and Park are currently closed to the public, but recreational use is expected to resume in the future on a seasonal basis. (Luminant 2021b).

The state of Texas has three federally recognized American Indian nations and tribal communities. No tribal lands are located within the 50-mile region of CPNPP. (NCSL 2021)

There are four Texas military installations located within the CPNPP region. Along with the Naval Air Station Joint Reserve Base Fort Worth, the Texas National Guard (NG) installations and training areas within the region include the NG Fort Wolters, NG Saginaw, and NG Fort Worth – Shoreview. (USACE 2021) There are no significant industrial and military facilities or activities located within 10 miles of CPNPP.

3.1.4 Federal and Non-Federal Related Project Activities

Since the initial CPNPP Unit 1 and Unit 2 licensing was finalized, the plant has undertaken minor construction and maintenance activities at the site.

In 2006, CPNPP replaced the Unit 1 steam generators and reactor pressure vessel closure head, housing the removed components onsite in a newly constructed storage facility. (NRC 2007a). For the proposed LR operating term, Vistra OpCo has determined that it expects the existing CPNPP Unit 2 steam generator and reactor pressure vessel head will not require replacement. There are currently no plans to construct an expansion to the old steam generator storage facility where the Unit 1 steam generators and reactor pressure vessel head are stored onsite (see Figure 3.1-1).

CPNPP has determined that the current onsite ISFSI pad has enough space for canister storage to support the current licenses. The possible need to expand the size of the ISFSI, and the scope of any such potential expansion, is speculative and not reasonably foreseeable at this time as it would depend on the status of the U.S. Department of Energy's (DOE)'s future performance of its obligation to accept spent nuclear fuel (SNF) or the availability of other interim storage options. If ISFSI expansion were needed, previously disturbed tracts of land in the proximity of the existing ISFSI are likely to be sufficient for the construction of a new ISFSI. This expansion would cause no significant environmental impact. No major changes to CPNPP

Units 1 and 2 operations or plans for future expansion of plant infrastructure during the LR term are anticipated.

In a separate licensing action, a combined license application (COLA) for a U.S. Advanced Pressurized Water Reactor (US-APWR), designated as CPNPP Units 3 and 4, was prepared by Luminant Generation Company LLC (Luminant) and submitted to the NRC for approval in 2008. Subsequently, in 2013 the CPNPP COLA project was put on hold. The licensing application review process remains suspended. (Luminant 2013a)

Additional federal or non-federal projects identified as taking place in the CPNPP region include the Texas Department of Transportation (TxDOT) ongoing road maintenance and construction projects. Additionally, the SCWD has been adding new waterlines to the county distribution network. More water lines are anticipated to be installed in the future, but currently a schedule has not been established.

Table 3.1-1 Federal, State, and Local Lands[a] Totally or Partially within a 6-Mile Radius of CPNPP

Name	Management	Distance[b]	Direction	Nearest Place	County
SCP (public use area)[c]	Local	1	N	Pecan Plantation	Hood and Somervell
Wheeler Branch Reservoir (park and habitat)	Local	3	SSE	Glen Rose	Somervell
Dinosaur Valley State Park	State	4	SSW	Glen Rose	Somervell
Somervell County Park	Local	4	SSE	Glen Rose	Somervell
Oakdale Park	Local	5	SSE	Glen Rose	Somervell
Glen Rose Bird Sanctuary	Local	5	SSE	Glen Rose	Somervell
Big Rocks Park	Local	5	SSE	Glen Rose	Somervell
Paluxy Heritage Park and River Walk	Local	5	SSE	Glen Rose	Somervell

(Luminant 2021b; SCWD 2021a; TPWD 2021a; TPWD 2021b; USDA 2020)

a. List is based on best available public information and includes lands that are totally or partially within a 6-mile radius of CPNPP.

b. Distances are approximate (rounded to the nearest mile and calculated based on the CPNPP center point and land centroid data).

c. SCP (public use area) distance is based on public use portion of property.

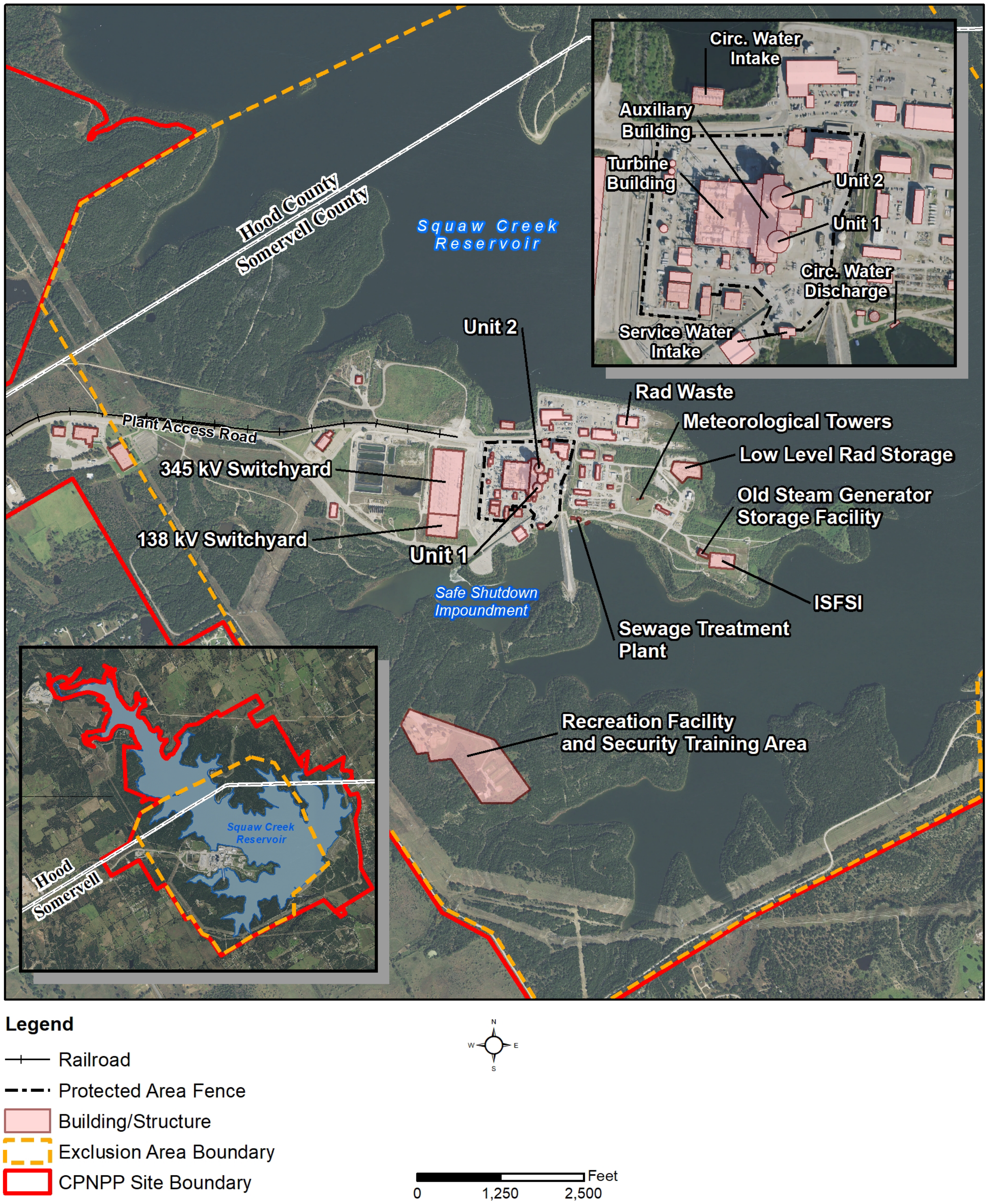


Figure 3.1-1 CPNPP Plant Layout

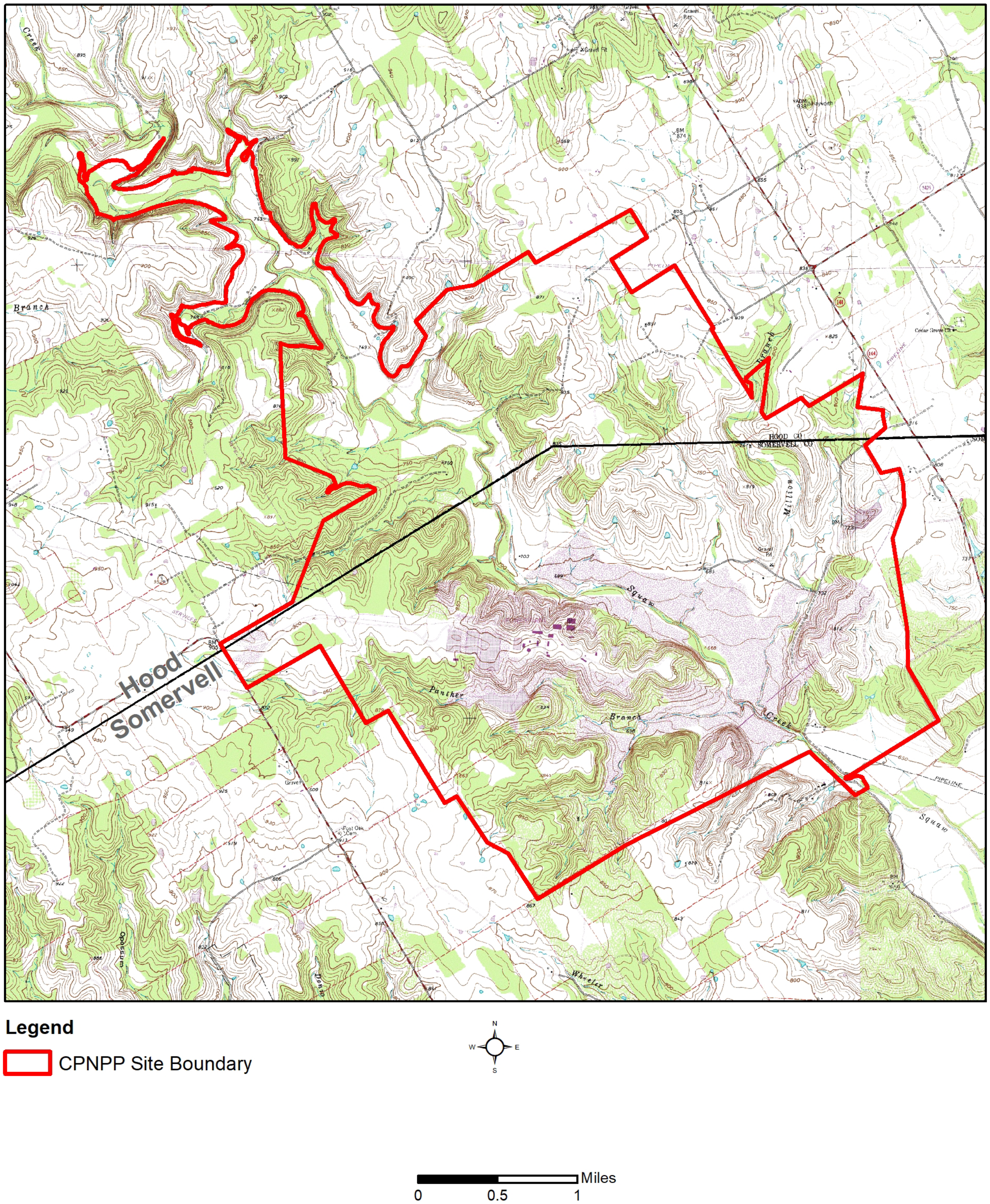


Figure 3.1-2 CPNPP Area Topography

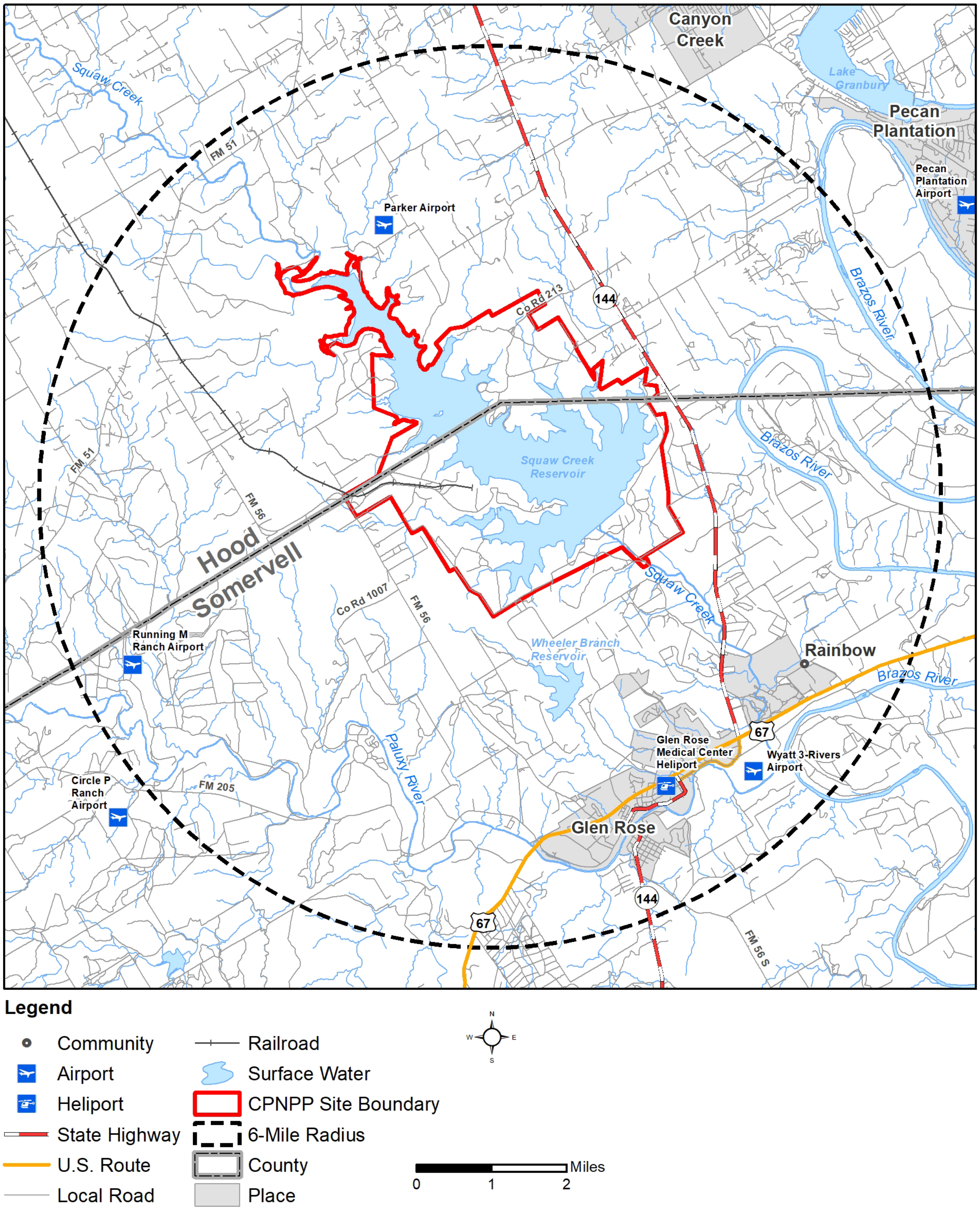


Figure 3.1-3 CPNPP Site and 6-Mile Radius

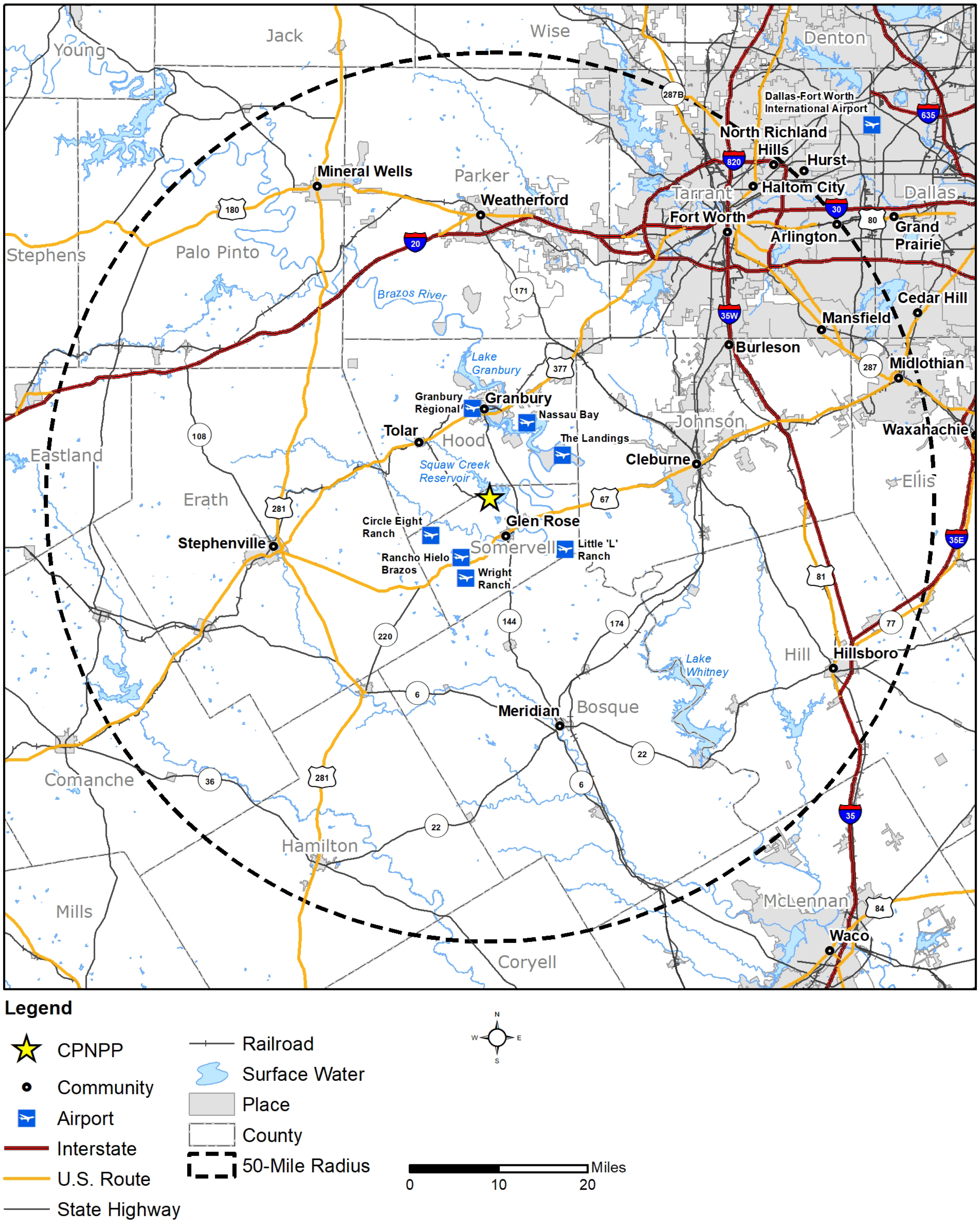


Figure 3.1-4 CPNPP Site and 50-Mile Radius

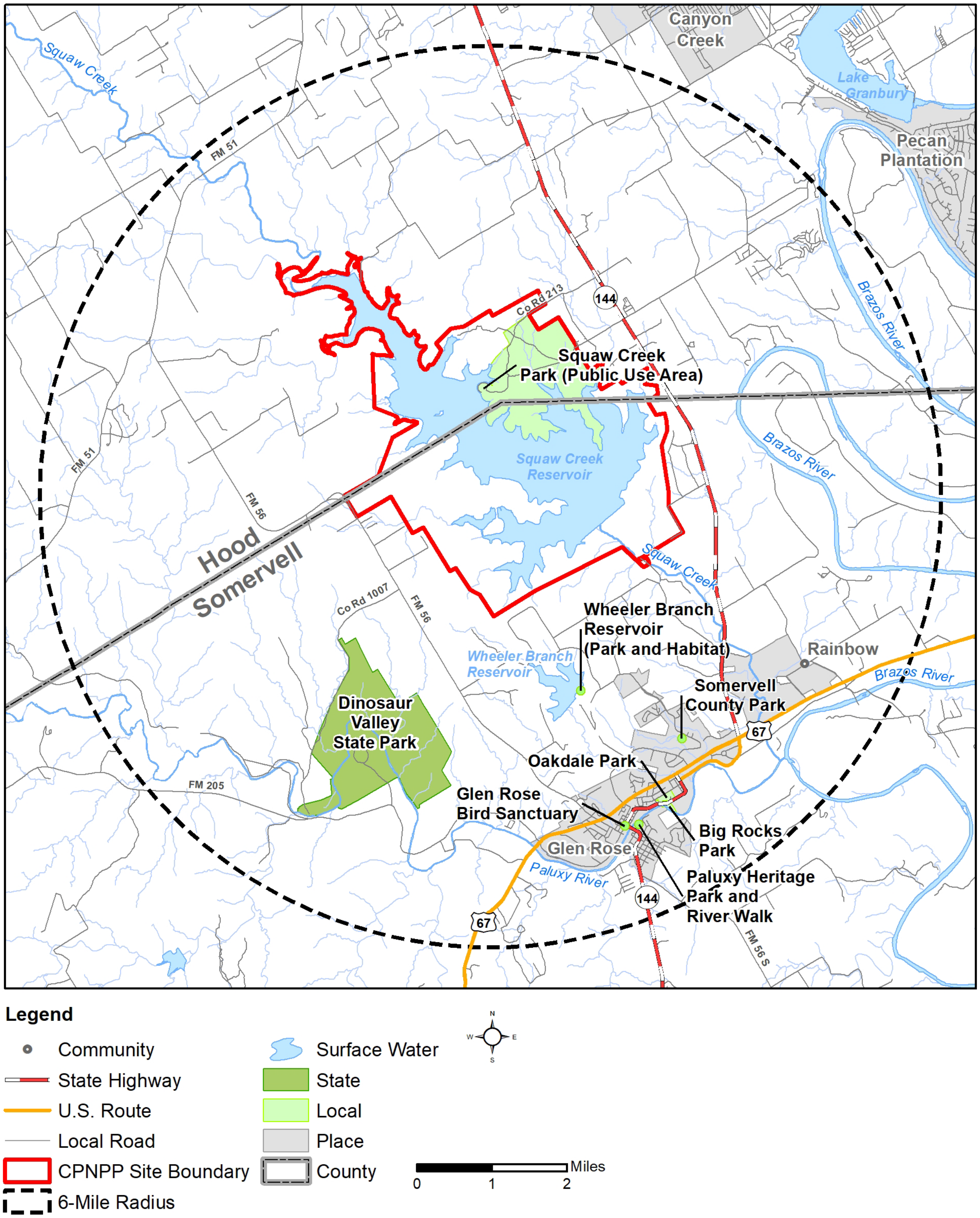


Figure 3.1-5 Federal, State, and Local Lands within a 6-Mile Radius of CPNPP

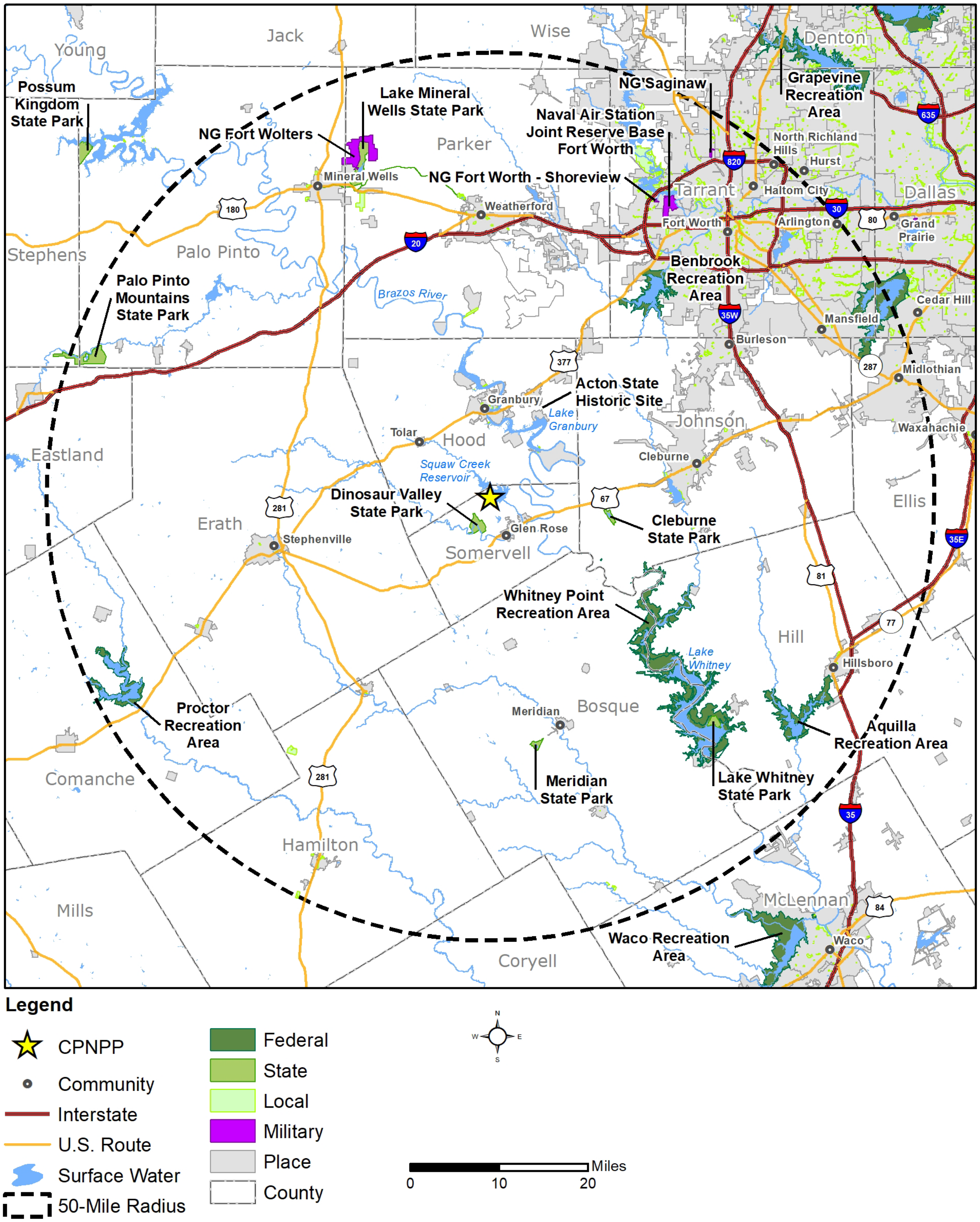


Figure 3.1-6 Federal, State, and Local Lands within a 50-Mile Radius of CPNPP

3.2 Land Use and Visual Resources

The land use description focuses on Hood, Somervell, and Tarrant counties, Texas, because, as described in Section 2.5, approximately 64 percent of the CPNPP workforce resides in these three counties and CPNPP pays taxes to Somervell County.

3.2.1 Onsite Land Use

CPNPP is situated on approximately 7,700 acres surrounding and inclusive of the SCR in Hood and Somervell counties, Texas. As illustrated in Figure 3.1-1, the plant area occupies a peninsula that extends into the SCR in Somervell County, and is accessed by the plant access road, which connects to FM 56 and a railroad spur that connects to the Fort Worth and Western Railroad main line (Luminant 2013b). The nearest communities to CPNPP are Glen Rose, approximately 5 miles south-southeast of the site, and Granbury, approximately 10 miles north of the site. Granbury is the largest city within the vicinity (i.e., a six mile radius). CP PowerCo owns and controls the access roads as well as the rail spur from the site to the Fort Worth and Western rail junction in Tolar, Texas, approximately 11 miles from the site. CP PowerCo owns and controls all surface land within the CPNPP site boundary. Five-year agricultural leases are in place that allow for hay production, and cattle grazing within the site boundary. As described in Section 3.1, CP PowerCo maintains SCP, located within the CPNPP site boundary, and controls access to the public use area within the park and SCR. CPNPP allows for deer hunting by plant staff as part of the plant's deer management program. There are a total of 40 zones along the west and south sides of SCR within the site boundary where bow hunting is allowed seasonally.

As discussed in Section 3.1.2, CP PowerCo owns a portion of the subsurface mineral rights within the site, with the remainder of the site and EAB subject to certain outstanding mineral rights. There are oil and gas wells located onsite. Based on the low potential for commercial production of minerals at CPNPP and the surrounding area, it is anticipated that the exercise of such outstanding mineral rights would involve only sporadic, exploratory activity with little or no production. CP PowerCo has granted easements and access of rights-of-way to owners of pipelines that traverse the EAB for maintenance purposes. No activities unrelated to CPNPP operations are permitted in the plant area without CPNPP approval, and CP PowerCo maintains authority to determine all activity within the CPNPP site and EAB, including ingress and egress for pipeline maintenance and mineral rights exploration.

As shown in Table 3.2-1 and illustrated in Figure 3.2-1, open water is the largest land use/land cover category within the CPNPP site boundary and is primarily associated with SCR, covering approximately 42 percent of the site. Evergreen forest, grassland/herbaceous, and developed areas (including areas developed for plant operations, rail, and roads) are the next largest land use/land cover categories with approximately 26.7 percent, 17.8 percent, and 8.2 percent, respectively. The remaining land use/land cover categories found onsite comprise approximately 5 percent of the CPNPP site. (TNRIS 2020)

CPNPP is located in unincorporated portions of Somervell and Hood counties. The cities of Glen Rose (Somervell County) and Granbury (Hood County) have zoning laws in place to mandate and regulate acceptable land-use practices. There are no zoning or land development regulations in place for unincorporated areas of Somervell and Hood counties. A portion of the CPNPP site falls within the extraterritorial jurisdiction area of the city of Glen Rose in Somervell County but is outside of the city limits and therefore not subject to the city's zoning regulations (CGR 2021a).

3.2.2 Offsite Land Use

As seen in Tables 3.11-2 and 3.11-3, Somervell, Hood, and Tarrant counties have seen an increase in total population since 2010, and this trend is expected to continue through 2053.

The CPNPP vicinity, as described in Section 3.1, includes portions of Somervell and Hood counties. The land use/land cover categories located within the vicinity of CPNPP are illustrated in Figure 3.2-2. The area surrounding CPNPP is predominately rural and undeveloped, and as noted in Table 3.2-2, grassland/herbaceous is the largest land use/land cover category at approximately 55 percent. The next largest land use/land cover categories in the vicinity are evergreen forest (18.1 percent); developed lands (8.3 percent); and deciduous forest (6.7 percent). The remaining land use/land cover categories found within the vicinity of CPNPP comprise approximately 12 percent. (TNRIS 2020)

Somervell County occupies approximately 119,337 acres of land, of which 82,967 acres (69.5 percent) are proportioned to farmland. The 2017 census of agriculture reports that the county had a total of 352 farms, with an average size of 236 acres. Approximately 184 farms produce crops, with the primary crop reported as forage (10,483 acres) and orchards (402 acres). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (211 farms), layers (46 farms), sheep and lambs (25 farms), and hogs and pigs (12 farms) reported. Other agricultural uses of farmland within the county included pasturelands (62,663 acres; 287 farms), permanent pasture and rangeland (48,870 acres; 260 farms), and woodlands (16,804 acres; 130 farms). (USDA 2017)

Hood County occupies approximately 269,238 acres of land, with approximately 205,407 acres (76.3 percent) proportioned to farmland. In 2017 it was reported that the county had a total of 1,176 farms, with an average size of 175 acres. Approximately 578 farms produce crops, with primary crops reported as forage (23,503 acres) and orchards (2,154 acres). Livestock commodities such as cattle and calves (721 farms), layers (149 farms), sheep and lambs (65 farms), hogs and pigs (19 farms), and broilers and other meat-type chickens (2 farms) were also reported. Other agricultural uses of farmland within the county included pasturelands (161,535 acres; 954 farms), permanent pasture and rangeland (143,452 acres; 867 farms), and woodlands (14,410 acres; 272 farms). (USDA 2017)

Tarrant County occupies approximately 552,756 acres of land, of which 190,682 (34.5 percent) are proportioned to farmland. In 2017 it was reported that the county had a total of 1,173 farms,

with an average size of 163 acres. Approximately 487 farms produce crops, with primary crops reported as forage (13,584 acres), wheat (3,304 acres), orchards (219 acres), and potatoes (2 acres). Livestock commodities such as cattle and calves (515 farms), layers (237 farms), sheep and lambs (94 farms), and broilers and other meat-type chickens (17 farms) were reported. Other agricultural uses of farmland within the county included pasturelands (146,848 acres; 854 farms), permanent pasture and rangeland (128,434 acres; 779 farms), and woodlands (7,917 acres; 224 farms). (USDA 2017)

The State of Texas Local Government Code Chapter 211 provides municipalities with the authority to govern land use and development through the implementation and enforcement of zoning regulations with the goal of promoting public health, safety, morals, general welfare, and protection, and preserving places and areas of historical, cultural, or architectural importance and significance (TCS 2021).

Texas counties have limited regulatory authority and are primarily established to deliver public services which include:

- Providing public safety and justice
- Holding elections at every level
- Maintaining vital records
- Building and maintaining roads, bridges and in some cases, county airports
- Providing health and safety services
- Collecting property taxes for the county and sometimes for other taxing entities
- Issuing vehicle registration and transfers
- Registering voters

Counties do not have the authority to pass ordinances or zoning regulations, as that authority is retained by municipalities. (Lumen 2021; TAsC 2021)

As discussed in Section 3.2.1, the cities of Glen Rose and Granbury have zoning laws in place as part of their municipal code of ordinances to govern existing and future land uses (CGR 2021b; Granbury 2021a). The city of Granbury adopted a comprehensive plan in 2016; however, as of June 2021, one is not currently in place for the city of Glen Rose (Granbury 2021b). There are no zoning or designated land uses for unincorporated areas outside of the two cities and there are no comprehensive land use plans in place for Hood and Somervell counties.

Tarrant County is home to the city of Fort Worth and is one of several counties that comprise the Dallas-Fort Worth metropolitan statistical area (see Section 3.1.1). The county has multiple incorporated cities and towns that administer ordinances and land use planning activities within their jurisdictions. Tarrant, Somervell, and Hood counties are part of the North Central Texas Council of Governments (NCTCOG). The NCTCOG is a voluntary association of local

governments with a membership of 235 political jurisdictions. Though a political subdivision of the State of Texas, the NCTCOG does not have the authority to levy taxes or enact laws. The primary role of the NCTCOG is to "perform long-range comprehensive planning for matters that transcend jurisdictional boundaries, promote sound development of the 16-county region and facilitate cooperation and coordination among its member governments." The NCTCOG adopted a Comprehensive Economic Development Strategy in 2016 which outlined goals, priorities, and strategies for achieving sustainable regional growth and economic development. This strategy is required to be updated every 5 years. (NCTCOG 2021)

3.2.3 Visual Resources

As discussed in Section 3.1.1, CPNPP is located in rural portions of Hood and Somervell counties. Figure 3.1-1 shows the building site layout and the property boundary in association with the SCR. The surrounding area is primarily rural, consisting of grasslands, deciduous and evergreen forest, and some agricultural cropland with rural residential interspersed (Luminant 2013b). The nearest residents to CPNPP are approximately 0.8 miles south-southwest and 0.8 miles southwest of the plant.

The tallest structures and therefore the predominant visual features onsite are the Units 1 and 2 reactor containment buildings, which are approximately 260.5 feet tall. The area immediately surrounding CPNPP is generally rural, with hilly terrain that provides visual screening and offers limited views to nearby residents and portions of the SCR and SCP. According to viewshed analysis, the domes of the containment buildings are also visible from portions of Oakdale Park in the city of Glen Rose and from the Dinosaur Valley State Park. As the distance from the CPNPP site increases, the visibility of the containment buildings decreases significantly and has minimal visual effect beyond 20 miles. (Luminant 2013b) There are no plans for refurbishment that would create new visual impacts during the proposed LR operating term. Therefore, CPNPP would continue to have minimal visual impact on the neighboring properties, SCR, SCP, and nearby public areas.

Table 3.2-1 Land Use/Land Cover, CPNPP Site

Category	Acres	Percent
Open Water	3,208.93	41.9
Developed, Open Space	231.74	3.0
Developed, Low Intensity	154.12	2.0
Developed, Medium Intensity	122.54	1.6
Developed, High Intensity	120.54	1.6
Barren Land (Rock/Sand/Clay)	1.33	0.02
Deciduous Forest	310.02	4.0
Evergreen Forest	2,048.25	26.7
Mixed Forest	12.01	0.2
Shrub/Scrub	3.11	0.04
Grassland/Herbaceous	1,366.62	17.8
Cultivated Crops	1.56	0.02
Woody Wetlands	77.17	1.0
Emergent Herbaceous Wetlands	7.34	0.1
Total	**7,665.28**[a]	**100**

a. The acreages presented in this table are based on the Multi-Resolution Land Characteristics Consortium (MRLC) land use/land cover data. These data are presented in a raster (pixel-based) format and because of their square geography, they do not exactly match the CPNPP site boundary. This geographic variation creates a small difference between total acreage reported compared to the CPNPP property acreage stated throughout the ER. (TNRIS 2020)

Table 3.2-2 Land Use/Land Cover, 6-Mile Radius of CPNPP

Category	Acres	Percent
Open Water	3,981.75	5.5
Developed, Open Space	3,758.69	5.2
Developed, Low Intensity	1,356.38	1.9
Developed, Medium Intensity	581.34	0.8
Developed, High Intensity	278.66	0.4
Barren Land (Rock/Sand/Clay)	129.21	0.2
Deciduous Forest	4,836.86	6.7
Evergreen Forest	13,137.07	18.1
Mixed Forest	88.74	0.1
Shrub/Scrub	787.72	1.1
Grassland/Herbaceous	39,748.37	54.9
Pasture/Hay	2,503.72	3.5
Cultivated Crops	244.63	0.3
Woody Wetlands	953.18	1.3
Emergent Herbaceous Wetlands	33.14	0.05
Total	**72,419.46**	**100.00**

(TNRIS 2020)

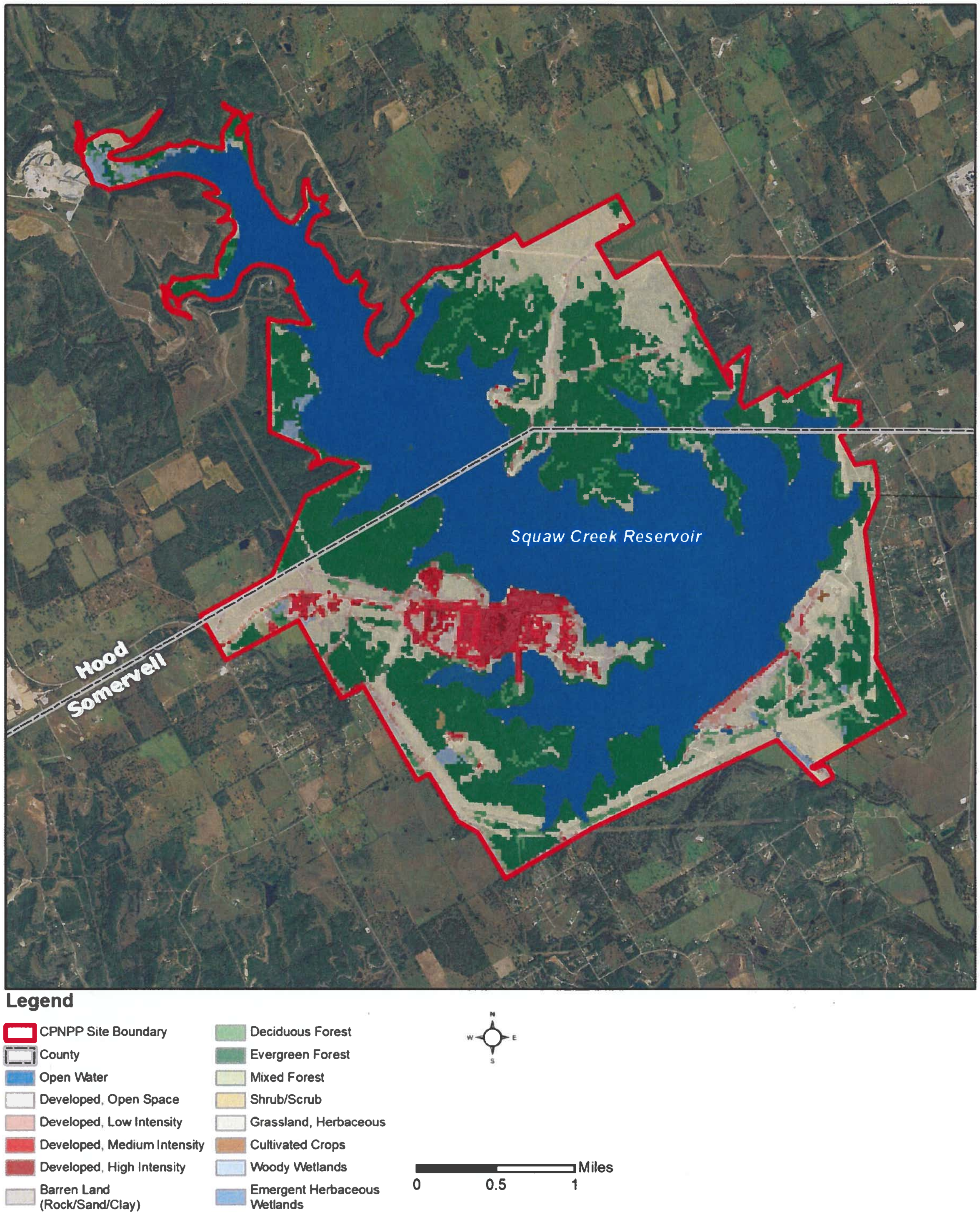


Figure 3.2-1 Land Use/Land Cover, CPNPP Site

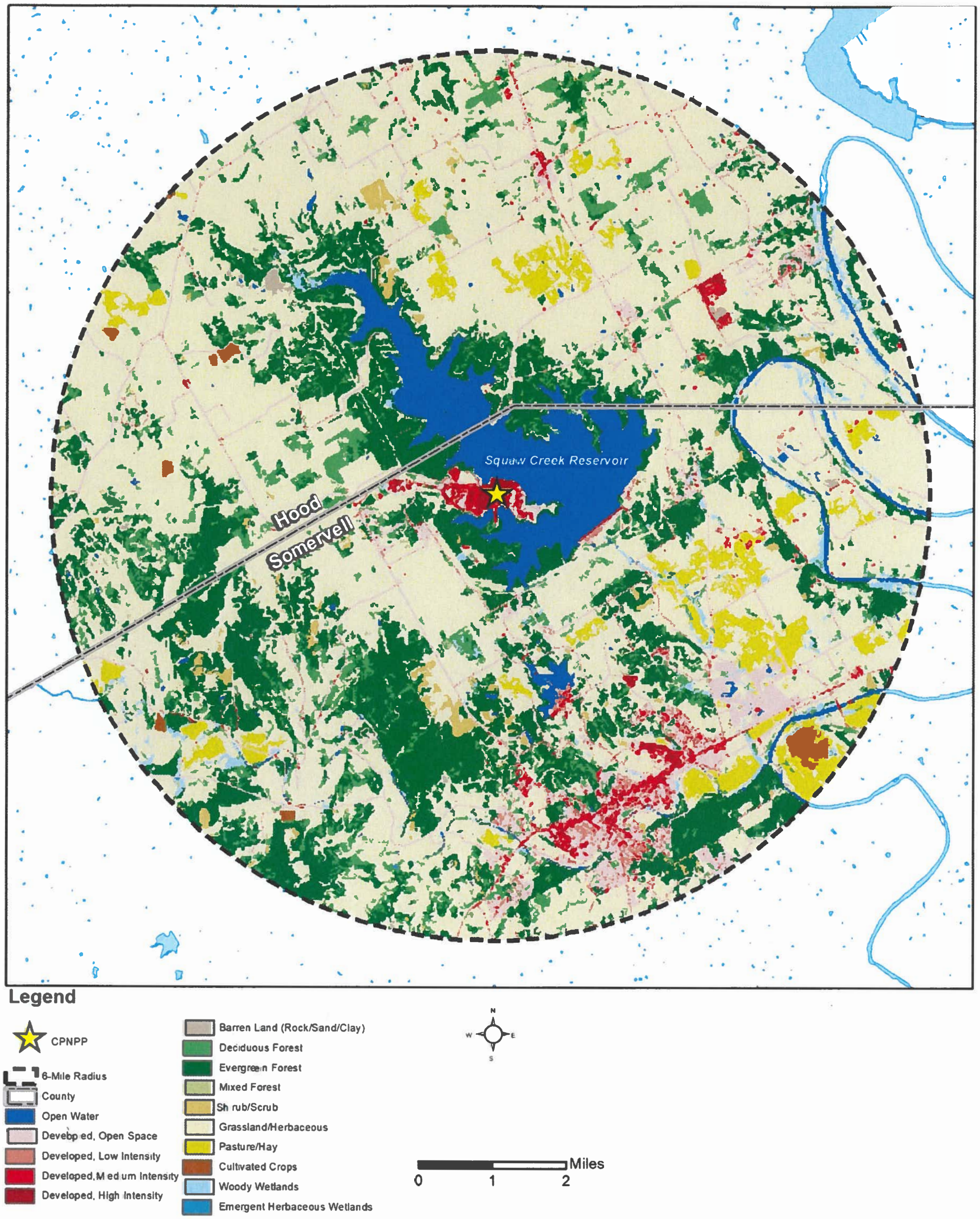


Figure 3.2-2 Land Use/Land Cover, 6-Mile Radius

3.3 Meteorology and Air Quality

CPNPP is located approximately 290 miles northwest of the Gulf of Mexico and is approximately equidistant between Cleburne and Stephenville, Texas, west of the Brazos River. The CPNPP site usually experiences a continental climate with marked temperature extremes both diurnally and seasonally. Maritime tropical air masses almost completely dominate the weather in summer. During the winter, outbreaks of polar continental air are the most common frontal activity, while pacific maritime cold fronts are more frequent in the spring and fall. Wide variations in precipitation amounts occur from year to year, including both drought and persistent rains (occasionally induced by land-weakened, rain-filled tropical cyclones from the Gulf of Mexico). (NRC 2021a) A high-level overview of the plant layout is provided in Figure 3.1-1.

Climatological data presented below have been provided to represent a range of meteorological conditions considered typical for the CPNPP site region. This analysis used three first-order weather stations and precipitation data from Rainbow, Texas, in Somervell County. The Dallas-Fort Worth and the Waco, Texas, weather stations are the closest first-order National Weather Service (NWS) data collection stations to CPNPP with a significant period of meteorological data. These stations are nearly equidistant from the site in the northeast and the southeast directions. The Abilene weather station (another first-order weather station) is to the west at nearly twice the distance as the Dallas-Fort Worth and Waco weather stations. (NCDC 2020; NOAA 2021a) The data from all four of these weather stations have been used to describe the representative climatic conditions at the site, thus making its continued use appropriate for comparison.

Hourly meteorological data for CPNPP are available from January 1999. The meteorological data archive prior to that date has been permanently stored on magnetic tape. The precipitation data collected at the site were not used because it is collected using a rate of measurement rather than volume. Data from the Rainbow weather station (approximately 5 miles east-southeast of the site) were used to supplement daily precipitation data for the analysis (NOAA 2021a).

3.3.1 General Climate

The Dallas-Fort Worth weather station is located approximately 59 miles northeast of CPNPP in north-central Texas, approximately 250 miles north of the Gulf of Mexico. The climate is humid subtropical with hot summers. It is also continental, characterized by a wide annual temperature range. Summer daytime temperatures frequently exceed 100°F. Generally, the highest temperatures of summer are associated with fair skies, westerly winds, and low humidity. Characteristically, hot weather in the summer is broken into three to five-day periods by thunderstorm activity. There are only a few nights each summer when the low temperature exceeds 80 degrees. Winters are mild, but cold fronts occur about three times each month, and often are accompanied by sudden drops in temperature. Periods of extreme cold that

occasionally occur are typically short-lived, so that even in January mild weather occurs frequently. (NCDC 2020)

The Waco weather station is located approximately 58 miles southeast of CPNPP, in the rich agricultural region of the Brazos River Valley in north-central Texas. The weather station lies on the edge of the gently rolling Blackland Prairies ecoregion. To the west lies the rolling to hilly Grand Prairie ecoregion. The climate is humid subtropical with hot summers. It is a continental-type climate characterized by extreme variations in temperature. Tropical maritime air masses predominate throughout the late spring, summer, and early fall months, while polar air masses frequent the area in winter. In an average year, April and May are the wettest months, while the July–August period is the driest. Most warm season rainfall occurs from thunderstorm activity. Consequently, considerable spatial variation in amounts occur. Cloudiness and showers are more frequent in the spring than in the fall. During July and August, daytime temperatures are hot in summer with little variety in the day-to-day weather. The highest temperatures are associated with fair skies, light winds, and comparatively low humidity. The average first occurrence of 32°F is late November, and the average last occurrence is in mid-March. Cold fronts moving down from the High Plains often are accompanied by strong, gusty, northerly winds and sharp drops in temperature. Cold weather is usually of short duration, rarely lasting longer than 2 or 3 days before a rapid warming occurs. Winter precipitation is closely associated with frontal activity, and may fall as rain, freezing rain, sleet, or snow. (NCDC 2020)

The Abilene weather station is located approximately 111 miles west of CPNPP in north-central Texas, on the boundary between the humid east Texas climate and the semi-arid west and north Texas climate. The rainfall pattern is typical of the Great Plains. Most precipitation occurs from April to October and is usually associated with thunderstorms. Severe storms are infrequent, occurring mostly in the spring. South is the prevailing wind direction, and southerly winds are frequently high and persist for several days. Strong northerly winds often occur during the passage of cold fronts. The large range of high and low temperatures, characteristic of the Great Plains, extends south to the Abilene area. High daytime temperatures prevail in the summer but are normally broken by thunderstorms about five times a month. Rapid cooling after sunset results in pleasant nights with low summertime temperatures in the upper 60s and low 70s. High summer temperatures are usually associated with fair skies, southwesterly winds, and low humidity. Rapid wintertime temperature changes occur when cold, dry, arctic air replaces warm moist tropical air. Drops in temperature of 20 to 30 degrees in one hour are not unusual. However, periods of cold weather are short lived. (NCDC 2020)

The climate of the CPNPP region is continental and is characterized by rapid changes in temperature, marked extremes, and large daily and annual temperature ranges. The mean annual temperature decreases from southeast to northwest because of elevation and latitude changes. The general climate of the region is modified frequently by advancing warm moist air from the Gulf of Mexico, resulting in high humidity and cloudiness. Rainfall generally decreases from east to west and is heaviest in late spring and early summer.

In summer, the Bermuda High exerts a strong influence upon the weather of the region. It furnishes the tropical maritime air from the Gulf of Mexico which almost completely dominates the weather from May to September. This air mass is responsible for almost all of the thunderstorm activity in the region regardless of time of year. Occasionally, in summer, tropical continental air may move into west Texas from the high plateaus to the west. This air mass is characterized by very hot daytime temperatures and almost cloudless skies.

During the winter and early spring, outbreaks of polar continental air are the most common frontal activity. Although these fronts frequently have little weather associated with them, they often stall in central and southern Texas. On occasion, arctic air masses push through the region and cause some of the coldest temperatures. Cold weather rarely lasts more than a few days.

Spring is characterized by rapid changes of temperature (i.e., alternating periods of warm and cold conditions.) On average, thunderstorms are more frequent and more violent in the spring than any other season. Spring is normally the wettest season of the year. Fall is characterized by fair weather, low wind speeds, and moderate temperatures. It is the most pleasant season of the year.

3.3.2 Meteorology

3.3.2.1 Wind Direction and Speed

The prevailing wind direction at CPNPP is south to southeast with northerly components during the winter months due to frequent outbreaks of polar air masses. The average annual wind speed is 10.2 mph (see Table 3.3-2).

For Dallas-Fort Worth, the 23-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 170 degrees (southerly). Monthly prevailing winds are from the south year-round. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 10.5 mph. A maximum 3-second wind speed of 79 mph was recorded in March 2019. (NCDC 2020)

For Waco, the 45-year period of record data show the annual prevailing wind direction is from 190 degrees (southerly). Monthly prevailing winds are from the south year-round. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 10 mph. A maximum 3-second wind speed of 77 mph was recorded in July 2010. (NCDC 2020)

For Abilene, the 40-year period of record data show the annual prevailing wind is from 170 degrees (southerly). Monthly prevailing winds range from the south to the south-southwest most of the year. In February, the prevailing wind direction is from the north. As listed in Table 3.3-1, the mean wind speed over the past 36-year period of record was 10.9 mph. A maximum 3-second wind speed of 70 mph was recorded in June 2013. (NCDC 2020)

Mean monthly wind speeds at the CPNPP site are provided in Table 3.3-2, based on a 21-year record (1999–2020) of measurements from the lower level (32.8 feet above ground level) of the onsite meteorological monitoring system. Annual wind rose diagrams for the period 2016–2020 are provided in Figures 3.3-1, 3.3-2, 3.3-3, 3.3-4, and 3.3-5. (NRC 2021a)

3.3.2.2 Temperature

Representative regional temperature averages and extremes are available from the Dallas-Fort Worth monitoring station. The local climate data summary for the Dallas-Fort Worth area indicates that the mean daily maximum temperature is highest in August (96.1°F) and decreases to the seasonal low in January (55.3°F). The Dallas-Fort Worth area experiences normal temperatures above 90°F approximately 95.2 days per year from February through November. The highest temperature of record (113°F) occurred in June 1980. The mean daily minimum temperature is above 60°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 34.5°F. Record low temperatures less than 32°F have been recorded from October through April, with below-freezing temperatures normally occurring approximately 29.4 days per year from October through April. The lowest temperature of record by the Dallas-Fort Worth station is -1°F, occurring in December 1989. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Dallas-Fort Worth area are summarized in Table 3.3-3.

Representative regional temperature averages and extremes are also available from the Waco monitoring station. The local climate data summary for the Waco area indicates that the mean daily maximum temperature is highest in August (96.9°F) and decreases to the seasonal low in January (57.6°F). The Waco area experiences normal temperatures above 90°F approximately 103.6 days per year from February through November. The highest temperature of record (114°F) occurred in July 2018. The mean daily minimum temperature is above 60°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 36.1°F. Record low temperatures below 32°F have been recorded from December through February, with below-freezing temperatures normally occurring approximately 31 days per year. The lowest temperature of record by the Waco station is -5°F, occurring in January 1949. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Waco area are summarized in Table 3.3-3.

Representative regional temperature averages and extremes are also available from the Abilene monitoring station. The local climate data summary for the Abilene area indicates that the mean daily maximum temperature is highest during July (95°F) and decreases to the seasonal low in January (56.1°F). The Abilene area experiences normal temperatures above 90°F approximately 90 days per year from February through November. The highest temperature of record (110°F) occurred in July 1978. The mean daily minimum temperature is above 60°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 32.1°F. Record low temperatures below 32°F have been recorded from October through April, with below-freezing temperatures normally occurring approximately 45.3 days per year. The lowest temperature of record by the Abilene station is -9°F, occurring in

January 1947. (NCDC 2020) Monthly and annual daily mean temperature data and temperature extremes for the Abilene area are summarized in Table 3.3-3.

Average temperatures in the area of CPNPP range from 48.2°F in January and 85.9°F in August, with annual extremes of approximately 12.6°F low and 107°F high. Monthly and annual daily mean temperature data and temperature extremes for the CPNPP area are summarized in Table 3.3-4. On average CPNPP has temperatures consistent with the regional and local stations with monthly average temperatures of the site falling within all of the mean daily maximum and mean daily minimum values for the representative sites.

3.3.2.3 Precipitation

Rainfall occurs during brief but sometimes intense showers and thunderstorms. As seen in Table 3.3-6, there are two periods of greater precipitation in the vicinity of CPNPP when compared to rest of the year. The first is in May and June, followed by September and October . The pattern is similar for Dallas-Fort Worth and Waco, which show more precipitation in May and June, and again in September and October, with lower amounts in July and August. The Abilene station precipitation data show a similar pattern for May and June but has a less distinct fall precipitation pattern (NCDC 2020). The Rainbow weather station precipitation data, as listed in Table 3.3-6, has a pattern more similar to Dallas-Fort Worth and Waco than the precipitation pattern for Abilene. (NOAA 2021a)

The precipitation records of normal rainfall totals for the Dallas-Fort Worth area indicate that precipitation of 0.01 inches or more occurs on average for 79.8 days per year, with four or more days per month receiving at least some precipitation. The annual average precipitation at the Dallas-Fort Worth station is 36.14 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs during May and June, with the most precipitation occurring in May. The highest seasonal precipitation occurs during the spring and fall (approximately 42 percent falling March, April, May, and June). May and June have the highest number of days with rain. Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at Dallas-Fort Worth, 8.11 inches, occurred in September 2018. Dallas-Fort Worth received a record minimum monthly rainfall total (0 inches) in August 2000. (NCDC 2020)

The precipitation records of normal rainfall totals for the Waco area indicate that precipitation of 0.01 inches or more occurs on average for 81.8 days per year, with five or more days per month receiving at least some precipitation. The annual average precipitation at the Waco station is 34.69 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs during May and June with the most precipitation occurring in May. The highest seasonal precipitation occurs during the spring and fall (approximately 39 percent falling March, April, May, and June). May and June have the highest number of days with rain. Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at Waco, 9.67 inches, occurred in October 2015. Waco received a record minimum monthly rainfall total (0 inches) in July 1993. (NCDC 2020)

The Abilene precipitation records indicate that precipitation of 0.01 inches or more normally occurs on average for 68.9 days per year, with four or more days per month receiving at least some precipitation. The annual average precipitation at the Abilene station is 24.82 inches per year. Precipitation recorded at the station shows the highest seasonal precipitation occurs during May and June with the most precipitation occurring in June. The highest seasonal precipitation occurs during late spring and early fall (approximately 59 percent falling May, June, August, September, and October). May and June have the highest number of days with rain. Normal regional precipitation and extremes are presented in Table 3.3-5. The maximum 24-hour precipitation total recorded at Abilene, 8.26 inches, occurred in July 2015. Abilene received a record minimum monthly rainfall total (0 inches) in August 2000. (NCDC 2020)

3.3.2.4 Snow and Glaze

In the CPNPP region, Winter precipitation is closely associated with frontal activity, and may fall as rain, freezing rain, sleet, or snow. The Dallas-Fort Worth and Waco weather stations report 1.2 inches of snow annually. The Abilene weather station reports 4.7 inches of snow annually. (NCDC 2020) Snow is not recorded at the CPNPP site.

3.3.2.5 Relative Humidity and Fog

The closest available fog data for the CPNPP region are from the Dallas-Fort Worth and Waco weather stations. The local climatological data for Dallas-Fort Worth and Waco weather stations indicate an average of 9.5 and 14 days per year of heavy fog, respectively. The Abilene weather station indicate an average of 7.2 days per year of heavy fog. Heavy fog is defined by the NWS as fog which reduces visibility to 0.25 miles or less. (NCDC 2020) Fog is not recorded at the site by CPNPP.

3.3.2.6 Severe Weather

3.3.2.6.1 Thunderstorms

The CPNPP site is located near the High Plains, an area noted for severe thunderstorm and tornado activity (NRC 2011, Section 2.9.1.4). Thunderstorms are frequent during the spring months, with the greatest occurrence in May (NCDC 2020). The mean number of days with thunderstorms in each month for Dallas-Fort Worth, Waco, and Abilene are provided in Table 3.3-7. Based on National Centers for Environmental Information (NCEI) records, Somervell County, Texas, has recorded 62 significant thunderstorm events since 1971, with most of the thunderstorms occurring in April, May, and June. (NCEI 2020)

3.3.2.6.2 Tornados

The most common time of year for tornadoes is the spring (NRC 2011, Section 2.9.1.4). Based on NCEI records, a total of six tornadoes have been recorded in Somervell County, Texas, since 1988. The records show that the intensity of the storms was limited to F0, F2, EF0, and EF1. (NCEI 2020)

3.3.2.6.3 Hurricanes

As recorded in National Oceanic and Atmospheric Administration (NOAA) historical storm records, there was one hurricane that tracked within 100 miles of Somervell County, Texas, between 1853 and 2020. An unnamed hurricane in September 1900 was the most recent hurricane that tracked within that distance; by the time it crossed the county line into Somervell County, it was downgraded to a tropical storm. Twenty-nine additional tropical storms and depressions have tracked within 100 miles of Somervell County. (NOAA 2021b)

3.3.2.7 Atmospheric Stability

Atmospheric stability is a meteorological parameter that describes the dispersion characteristics of the atmosphere. It can be determined by the difference in temperature between two heights. A seven-category atmospheric stability classification scheme (ranging from A for extremely unstable to G for extremely stable) based on temperature differences is set forth in the NRC's Regulatory Guide 1.23, Revision 1 (NRC 2007b). When the temperature decreases rapidly with height (typically during the day when the sun is heating the ground), the atmosphere is unstable and atmospheric dispersion is greater. Conversely, when temperature increases with height (typically during the night as a result of the radiative cooling of the ground), the atmosphere is stable, and dispersion is more limited. The stability category between unstable and stable conditions is D (neutral), which would occur typically with higher wind speeds and/or higher cloud cover, irrespective of day or night. (NRC 2013c, Section 2.9.1.4).

Based on a 5-year average (2016–2020), onsite temperature difference data recorded at CPNPP indicate that stable atmospheric conditions (E to G) occurred about 29.0 percent of the time and unstable conditions (A to C) occurred about 23.6 percent of the time. The remaining observations (about 47.4 percent) fell into the neutral (D) category. (NRC 2021a) Stability class distributions at CPNPP covering the period 2016–2020 are presented in Table 3.3-8.

3.3.3 Air Quality

3.3.3.1 Clean Air Act Non-Attainment Maintenance Areas

The Clean Air Act (CAA) was established in 1970 [42 U.S. Code (USC) § 7401 et seq.] to reduce air pollution nationwide. The EPA has developed primary and secondary national ambient air quality standards (NAAQS) under the provisions of the CAA. The EPA classifies air quality within an air quality control region (AQCR) according to whether the region meets or exceeds federal primary and secondary NAAQS. An AQCR or a portion of an AQCR may be classified as being in attainment or non-attainment, or it may be unclassified for each of the six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$, fine particulates; and PM_{10}, coarse particulates), ozone, and sulfur dioxide (SO_2).

Emissions from non-radiological air pollution sources, including the criteria pollutants, are controlled through compliance with federal, state, and local regulations. Non-attainment areas are geographic areas where the ambient levels of criteria air pollutants in the air are designated as not meeting the primary standard set forth in federal, state, and local regulations. Attainment

areas are geographic areas where ambient air pollutant levels meet or are better than the criteria or cannot be classified (depending on the pollutant and other factors). A maintenance area is an area that formerly did not meet the attainment criteria but currently meets or exceeds the attainment criteria. (EPA 2021b)

The CPNPP site is in Somervell County, which is in the Metropolitan Dallas-Fort Worth Intrastate AQCR. Somervell County is one of 19 counties in the AQCR. [40 CFR 81.39] Nine counties in the AQCR make up the non-attainment area for 8-hour ozone (2015 standard). These counties include Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Tarrant, and Wise counties, Texas. For 8-hour Ozone (2008 standard), the previous nine counties and Rockwell County are combined to produce the non-attainment area. Collin County, Texas, is a maintenance area for lead (1978 standard) and lead (2008 standard). All remaining counties within the Metropolitan Dallas-Fort Worth Intrastate AQCR which includes Somervell County, are in attainment for all criteria pollutants. (EPA 2021b).

Figure 3.3-6 illustrates non-attainment and maintenance areas defined under the CAA, as amended, within a 65-mile radius of CPNPP. The closest Class I Area is the Wichita Mountains National Wildlife Refuge, over 175 miles north [40 CFR 81.424]. The Class I areas within the state of Texas are over 350 miles to the southwest [40 CFR 81.429]. Given the minor nature of air emissions associated with operations of CPNPP, this distance is sufficiently far as to not warrant concern.

3.3.3.2 Air Emissions

CPNPP holds a TCEQ air permit (19225) that authorizes the operation of emission sources listed in the permit at the CPNPP Units 1 and 2. The listed emission sources include one auxiliary boiler, six emergency diesel generators, and two diesel fire water pumps. Permitted air emission sources are listed in Table 3.3-9. Because CPNPP utilizes a once-through cooling system for condenser cooling purposes, there are no cooling towers or associated particulate emissions.

The permitted emission sources at CPNPP are regulated by the applicable regulations cited in the emissions permit. CPNPP does not meet the requirements for annual reporting per 30 TAC 101.10(A). Theoretical maximum annual emissions are calculated and presented in Table 3.3-10. The values are calculated using the applicable regulations to assume emission source run time limits and fuel sulfur content limits. All other emission generating equipment not detailed in the air permit comply with Permit by Rule (PBR) per 30 TAC 106.

As presented in Chapter 9, there have been no notices of violation or non-compliances associated with CPNPP air emissions over the five years from 2016–2020.

As presented in Section 2.3, no LR-related refurbishment or other LR-related construction activities have been identified. In addition, CP PowerCo's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel

pumps) that would affect CPNPP's current air emissions program. Therefore, no increase or decrease of air emissions is expected over the proposed LR operating term.

Studies have shown that the amount of ozone generated by even the largest industry transmission lines in operation (765 kV) would be insignificant (NRC 2013a, Section 4.3.1.1). As discussed in Section 2.2.5, the in-scope transmission lines at CPNPP are 138-kV and 345-kV. Therefore, the amount of ozone generated from in-scope transmission lines is anticipated to be minimal.

3.3.4 Greenhouse Gas Emissions

Because CPNPP is not required to inventory and report greenhouse gases (GHGs), data do not exist for mobile sources such as visitors and delivery vehicles. Therefore, CP PowerCo calculated estimates of GHG gas emissions on those direct (stationary and portable combustion sources) and indirect (workforce commuting) plant activities from information that was readily available from CPNPP and other sources such as the US Census Bureau (see Table 3.3-11). Estimates from stationary and portable combustion sources are based on reported fuel usage. Estimates of workforce commuting are based on current staffing of 1,159 employees as discussed in Section 2.5, an estimate of 4.4 percent workforce carpooling, and use of EPA’s Greenhouse Gas Equivalency Calculator. (EPA 2021c; USCB 2021c) Estimates of GHG emissions generated at CPNPP are presented in Table 3.3-11.

Ozone-depleting substances such as chlorofluorocarbons and hydrochlorofluorocarbons are present at CPNPP and can potentially be emitted; however, estimating GHG emissions from these substances is complicated due to their ability to deplete ozone, which is also a GHG, making their global warming potentials difficult to quantify. These ozone-depleting substances are regulated by the CAA under Title VI. As discussed in Section 9.5.2.3, CP PowerCo maintains a program to manage stationary refrigeration appliances at CPNPP to recycle, recapture, and reduce emissions of ozone depleting substances and is in compliance with Section 608 of the CAA. Because these emissions are not expected to add to the values in Table 3.3-11, CP PowerCo did not include potential emissions as result of leakage, servicing, repair, and disposal of refrigerant equipment at CPNPP.

The potential for cumulative impacts of continued operation of CPNPP and climate change are addressed in Section 4.12.

Table 3.3-1 Regional Wind Conditions

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas														
Mean Speed (MPH)	36	10.8	11.3	12.1	12.2	11.4	10.5	9.9	8.7	8.6	9.8	10.6	10.3	10.5
Prevailing Direction (degrees from)	23	190	170	170	170	170	170	170	170	170	170	190	190	170
Max 3-Second Speed (MPH)	24	55	78	79	75	67	64	64	60	52	67	54	60	79
Max Speed Year of Occurrence		2017	2000	2019	2008	2006	2009	2012	2013	2016	2019	2006	2015	Mar. 2019
Waco, Texas														
Mean Speed (MPH)	36	10	10.6	11.3	11.4	10.6	10	9.8	9	8.4	9.2	9.8	9.5	10
Prevailing Direction (degrees from)	45	190	170	170	170	170	170	190	190	190	170	190	190	190
Max 3-Second Speed (MPH)	26	66	63	64	69	75	74	77	49	55	60	55	49	77
Max Speed Year of Occurrence		2017	2013	2005	1999	2016	2016	2010	2019	1995	2000	2001	2012	Jul. 2010
Abilene, Texas														
Mean Speed (MPH)	36	10.7	11.4	12.4	13	12.1	11.3	10	9	9.2	10.3	10.8	10.5	10.9
Prevailing Direction (degrees from)	40	200	360	170	170	170	170	170	170	170	170	200	200	170
Max 3-Second Speed (MPH)	23	53	59	55	68	64	70	60	67	53	56	56	58	70
Max Speed Year of Occurrence		2019	2007	2019	1998	2010	2013	2017	1997	2010	2012	2005	2015	Jun. 2013

(NCDC 2020)

Table 3.3-2 CPNPP Wind Conditions

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Mean Speed (MPH)	21	10.6	11.1	11.2	11.8	11.1	10.2	9.2	8.6	8.7	9.5	10.1	10.3	10.2
Prevailing Direction (degrees from)	21	0	170	160	160	160	160	160	170	140	150	160	150	160

Table 3.3-3 Regional Temperatures

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas														
Mean Daily Maximum (°F)	77	55.3	59.8	68.1	76.1	83.5	91.5	95.8	96.1	88.7	78.9	66.7	58.2	76.6
Highest Daily Maximum (°F)	66	88	95	96	101	103	113	110	110	111	102	94	89	113
Year of Occurrence		1969	1996	1991	2006	1985	1980	1998	2011	2000	1979	2017	2005	Jun-80
Mean Daily Minimum (°F)	77	34.5	38.3	46	54.5	63.4	71.1	74.9	74.6	67.5	56.7	45.3	37.4	55.4
Lowest Daily Minimum (°F)	66	4	7	15	29	39	51	59	56	43	29	20	-1	-1
Year of Occurrence		1964	1985	2002	1989	2013	1964	1972	1967	1984	1993	1959	1989	Dec-89
Waco, Texas														
Mean Daily Maximum (°F)	90	57.6	60.9	69.7	77.4	84.8	91.7	96.4	96.9	89.6	80.6	67.9	60	77.8
Highest Daily Maximum (°F)	77	88	96	100	101	102	109	114	112	111	101	92	91	114
Year of Occurrence		1971	1996	1971	1963	1985	1980	2018	1969	2000	1989	2017	1955	Jul-18
Mean Daily Minimum (°F)	90	36.1	39.4	47	55.3	64.1	71	74.8	74.4	67.5	57.2	45.8	38.5	55.9
Lowest Daily Minimum (°F)	77	-5	4	15	26	34	52	58	53	40	25	17	-4	-5
Year of Occurrence		1949	1985	1948	2009	2013	1964	2013	1992	1983	1993	1976	1989	Jan-49
Abilene, Texas														
Mean Daily Maximum (°F)	72	56.1	60.6	68.9	77.7	84.5	91.4	95	94.6	87.2	77.7	65.9	57.8	76.5
Highest Daily Maximum (°F)	80	89	93	97	104	109	109	110	109	107	103	92	89	110
Year of Occurrence		1943	2009	1974	2012	2011	1994	1978	2019	2000	1979	1980	1955	Jul-78
Mean Daily Minimum (°F)	72	32.1	36.3	43.6	52.6	61.2	68.9	72.5	71.8	64.8	54.4	42.5	34.3	52.9
Lowest Daily Minimum (°F)	80	-9	-7	7	25	33	47	55	50	35	20	14	-7	-9
Year of Occurrence		1947	1985	1943	1973	2013	1964	1940	1992	1942	2019	1976	1989	Jan-47

(NCDC 2020)

Table 3.3-4 CPNPP Site Temperatures 1999–2020

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Monthly Average (°F)[a]	21	48.2	51.5	59.3	67.2	74.3	81.6	84.9	85.9	79.2	68.7	58.3	49.3	67.6
Highest Daily Maximum (°F)	21	88.8	92.2	92.6	100.2	99.5	103.8	106.8	106.3	107.0	96.5	92.4	91.4	107.0
Year of Occurrence	21	2006	2008	2006	2006	2000	2011	2018	2011	2000	2014	2017	2005	2000
Lowest Daily Minimum (°F)	21	14.7	12.6	15.1	31.3	41.8	62.7	66.0	62.3	32.3	29.2	22.6	15.3	12.6
Year of Occurrence	21	2014	2011	2014	2007	2013	2000	2014	2015	2008	2019	2019	2016	2011

a. Calculated average of all temperature measurements for each month and of all measurements for the period January 1999–August 2020.

Table 3.3-5 Regional Precipitation (Sheet 1 of 2)

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas														
Normal Monthly (inches)	30	2.13	2.66	3.49	3.07	4.9	3.79	2.16	1.91	2.55	4.22	2.71	2.55	36.14
Maximum Monthly (inches)	66	6.18	11.31	7.39	12.19	16.96	11.1	11.13	6.85	12.69	15.66	9.86	8.75	16.96
Year Occurred		2012	2018	2002	1957	2015	2007	1973	1970	2018	2018	2015	1991	May-15
Maximum 24-hour (inches)	66	4.27	4.72	4.39	4.55	5.34	3.98	4.01	4.05	8.11	5.91	4.78	4.22	8.11
Year Occurred		2012	2018	1977	1957	1989	2017	2004	1976	2018	1959	2015	1991	Sep-18
Minimum Monthly (inches)	66	T	0.15	0.07	0.11	0.7	0.34	0	0	T	T	0.02	0.17	0
Year Occurred		1986	1963	2011	1987	2017	2006	1993	2000	2019	1975	2005	1981	Aug-00
Waco, Texas														
Normal Monthly (inches)	30	2.12	2.63	3.15	2.69	4.3	3.43	1.79	2.05	3.06	3.9	2.82	2.75	34.69
Maximum Monthly (inches)	77	6.1	7.91	9.76	13.37	15	12.06	8.58	10.33	9.49	15.19	9.72	9.81	15.19
Year Occurred		1998	1997	2007	1957	1965	1961	1971	2008	2010	2015	2004	1997	Oct-15
Maximum 24-hour (inches)	77	4.79	3.97	6.17	5.09	7.18	4.39	4.93	4.8	5.89	9.67	4.26	7.98	9.67
Year Occurred		1998	1997	2012	1957	1953	2014	2004	1958	2010	2015	1952	1997	Oct-15
Minimum Monthly (inches)	77	0.03	0.07	0.04	0.12	0.55	0.18	0	T	0	0	T	0.04	0
Year Occurred		1971	1999	1956	1983	1998	2008	1993	1952	1956	1952	2012	1950	Jul-93

Table 3.3-5 Regional Precipitation (Sheet 2 of 2)

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Abilene, Texas														
Normal Monthly (inches)	30	1.02	1.36	1.74	1.64	3.18	3.56	1.87	2.59	2.24	2.98	1.41	1.23	24.82
Maximum Monthly (inches)	80	4.35	3.6	5.16	6.8	13.19	9.6	8.3	8.18	11.03	12.09	5.12	6.28	13.19
Year Occurred		1968	1992	1979	1966	1957	1961	2015	1969	1974	2018	2004	1991	May-57
Maximum 24-hour (inches)	80	2.84	2.09	2.24	3.75	4.76	3.66	8.26	6.3	6.7	6.08	2.43	2.62	8.26
Year Occurred		2010	2018	1998	1957	1990	1959	2015	1978	1961	1981	1975	1991	Jul-15
Minimum Monthly (inches)	80	T	0	0.03	T	0.15	T	T	0	T	0	0	T	0
Year Occurred		2018	1999	1963	1961	1956	1994	2011	2000	1956	1952	1949	1972	Aug-00

(NCDC 2020)

Table 3.3-6 Rainbow Precipitation Records 1991–2020

	Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Monthly (inches)	30	2.1	2.3	3	3	4.2	3.3	1.7	2.6	3	3.8	2.3	2.2	33.5
Maximum Monthly (inches)	30	6.7	6.7	6.4	9	14.8	11.5	6.2	9.2	11.2	12	8.3	9.4	59.6
Year Occurred	30	2012	1997	2006	2015	2015	2000	2007	1996	2018	2015	2004	1991	2015
Minimum Monthly (inches)	30	0.06	0.01	0.08	0.08	0.73	0.03	0.00	0.00	0.03	0.28	0.05	0.05	16.3
Year Occurred	30	2014	1999	2011	2005	1996	2018	1993 2000	1999 2000 2002	2019	2010	1999 2012	2005	2005

(NOAA 2021a)

Table 3.3-7 Regional Thunderstorms

Period of Record (years)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Dallas-Fort Worth, Texas													
72	1.3	2	4	5.8	7.6	6.3	4.7	4.7	3.3	3.3	1.9	1.3	46.2
Waco, Texas													
72	1.4	2.2	3.6	5.1	7.1	5.5	3.6	3.9	3.5	3.1	1.9	1.3	42.2
Abilene, Texas													
72	0.5	1.2	2.6	4.2	7.2	5.7	4.3	4.8	3.3	2.8	1.3	0.7	38.6

(NCDC 2020)

Table 3.3-8 CPNPP Stability Class Distributions

Percent Frequency of Occurrence by Stability Class Pasquill Stability Class[a]							
Year	A	B	C	D	E	F	G
2016	6.8	7.4	9.4	48.9	21.1	4.4	2.1
2017	8.3	7.1	9.1	44.8	22.9	5	2.9
2018	11.1	7	9.2	46.4	20	4.2	2.1
2019	8.7	6.8	8.6	46.5	22.4	4.7	2.4
2020	6	5.2	7.3	50.3	22.8	5.5	2.9
2016–2020	8.2	6.7	8.7	47.4	21.8	4.7	2.5

(NRC 2021a)

a. Classes are as follows (NRC 2007b, Regulatory Guide 1.23, Table 1):

Class A: Extremely unstable

Class B: Moderately unstable

Class C: Slightly unstable

Class D: Neutral

Class E: Slightly stable

Class F: Moderately stable

Class G: Extremely stable

Table 3.3-9 Permitted Air Emission Sources (Sheet 1 of 2)

Emission Source[(a)(b)(c)]	Description	Capacity Rating	Permit Conditions[(d)]
CP-AB1S[(c)]	Auxiliary Boiler	92.08395 MMBtu/hr	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur and refinery grade, first run oil not to be blended or contain waste oil or solvents. Shall not exceed 0.16 pounds per million Btu heat input. Opacity shall not exceed 20%. Limited to 150 hours per year. SO_2 limited to 51.16 lbs/hr and 3.84 tons/yr. NO_x [(e)] limited to 14.73 lbs/hr and 1.11 tons/yr. CO limited to 14.73 lbs/hr and 1.11 tons/yr. PM limited to 8.29 lbs/hr and 0.62 tons/yr. VOC limited to 0.46 lbs/hr and 0.04 tons/yr. Planned maintenance startup and shutdown VOC limited to 26.34 lbs/hr and 0.15 tons/yr.
CP-EDG1S[(b)] CP-EDG2S[(b)] CP-EDG3S[(b)] CP-EDG4S[(b)]	Emergency Generator Nos. 1 through 4	(4) 9,717 BHP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 600 combined hours per year. SO_2 limited to 36.2 lbs/hr each and 10.9 tons/yr combined. NO_x limited to 278.5 lbs/hr each and 83.6 tons/yr combined. CO limited to 23.6 lbs/hr each and 7.1 tons/yr combined. PM limited to 4.3 lbs/hr each and 1.3 tons/yr combined. VOC limited to 1.3 lbs/hr each and 0.39 tons/yr combined.
CP-EDG5S[(b)]	Emergency Generator No. 5	640 HP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 100 hours per year. SO_2 limited to 2.7 lbs/hr and 0.13 tons/yr. NO_x limited to 9.1 lbs/hr and 0.45 tons/yr. CO limited to 2.1 lbs/hr and 0.10 tons/yr. PM limited to 0.6 lbs/hr and 0.03 tons/yr. VOC limited to 0.1 lbs/hr and <0.01 tons/yr.

Table 3.3-9 Permitted Air Emission Sources (Sheet 2 of 2)

Emission Source[(a)(b)(c)]	Description	Capacity Rating	Permit Conditions[(d)]
CP-EDG6S[(b)]	Emergency Generator No. 6	167 HP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 100 hours per year each. SO_2 limited to 0.8 lbs/hr and 0.04 tons/yr. NO_x limited to 5.2 lbs/hr and 0.26 tons/yr. CO limited to 1.2 lbs/hr and 0.06 tons/yr. PM limited to 0.4 lbs/hr and 0.02 tons/yr. VOC limited to 0.4 lbs/hr and 0.02 tons/yr.
CP-DFP1S[(b)] CP-DFP2S[(b)]	Diesel Fire Engine Pump No. 1 and 2.	(2) 400 HP	May burn only No.2 fuel oil containing no more than 0.50% by weight sulfur. Limited to 150 combined hours per year. SO_2 limited to 2.9 lbs/hr each and 0.22 tons/yr combined. NO_x limited to 12.4 lbs/hr each and 0.93 tons/yr combined. CO limited to 2.7 lbs/hr each and 0.20 tons/yr combined. PM limited to 0.9 lbs/hr each and 0.07 tons/yr combined. VOC limited to 1.0 lbs/hr each and 0.08 tons/yr combined.

a. Emission source unit reference is from TCEQ Permit No. 19225.

b. Stationary combustion sources also subject to 40 CFR Part 63, Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

c. Also subject to 40 CFR Part 63, Subpart JJJJJ–National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources.

d. For a full discussion of air permit conditions, see TCEQ Permit No. 19225.
NO_x = nitrogen oxides PM = particulate matter VOC = volatile organic compound

Table 3.3-10 Theoretical Maximum Annual Air Emissions Summary

Annual Emissions (tons/year)						
CO	NO_X	PM	SO_2	VOC	HAP	CO_2e
11.68	91.62	3.15	15.21	4.70	1.22	5,231

CO_2e = carbon dioxide equivalent
HAP = hazardous air pollutant

Table 3.3-11 Annual Greenhouse Gas Emissions Inventory Summary

Carbon Dioxide Equivalent (CO_2e) Emissions, Metric Tons	
Emission Source	
Combustion Sources[a]	4,745
Workforce Commuting[b]	5,129
TOTAL	**9,874**

GHG calculated emissions are based on the following:

a. Fuel usage for combustion sources shown in Table 3.3-9; EPA Compilation of Air Pollutant Emissions factors (AP-42).

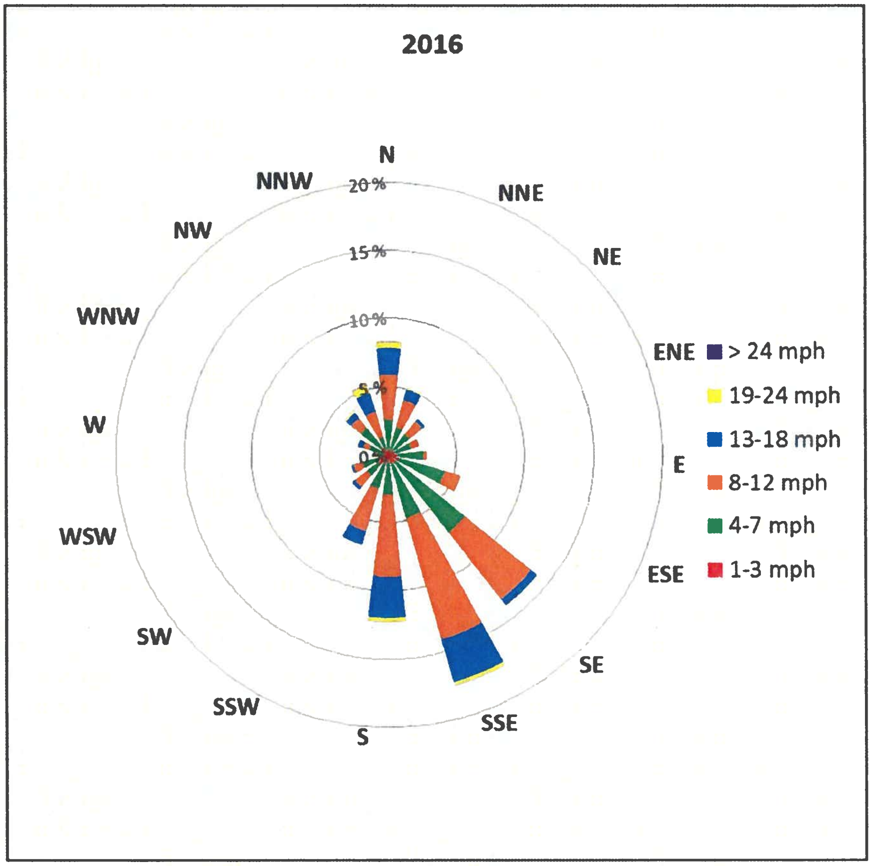
b. Workforce commuting calculations are based on:

i. Statistical information from U.S. Census Bureau (USCB) indicates that 4.4 percent of Texas workers in the transportation and warehouse and utilities industry carpool to work (USCB 2021c). The number of CPNPP employees as of December 2020 was 1,159. Utilizing the 4.4 percent USCB carpool statistic, a value of 1,108 passenger vehicles per day was utilized.

ii. Based on the EPA's Greenhouse Gas Equivalencies Calculator, the CO_2e/year is 5,129 metric tons for 1,108 vehicles (EPA 2021c).

iii. Carbon dioxide has a global warming potential (100-year time horizon) of 1 based on Table A-1 to Subpart A of 40 CFR Part 98.

iv. 3,546 metric tons CO_2e/year × 1 (global warming potential).



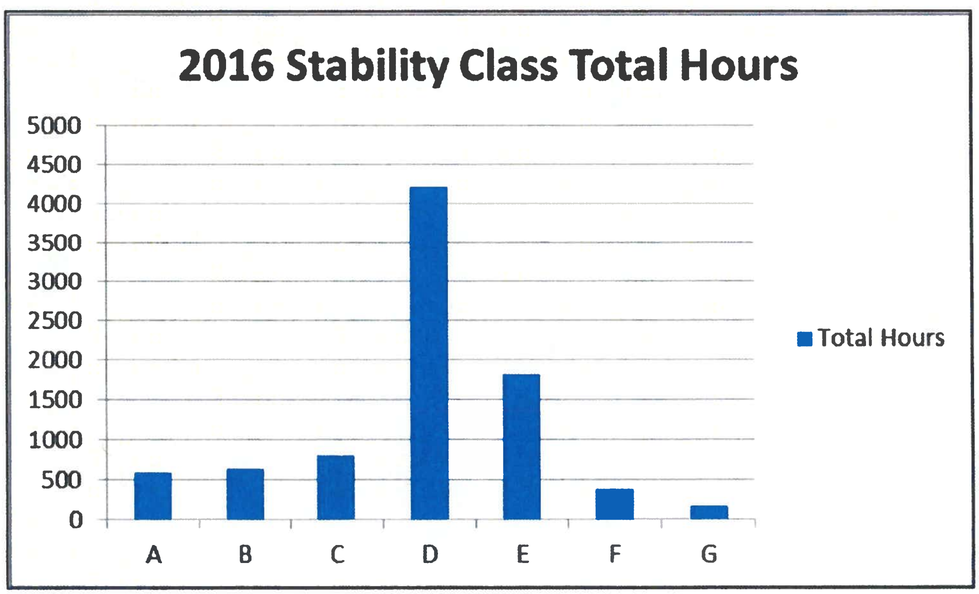
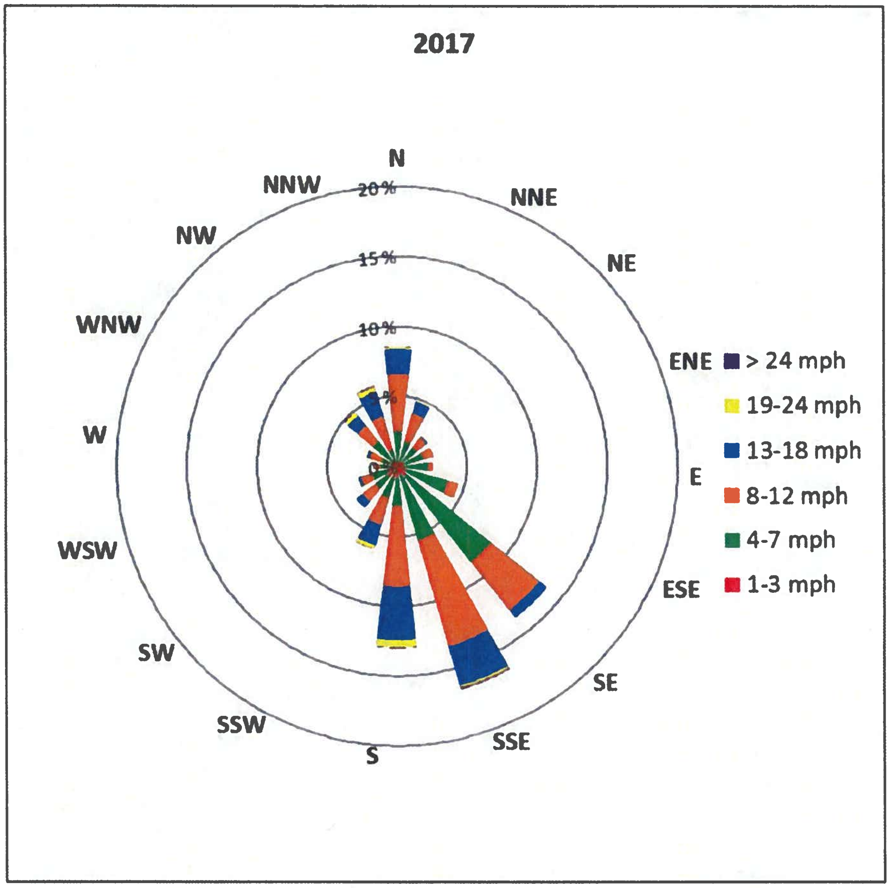


Figure 3.3-1 2016 CPNPP Wind Rose



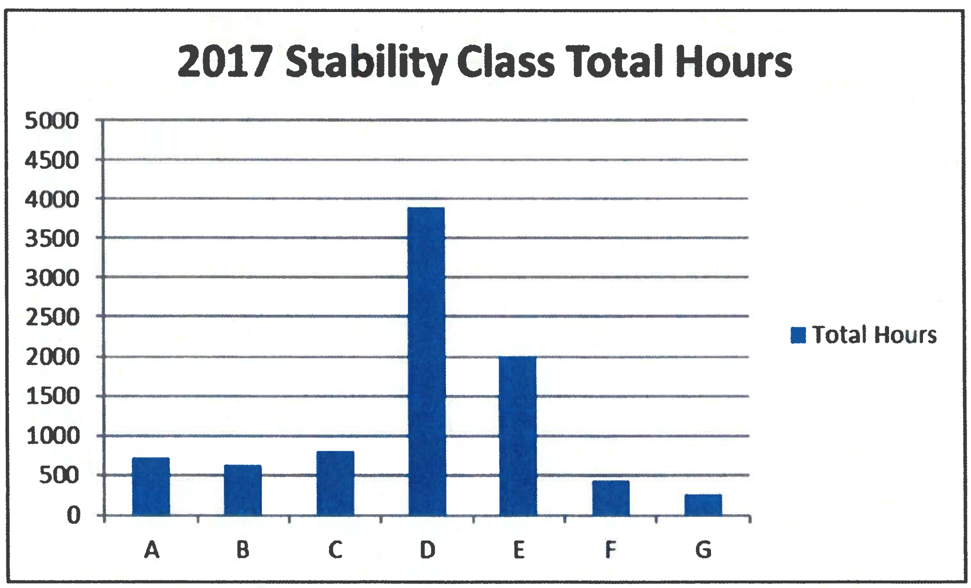
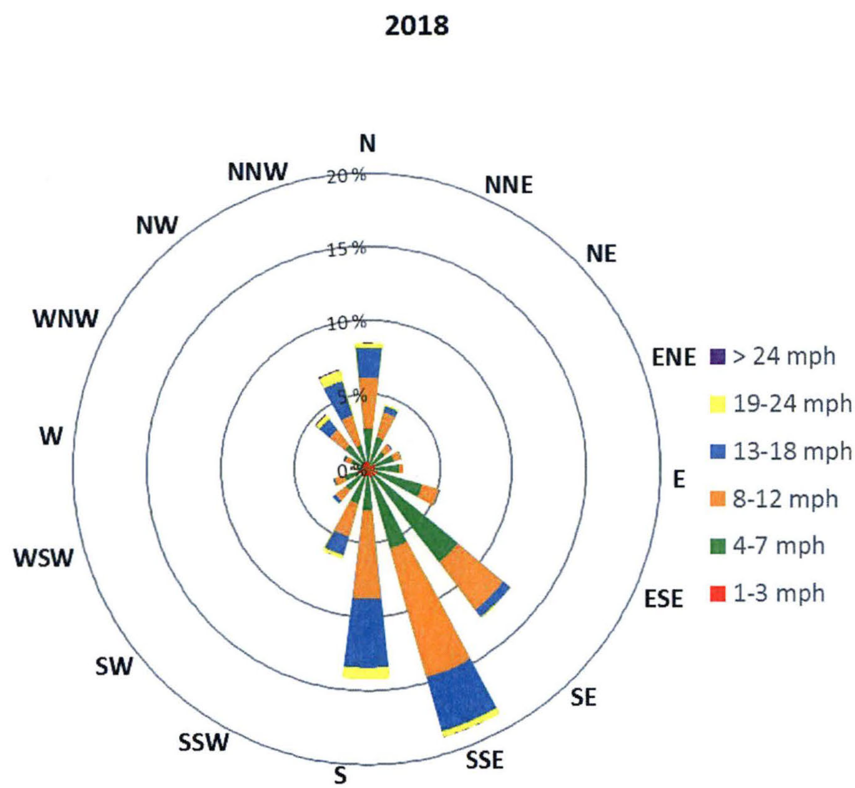


Figure 3.3-2 2017 CPNPP Wind Rose



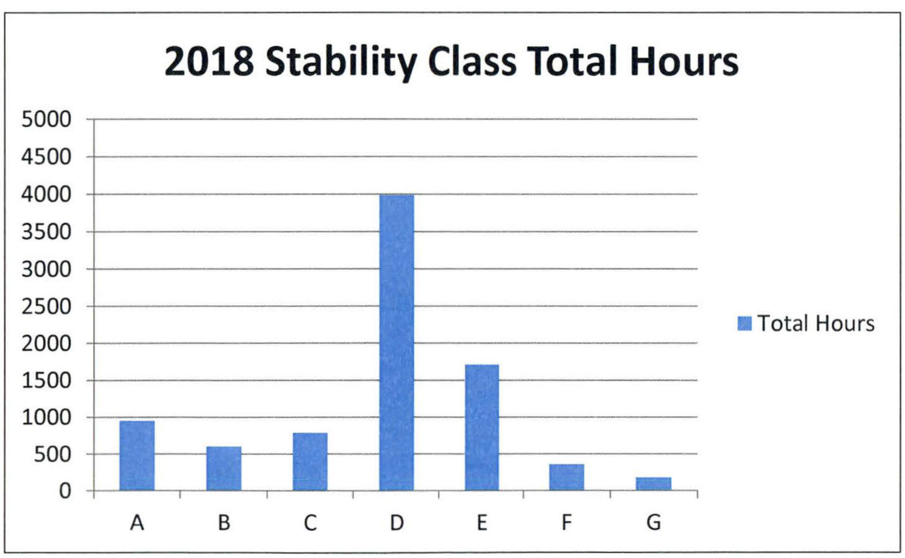
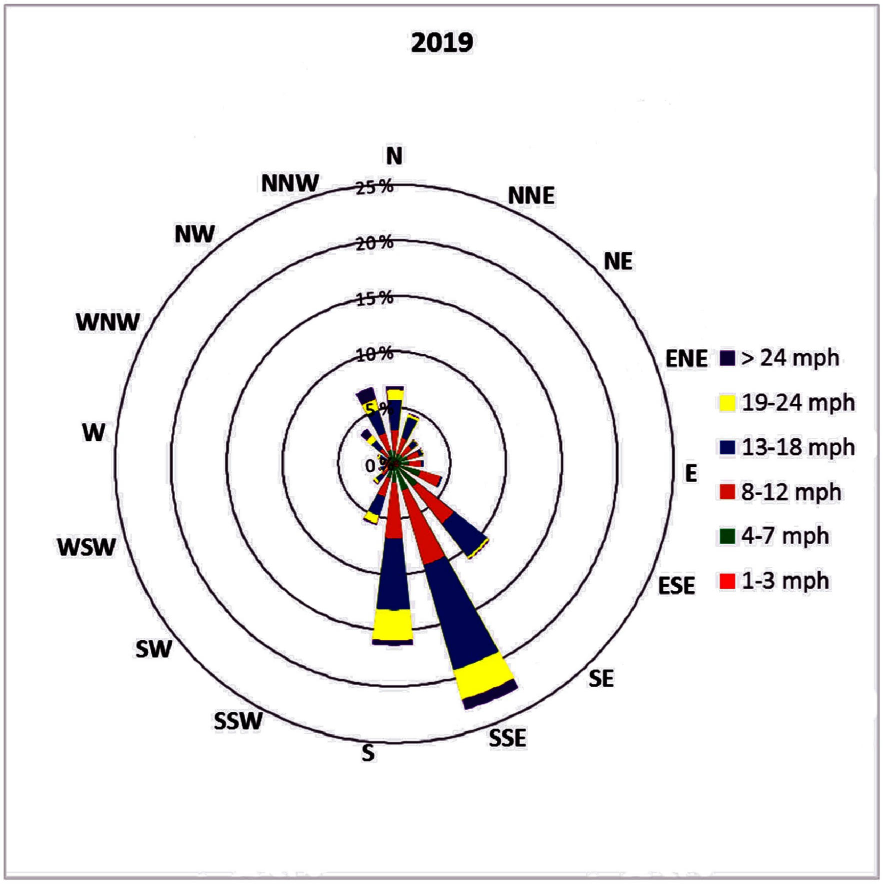


Figure 3.3-3 2018 CPNPP Wind Rose

2019 Wind Rose and Stability Class Graphs



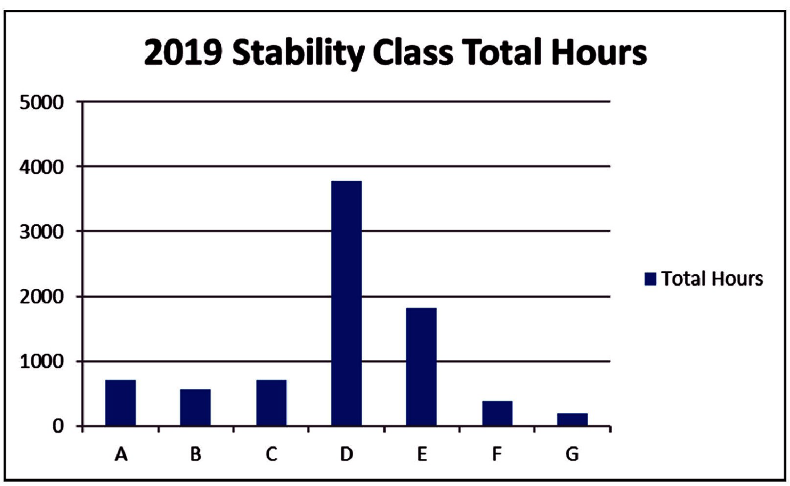
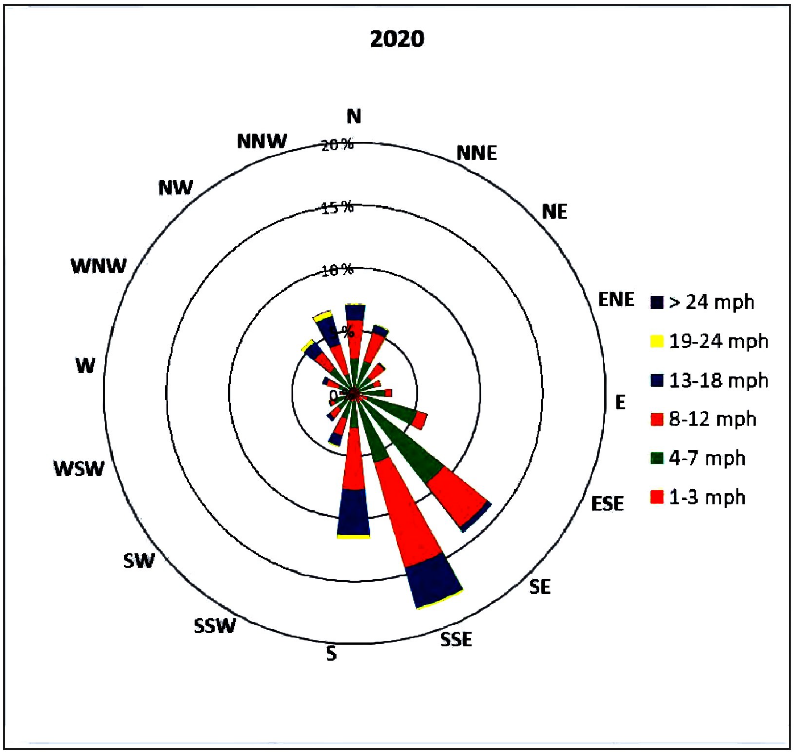


Figure 3.3-4 2019 CPNPP Wind Rose

2020 Wind Rose and Stability Class Graphs



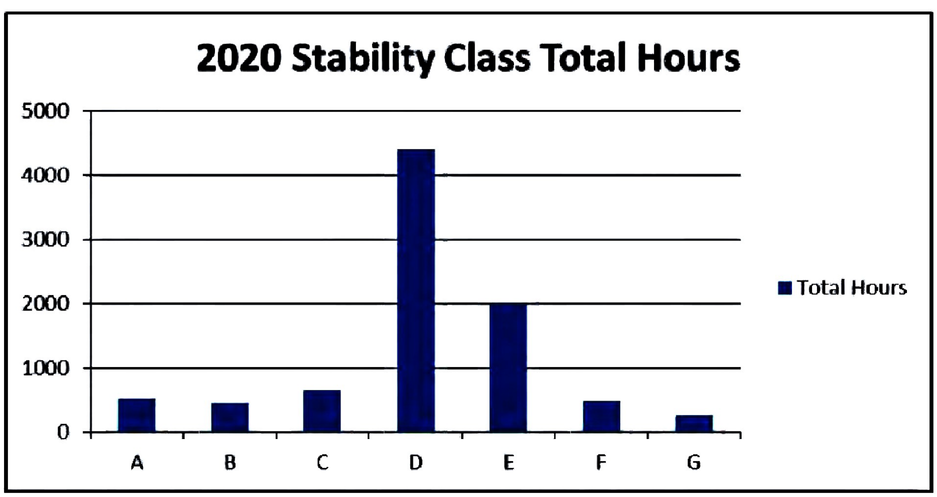


Figure 3.3-5 2020 CPNPP Wind Rose

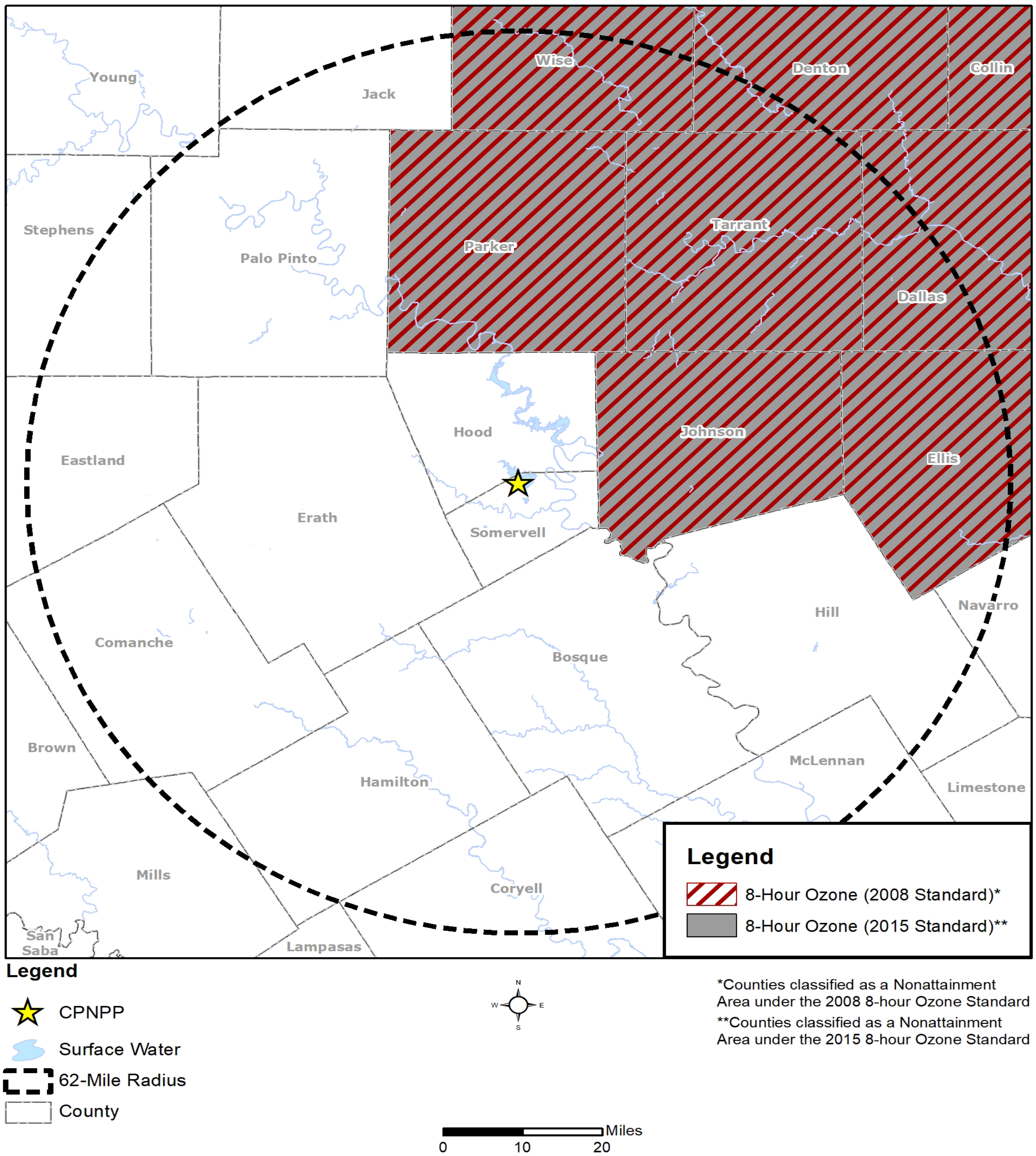


Figure 3.3-6 Air Quality Non-Attainment Areas within a 62-Mile Radius of CPNPP

3.4 Noise

Noise is produced at CPNPP from industrial plant operations and site activities. Industrial and operational background noise at CPNPP is generally from emergency diesel generator operations, turbine generators, transformers and electrical equipment, public address systems, transmission lines and switchyards, the main steam safety valves, heating, ventilation and air-conditioning systems, vents, water pumps, material-handling equipment, motors, maintenance vehicles (forklifts, tractors, trucks, etc.), warning sirens, trucks, and vehicular traffic. Many of the noise sources are confined indoors, underground, or are used infrequently. A shooting range is also located onsite, away from the main portion of the plant, but can create sporadic noise when weapons are fired. (Luminant 2013b, Section 2.5.5)

The loudest sound emitted from CPNPP plant systems would be from release of steam into the atmosphere and the use of firearms at the shooting range. The steam release occurs four times over each three-year period during shutdowns. If a trip occurs, there may also be a steam release. The most likely source of noise is when the main steam atmospheric relief valves open at the roof of the Safeguard Buildings, and that may be heard from a distance but not at levels that would require hearing protection. The shooting range is active on weekdays.

The firing range is approximately 1,710 feet from the closest point of the site boundary in the western direction. The nearest residents to CPNPP are located approximately 0.8 miles south-southwest and 0.8 southwest of the plant.

From an ambient noise study performed in February 2007, receptors were reviewed within a 10-mile radius of the site including the nearest residences, south fence line, near the east fence line, Post Oak Memorial Chapel and cemetery, Freedom Church, and Happy Hill Children's Home. Recreation locations were also selected. These noise measurements provide information on the baseline noise levels in the area during both the daytime and nighttime periods. (Luminant 2013b, Section 2.5.5)

No sensitive receptors, except for wildlife and migratory birds, were located within the fence line of the facility. Noise is attenuated with distance for the residences to the south-southwest because trees with foliage, ground cover, earthen berms, and other natural features dampen the noise. However, because water is between the eastern fence line and the residences across SCR, potential noise from the site would not be attenuated with distance past the fence line as it would be by natural methods. These residences are located a substantial distance from the site and are thus unaffected by CPNPP noise. (Luminant 2013b, Section 2.5.5)

The ambient noise study concluded that the fence line and offsite noise levels measured were in the range of values expected for ambient noise for a low density residential and rural location. Area noise levels ranged between 35 A-weighted decibel scale (dBA) and 70 (traffic) dBA (daytime) and between 36 dBA and 60 dBA (nighttime). Average equivalent sound levels (Leq) were measured between 36 dBA and 55 dBA (daytime) and from 37 dBA to 55 dBA (nighttime). These measurements for the day-night average (Ldn) are similar to expected levels for the day-

night average in a rural area ranging from 50 to 55 Ldn. (Luminant 2013b, Section 2.5.5) The conclusions of the study are still relevant as there have been no significant changes to receptors since 2007 and no anticipated changes during the LR period.

Other noise generated onsite is from natural sources such as wind through foliage, wildlife, and insects. Noise generated outside of the fence line from nearby offsite sources includes residential activities, traffic along the western fence line (plant entrance), and boats at the northern fence line. (Luminant 2013b, Section 2.5.5)

The U.S. Department of Housing and Urban Development (HUD) has established noise impact guidelines for residential areas based on Ldn. The Ldn is the 24-hour average sound level, in decibels, obtained after addition of 10 decibels (dB) to sound levels in the night from 10 p.m. to 7 a.m. (HUD 2009). Neither the State of Texas nor Hood and Somervell counties have developed noise regulations specifying acceptable community noise levels.

HUD's goal is to have the exterior noise level not to exceed an Ldn of 55 dBA. However, when considering cost and feasibility, HUD suggests an Ldn of 65 dB is acceptable and allowable, below which the noise would be considered acceptable for residential and outdoor recreational uses. (HUD 2009) As discussed earlier, CPNPP noise levels range from 36 dBA to 55 dBA and are below the requirements of 65 dBA established by HUD. Additionally, according to NUREG-1437, noise levels are considered acceptable if the Ldn outside a residence is less than 65 dBA (NRC 2013a, Section 3.3.3).

Because CPNPP is located in a rural area (away from urban areas), it is unlikely that noise levels from CPNPP would affect offsite residences. This is further substantiated by the fact that during the most recent 5 years (2016–2020), no noise complaints related to CPNPP plant operational and outage activities have been received from offsite residences . Therefore, no noise issues affecting offsite residences are anticipated during the LR period because noise levels at CPNPP are expected to remain the same as under current operating conditions.

The CPNPP safety handbook requires all employees, regardless of whether affected or not, to wear approved hearing protection equipment in high noise areas. These areas not only include those that are posted as such, but any area in which the noise level makes normal conversation difficult. Luminant's hearing conservation program is designed to prevent any temporary or permanent noise-induced hearing loss to employees and to comply with federal regulations. As required by the regulations, the body of the standard, 29 CFR 1910.95, is made available to employees on the official bulletin boards located across the site.

Monitoring is routinely performed to measure sound levels throughout the plant. Data developed from monitoring is used to ensure that high noise areas are properly posted. High noise areas are those that could expose employees to an 8-hour time-weighted average of 85 dB or greater. Additionally, as a general rule of thumb, CPNPP requires that hearing protection should also be worn in any area where normal conversational tones cannot be heard. Luminant's hearing conservation program also requires audiometric testing to be performed annually for all

employees who have unescorted access to the protected area and have not been excluded from the hearing conservation program, to monitor the health of employee hearing.

A monitoring survey was performed in 2001 for atmospheric relief valves and noise readings were taken near equipment (generators, exciters, main steam isolation valve walkway etc.) and on the roof. The atmospheric relief valves sound survey indicates that noise levels range from 80 dBA to greater than 126 dBA. As discussed earlier, CPNPP requires that hearing protection be worn when noise levels are greater than 85 dBA. Noise from atmospheric relief valves can also be heard at times in plant parking lots, where hearing protection is not readily available. However, it is typically of short duration and rarely occurs. Additionally, the ambient noise study from 2007 showed that noise levels attenuate and were much lower at the fence line and offsite receptors and were within limits set by HUD.

3.5 Geologic Environment

3.5.1 Regional Geology

The CPNPP site is located on the Comanche Plateau, a subdivision of the central Texas section of the Great Plains physiographic province. The relationship of the site to these features and to other physiographic units in the region is shown in Figure 3.5-1. The Great Plains spans 725,000 square kilometers (km) (450,000 square miles) of flat "high plains" bordered to the west by the Rocky Mountains. The eastern border with the Central Lowlands is less distinct; the separation is characterized by the 50 centimeters (20 inches) rainfall divide and changes in vegetation and soils. The Great Plains slope downward to the east with maximum heights in the foothills of the Rockies at 1,700 m (5,500 feet) decreasing to 610 m (2,000 feet). The bedrock is horizontal beds of sandstones, shales, limestones, conglomerates, and lignite. (NPS 2021)

Near the CPNPP, the Great Plains province of Texas is subdivided on the degree of erosion of the resistant Lower Cretaceous limestone cover and on the nature of the older rocks thereby exposed. The Comanche Plateau subdivision in which the CPNPP site is located is a submaturely dissected area that slopes eastward at a gradient confirming the dip of the Lower Cretaceous rocks. The eastern boundary of the Comanche Plateau, from a point near Waco southward, is formed by the Balcones escarpment.

The formations forming the Comanche Peak Plateau and the outlier remnants of the Callahan Divide to the west are principally limestones of Lower Cretaceous age. These more resistant rocks are grouped with associated sands and calcareous clay or marl units into three subdivisions: the Trinity, Fredericksburg, and Washita Groups. South and west of the Brazos River, the youngest (Washita) rocks are thin and have a small extent of a real outcrop. This group is absent in the site vicinity. The Fredericksburg group of formations (Edwards and Comanche Peak limestones and underlying Walnut Clay) are confined to the major drainage divides; the only complete section in the site vicinity is at Comanche Peak, the prominent landmark a little more than five miles north of the plant site. The Trinity rocks are roughly equal in a real extent to those of the Fredericksburg. They crop out in the western marginal area of the plateau and in the valley areas projecting southeastward. Classic exposures are present in the valleys of the Brazos River, Paluxy River, and Squaw Creek in the site area. The plant dams and reservoirs are all within the Glen Rose bedrock outcrop with the overlying Paluxy Sand on the adjacent divides. The underlying basal Trinity sands (Twin Mountains Formation), unexposed in the Squaw Creek drainage, crop out about 8 miles to the southwest of the site in the Paluxy River valley.

The Trinity formations exhibit characteristic terrain aspects. The outcrop area of the Paluxy Sand is confined to the summit regions of the drainage divides and forms gently rolling hills of red, sandy soil, which supports deciduous trees and native grasses. Areas underlain by the Glen Rose Formation are typically prairies having relatively steep, stair-stepped slopes developed on limestone alternating principally with claystone, siltstone, and/or shale. A flat, broadly undulating plain lying to the west of the site characterizes the outcrop area of the Twin

Mountains Formation. Topographic elevations in the site range from about 550 to 1,000 feet above sea level.

The Great Plains province is bordered on the east by the Coastal Plain, Ouachita, and Ozark Plateau provinces. The western and northern boundary of the Coastal Plain province coincides in general with the limit of the Upper/Lower Cretaceous sedimentary boundary. The boundary extent in common with the Great Plans (Comanche Plateau area) is reasonably sharp and marked by the contrast between the harder limestones (Lower Cretaceous) and the softer shale-chalk-sandstone (Upper Cretaceous) to the east. North of the Brazos River, the Central Lowlands-Coastal Plain boundary is less distinct, and the Coastal Plain limit is arbitrarily continued at the same geologic position by placement at the base of Upper Cretaceous units.

The closest point of the Coastal Plain Province is 25 miles east of the site. The Coastal Plain comprises semi-consolidated and unconsolidated sediments of upper Cretaceous, Tertiary, and Quaternary age. The geological materials become progressively younger and are generally softer towards the Gulf of Mexico. All the sediments dip gently seaward.

The Palo Pinto Country adjoins the Comanche Plateau to the northwest. Palo Pinto Country is the locality in which Pennsylvanian-age rocks have been exposed by stripping away of the Edwards Limestone (Upper Cretaceous). It is characterized by steep-sided mesas cut by canyons, the mesas being remnants of strong sandstone beds. Between the mesas, on lower-lying shales, are rolling, mesquite-covered plains.

3.5.2 Site Geology

Within the general 5-mile radius area of the site vicinity, the stratigraphic units exposed consist of Quaternary fluvial deposits exposed in the drainage lowlands and Lower Cretaceous strata. The CPNPP site and surrounding areas are underlain by strata of the Lower Cretaceous Trinity Group. The Cretaceous rocks form a southeastward-thickening wedge extending across the area into a structural feature known as the East Texas Basin. Regional dip of the beds is to the east and southeast at rates of about 15 to 40 feet per mile. The CPNPP site is located on the southern flank of the basin, which is a sedimentary depositional trough formed in mid-Pennsylvanian time. The trough is filled with Pennsylvanian and Permian sediments. A regional unconformity separates these Paleozoic sediments from the Lower Cretaceous sediments underlying the site. Figure 3.5-2 depicts the geologic map of the subject property and surrounding areas (USGS 2021a).

Quaternary deposits in the site areas are on recent floodplain alluvium and Pleistocene fluvial terrace sediments. These deposits consist of gravel, sand, silt, silty clay, and organic material and are confined to the bottoms of the Squaw Creek, Paluxy River, and Brazos River valleys. The scattered patches of Pleistocene fluvial terrace remnants are adjacent to the recent floodplain alluvium, but at a slightly higher elevation.

Three formations of the Trinity Group comprise bedrock in the site region and are approximately equal in thickness. In descending order, they are the Paluxy, the Glen Rose, and the Twin Mountains formations. The Paluxy Formation at the top of the group is a sand that thins southward and eastward (downdip). The Paluxy Formation has been eroded from the immediate plant and reservoir area. However, it crops out on the periphery of the site area and there consists of fine- to very fine-grained, well-sorted, poorly cemented friable sandstone with occasional siltstone and claystone interbeds.

The Glen Rose Formation, which underlies the Paluxy, constitutes the principal bedrock formation in the CPNPP area. It pinches out to the west (updip) and to the north. The Paluxy-Glen Rose contact in this area is abrupt, distinct, and conformable. The Glen Rose Limestone is characterized by stair-step topography resulting from differential weathering of impure, nodular limestones, softer claystone beds, and resistant, sparry-cemented medium-to-thick bedded, hard limestones. The materials of the Glen Rose Formation extend from an elevation 810 feet (plant grade) to elevation 610 feet. The Glen Rose Formation consists of bedded argillaceous limestone alternative with units composed of variable amounts of clay, marl, and sand.

The Twin Mountains Formation underlies the Glen Rose Formation. This stratum forms a gradational contact with the Glen Rose Formation and is composed principally of sandstone, limestone, and claystone. The sandstones are water-bearing and serve as a source for water supplies in the site vicinity. The Twin Mountains Formation is not exposed in the immediate site area. The materials of the Twin Mountains formation extend from elevation 610 feet to elevation 366 feet and consist of interbedded claystone and sandstone sequences. The Twin Mountains Formation consists of fine- to medium-grained sands with pebble and gravel conglomerates and clays and silts throughout. In general, the Twin Mountains Formation is a fining-upward sequence of sandstone and claystone. The Twin Mountains Formation unconformably overlies the Mineral Wells Formation of the Strawn Series (Pennsylvanian) at elevation 366 feet.

The Paleozoic section is not exposed within a five-mile radius of the site. A typical Paleozoic section consists of predominantly sandstone and shale of the Strawn and Atoka Stoke Series (Pennsylvanian); limestones of the Marble Falls Formation (Pennsylvanian) and Ellenburger Formation (Ordovician); and sandstone of the Hickory Formation (Cambrian).

Columnar geologic cross sections are shown in Figures 3.5-3a through 3.5-3e.

3.5.3 Soils

3.5.3.1 Onsite Soils and Geology

Soil units that occur within the CPNPP property boundary are described in detail in Table 3.5-1 and shown in Figure 3.5-4. They are also summarized below (USDA 2021). Approximately 40.4 percent of the CPNPP site is covered in water.

- Bolar clay loam, 1-3 percent slopes
- Bolar clay loam, 3-5 percent slopes

- Bosque loam, occasionally flooded
- Bunyan fine sandy loam, occasionally flooded
- Chaney loamy sand, 1-5 percent slopes
- Chaney loamy sand, 1-5 percent slopes, eroded
- Duffau loamy fine sand, 1-5 percent slopes
- Duffau fine sandy loam, 1-3 percent slopes
- Duffau-Windthorst complex, 1-5 percent slopes
- Duffau-Weatherford complex, 3-8 percent slopes
- Frio silty clay, 0-1 percent slopes, occasionally flooded
- Hassee fine sandy loam, 0-1 percent slopes
- Krum clay, 1-3 percent slopes
- Nimrod fine sand, 0-5 percent slopes
- Pedernales fine sandy loam, 1-3 percent slopes
- Pedernales fine sandy loam, 3-5 percent slopes
- Pedernales fine sandy loam, 1-5 percent slopes, moderately eroded
- Purves clay, 1-3 percent slopes
- Purves clay, 3-5 percent slopes
- Sunev clay loam, cool, 3-5 percent slopes
- Tarrant-Bolar association, hilly
- Tarrant-Purves association, undulating
- Thurber clay loam, 1-3 percent slopes
- Venus loam, 1-3 percent slopes
- Windthorst loamy fine sand, 1-5 percent slopes
- Windthorst very fine sandy loam, 1-3 percent slopes
- Windthorst fine sandy loam, 3-5 percent slopes
- Windthorst fine sandy loam, 1-5 percent slopes, eroded
- Windthorst fine sandy loam, 3-8 percent slopes, eroded
- Windthorst fine sandy loam, 1-8 percent slopes, severely eroded

During construction of CPNPP Units 1 and 2, all soil and weathered rock, along with a significant amount of unweathered Glen Rose Limestone, were excavated and removed. As a result of the excavation, Units 1 and 2 lie directly on unweathered Glen Rose limestone.

3.5.3.2 Erosion Potential

Because CPNPP has been operational since the early 1990s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture (USDA), all soil units listed in Table 3.5-1 subject to erosion have a slight to moderate erosion potential, except for the Windthorst fine

sandy loam, percent slopes, which has severe erosion potential. This soil is mapped south of the plant area on the west side of the SCR in a small undeveloped location adjacent to an easement (USDA 2021).

CPNPP maintains and implements a stormwater pollution prevention plan (SWPPP) that identifies potential sources of pollution reasonably expected to affect the quality of stormwater, such as erosion, and identifies best management practices (BMPs) that will be used to prevent or reduce the pollutants in stormwater discharges. The topography, physical features, activities, and operation of CPNPP do not present a high potential for soil erosion. In addition, the drainage areas and conveyances are well vegetated and contoured in a manner to limit erosion. In addition, any ground disturbance of one or more acres requires a construction stormwater permit to be obtained from the TCEQ. The construction stormwater permit specifies BMPs to reduce erosion caused by stormwater runoff, thereby minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the stormwater may contact. Although no LR-related refurbishment or construction activities are planned, any such activities would continue to be managed in adherence to the CPNPP SWPPP.

3.5.3.3 Prime Farmland Soils

The USDA's Natural Resources Conservation Service maps show that approximately 11.4 percent of the site is considered prime farmland or farmland of statewide importance. Locations designated as prime farmland are small, isolated patches on the outer boundaries of the site (USDA 2021). These areas would most likely still be considered prime farmland even though they are part of the property owned by CP PowerCo. Even if areas of the property are designated prime farmland, CPNPP would not be subject to the Farmland Protection Policy Act (FPPA) because the act does not include federal permitting or licensing for activities on private or nonfederal lands. Soil units designated as prime farmland are identified in Table 3.5-1.

3.5.4 Seismic History

The site region is located within the Central and Eastern United States, a stable continental region characterized by low rates of crustal deformation and no active plate boundary conditions (Luminant 2013b, Section 2.5.1.1.4). Central and eastern Texas lie within the zone of least seismic activity in the United States. The tectonic features within the site region were most recently active in either the Late Paleozoic (associated with the Ouachita orogeny) or Mesozoic to Eocene (related to the opening of the Gulf of Mexico). (Luminant 2013b, Section 2.5.1.1.4.3)

The site is underlain by undeformed rocks of Cretaceous age more than 80 million years old. No geological faults have been found in these rocks near the site. Their sub-horizontal stratigraphy across hundreds of miles of exposure testifies to the tectonic quiescence of the region for many millions of years. In this region, excepting deformation associated with the Meers fault in Oklahoma, no evidence has been found of tectonic activity at the earth's surface younger than late Miocene age, or about 11 million years ago.

The Meers fault is the only tectonically capable fault within 200 miles of the CPNPP site (Luminant 2013b, Section 2.5.1.1.4.3). Quaternary activity on the Meers fault was recognized in the early 1980s, after CPNPP was constructed. The Meers fault is the southern boundary of the frontal Wichita fault system in southern Oklahoma and is approximately 180 miles from the site. The trace of the Meers fault is easily identified on aerial photographs for a total distance of approximately 23 miles as a south-down topographic escarpment. The scarp is thought to be related to Holocene rupture along the Meers fault. (Luminant 2013b, Section 2.5.1.1.4.3.6.1)

The severity of an earthquake is described by two methods: the modified Mercalli (MM) intensity scale and the Richter magnitude scale. The MM intensity is a subjective measure of observed damage at a particular location caused by an earthquake. The Richter magnitude scale is an estimate of the total amount of energy released by an earthquake. The accuracy of locating the epicenters of earthquakes in the region has improved with the increase in sensitivity and in the number of modern seismographs.

The literature of Texas seismicity reflects a scarcity of recent damaging shocks, or even widely felt shocks. No Texas earthquake with an intensity greater than VI has been reported east of the 100^{th} meridian since 1882. Seventeen seismic events (or series of events) have been reported with epicenters within 200 miles of the site between 1882 and 1975. Three events (or series of events) are within 100 miles to the southeast of the site in 1932 (V-VI) and 1970 (IV), respectively. The highest reported intensity within 200 miles of the site was MM intensity VII, exhibited by both the 1882 Paris and 1891 Rusk events located 155 and 160 miles respectively from the site. Regional seismic events that occurred between 1882 and 1975 are listed in the FSAR for Units 1 and 2, Table 2.5.2-2, with the corresponding MM intensities. (Luminant 2020d)

No earthquakes have been felt at the site since the beginning of site selection activities in the 1960s. Earthquake epicenter locations greater than Richter magnitude 3.0 within a 200-mile radius of the site from 1970 through February 25, 2022, are listed in Table 3.5-2 and shown in Figure 3.5-5 (USGS 2022). The maximum recorded magnitude was 4.5 in 1997. Of the 168 earthquakes reported since 1970, 133 occurred since 2009. Although there have been more frequent earthquakes since 2009, the magnitudes of these earthquakes have been relatively low and decreasing over time, averaging 3.3. Eighteen earthquakes within 50 miles of the site have occurred since 1970, with a maximum magnitude of 3.7. The earthquake epicenters were in northern Texas.

The U.S. Geological Survey's (USGS)'s national seismic hazard map shows that the CPNPP site is in a region with a 2 percent in 50 years (once in 2,500 years) probability of exceeding a peak ground acceleration between 0 and 0.04g (USGS 2015, Figure 1).

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 1 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
10	Bolar clay loam, 1-3% slopes	The Bolar component makes up 0.17% of the map unit. Slopes are 1-3%. This component is found on shoulders and summits of ridges. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer is 20 to 40 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to high. Available water to a depth of 3.6 inches is low. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 245 days. The depth to water table is more than 80 inches. Non-irrigated land capability classification is 3s. This soil does not meet hydric criteria.	Farmland of statewide importance
11	Bolar clay loam, 3-5% slopes	The Bolar component makes up 0.11% of the map unit. Slopes are 3-5%. This component found on shoulders and backslopes of ridges. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer 20 to 40 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to high. Available water to a depth of 4.3 inches is low. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220-245 days. The depth to water table is more than 80 inches. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Farmland of statewide importance
12	Bosque loam, occasionally flooded	The Bosque component makes up 0.74% of the map unit. Slopes are 0-1%. This component is flood plains. The parent material consists loamy alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 10.5 inches is high. Runoff class is negligible. This soil is occasionally flooded. It is not ponded. The frost-free period is 220-275 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2w. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 2 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
14	Bunyan fine sandy loam, occasionally flooded	The Bunyan component makes up 0.22% of the map unit. Slopes are 0-1%. This component is on flood plains. The parent material consists of loamy alluvium. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 9.9 inches is high. The depth to the water table is more than 80 inches. Runoff class is negligible. This soil is occasionally flooded. It is not ponded. The frost-free period is 220-280 days. Non-irrigated land capability classification is 2w. This soil does not meet hydric criteria.	Not prime farmland
15	Chaney loamy sand, 1-5% slopes	The Chaney component makes up 0.88% of the map unit. Slopes are 1-5%. This component is on shoulders and backslopes of ridges. The parent material consists of loamy slope alluvium and/or residuum weathered from sandstone and shale over claystone and/or interbedded sedimentary rock. Depth to a restrictive layer is 40 to 60 inches to densic bedrock. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately high. Available water to a depth of 6.2 inches is moderate. This soil is not flooded or ponded. Runoff class is medium. The frost-free period is 210-240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
16	Chaney loamy sand, 1-5% slopes, eroded	The Chaney component makes up 0.97% of the map unit. Slopes are 1-5%. This component is on ridge shoulders and backslopes. The parent material consists of loamy slope alluvium and/or residuum weathered from sandstone and shale over claystone and/or interbedded sedimentary rock. Depth to a restrictive layer is 40 to 60 inches to densic bedrock. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately high. Available water to a depth of 6.7 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 3 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
21	Duffau loamy fine sand, 1-5% slopes	The Duffau component makes up 0.00% of the map unit. Slopes are 1-5%. This component is on ridge backslopes and footslopes. The parent material consists of sandy and/or loamy residuum weathered from sandstone and/or claystone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 6.5 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
22	Duffau fine sandy loam, 1-3% slopes	The Duffau component makes up 0.52% of the map unit. Slopes are 1-3%. This component is on ridge footslopes and backslopes. The parent material consists of sandy and/or loamy residuum weathered from sandstone and/or claystone. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 6.5 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
23	Duffau-Windthorst complex, 1-5% slopes, moderately eroded	The Duffau and Windthorst components make up 0.19% of the map unit. Slopes are 1-5%. This component is on ridge backslopes and footslopes. The parent material consists of residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 6.5 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 197 to 263 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Farmland of statewide importance

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 4 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
25	Duffau-Weatherford complex, 3-8% slopes	The Duffau and Weatherford components make up 0.05% of the map unit. Slopes are 3-8%. This component is on ridge backslopes. The parent material consists of residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 8.6 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 197 to 263 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria.	Not prime farmland
26	Frio silty clay, 0-1% slopes, occasionally flooded	The Frio component makes up 1.15% of the map unit. Slopes are 0-1%. This component is on flood plains. The parent material consists of calcareous loamy and/or clayey alluvium derived from limestone and shale. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 7.6 inches is moderate. Runoff class is low. This soil is occasionally flooded. It is not ponded. The frost-free period is 220 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3w. The soil does not meet hydric criteria.	All areas are prime farmland
28	Hassee fine sandy loam, 1-3% slopes	The Hassee component makes up 0.35% of the map unit. Slopes are 1-3%. This component is on depressions on stream terraces. The parent material consists of clayey alluvium. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately low. Available water to a depth of 8.8 inches is moderate. Runoff class is negligible. This soil is not flooded or ponded. The frost-free period is 230 to 240 days. Depth to the water table is about 6 to 12 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 5 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
31	Krum clay, 1-3% slopes	The Krum component makes up 0.80% of the map unit. Slopes are 1-3%. This component is on linear draws. The parent material consists of clayey alluvium. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 9 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 230 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2e. The soil does not meet hydric criteria.	All areas are prime farmland
33	Nimrod fine sand, 0-5% slopes	The Nimrod component makes up 0.38% of the map unit. Slopes are 0-5%. This component is on ridge summits. The parent material consists of locally reworked eolian sands over residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 6.4 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 217 to 243 days. Depth to the water table is about 20 to 29 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland
38	Pedernales fine sandy loam, 1-3% slopes	The Pedernales component makes up 1.13% of the map unit. Slopes are 1-3%. This component is on ridge summits, backslopes, and shoulders. The parent material consists of loamy residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.4 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 215 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 6 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
39	Pedernales fine sandy loam, 3-5% slopes	The Pedernales component makes up 0.39% of the map unit. Slopes are 3-5%. This component is on backslope and side slope interfluves. The parent material consists of loamy residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.3 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 215 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
40	Pedernales fine sandy loam, 1-5% slopes, moderately eroded	The Pedernales component makes up 0.66% of the map unit. Slopes are 1-5%. This component is on ridge backslopes, shoulders, and summits. The parent material consists of loamy residuum weathered from sandstone and siltstone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.4 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 215 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland
42	Purves clay, 1-3% slopes	The Purves component makes up 0.03% of the map unit. Slopes are 1-3%. This component is on ridge shoulders, summits, and backslopes. The parent material consists of clayey residuum weathered from limestone. Depth to a restrictive layer is 8 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1.8 inches is very low. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4s. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 7 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
43	Purves clay, 3-5% slopes	The Purves component makes up 0.04% of the map unit. Slopes are 3-5%. This component is on ridge backslopes. The parent material consists of clayey residuum weathered from limestone. Depth to a restrictive layer is 8 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1.9 inches is very low. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4s. The soil does not meet hydric criteria.	Not prime farmland
46	Sunev clay loam, cool, 3-5% slopes	The Sunev component makes up 2.27% of the map unit. Slopes are 3-5%. This component is on footslopes of ridges on hills and stream terraces on hills. The parent material consists of loamy alluvium derived from limestone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 7.7 inches is moderate. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 245 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Farmland of statewide importance
48	Tarrant-Bolar association, hilly	The Tarrant and Bolar components make up 21.88% of the map unit. Slopes are 10-30%. This component is on ridge summits. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer is 6 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1.2 inches is very low. Runoff class is very high. This soil is not flooded or ponded. The frost-free period is 220 to 260 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7s. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 8 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
49	Tarrant-Purves association, undulating	The Tarrant and Purves components make up 20.15% of the map unit. Slopes are 1-8%. This component is on ridge summits. The parent material consists of loamy residuum weathered from limestone. Depth to a restrictive layer is 6 to 20 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Available water to a depth of 1 inch is very low. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 7s. The soil does not meet hydric criteria.	Not prime farmland
50	Thurber clay loam, 1-3% slopes	The Thurber component makes up 0.26% of the map unit. Slopes are 1-3%. This component is on ridge toeslopes. The parent material consists of clayey slope alluvium derived from claystone. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately low. Available water to a depth of 6.7 inches is moderate. Runoff class is very high. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3s. The soil does not meet hydric criteria.	Farmland of statewide importance
53	Venus loam, 1-3% slopes	The Venus component makes up 2.88% of the map unit. Slopes are 1-3%. This component is on footslopes and toeslopes of ridges and stream terraces. The parent material consists of loamy slope alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 10.3 inches is high. Runoff class is low. This soil is not flooded or ponded. The frost-free period is 220 to 250 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 9 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
54	Windthorst loamy fine sand, 1-5% slopes	The Windthorst component makes up 0.11% of the map unit. Slopes are 1-5%. This component is on ridge backslopes, shoulders, and summits. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.1 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland
55	Windthorst very fine sandy loam, 1-3% slopes	The Windthorst component makes up 0.48% of the map unit. Slopes are 1-3%. This component is on ridge shoulders and summits. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2e. The soil does not meet hydric criteria.	All areas are prime farmland
56	Windthorst fine sandy loam, 3-5% slopes	The Windthorst component makes up 0.06% of the map unit. Slopes are 3-5%. This component is on ridge shoulders and backslopes. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is medium. This soil is not occasionally flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	All areas are prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 10 of 11)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
57	Windthorst fine sandy loam, 1-5% slopes, eroded	The Windthorst component makes up 2.01% of the map unit. Slopes are 1-5%. This component is on ridge summits, backslopes, and shoulders. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.5 inches is moderate. Runoff class is medium. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria.	Not prime farmland
58	Windthorst fine sandy loam, 3-8% slopes	The Windthorst component makes up 0.16% of the map unit. Slopes are 3-8%. This component is on ridge shoulders and backslopes. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 210 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria.	Not prime farmland
59	Windthorst fine sandy loam, 1-8% slopes, severely eroded	The Windthorst component makes up 0.54% of the map unit. Slopes are 1-8%. This component is on ridge shoulders and backslopes. The parent material consists of sandy and/or clayey residuum weathered from sandstone and shale. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 8.6 inches is moderate. Runoff class is high. This soil is not flooded or ponded. The frost-free period is 220 to 240 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria.	Not prime farmland

Table 3.5-1 Onsite Soil Unit Descriptions (Sheet 11 of 11)

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
W	Water	Water covers 40.42% of the CPNPP site. The frost-free period is 181 to 270 days. Non-irrigated land capacity classification is 8.	Not prime farmland

(USDA 2021)

a. See Figure 3.5-4 for map unit symbols.

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 1 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
9/12/1975	8:25 PM	34.139	-97.369	3.4 lg	129	Oklahoma
10/11/1975	9:58 PM	34.816	-97.406	3.2 lg	175	Oklahoma
11/29/1975	9:29 AM	34.521	-97.347	3.5 lg	155	Oklahoma
6/7/1977	6:01 PM	33.058	-100.749	4 ml	180	Western Texas
11/27/1977	8:40 PM	32.954	-100.837	3.5 ml	184	Western Texas
6/16/1978	6:46 AM	33.03	-100.766	4.4 mb	181	Western Texas
6/8/1981	8:46 PM	32.142	-94.399	3 mblg	199	Northern Texas
7/11/1981	4:09 PM	34.884	-97.677	3.5 mblg	178	Oklahoma
11/6/1981	7:36 AM	32.021	-95.262	3.2 mblg	149	Northern Texas
3/28/1982	6:24 PM	29.849	-98.465	3 mblg	173	Southern Texas
5/3/1982	2:54 AM	34.07	-96.38	3 mblg	147	Oklahoma
11/27/1982	9:36 PM	33.003	-100.842	3.3 mblg	185	Western Texas
2/2/1984	11:38 PM	34.657	-97.394	3.2 mblg	164	Oklahoma
9/11/1984	9:47 AM	31.991	-100.697	3.2 mblg	172	Western Texas
9/19/1984	1:15 AM	32.027	-100.688	3 mblg	171	Western Texas
9/18/1985	10:54 AM	33.548	-97.051	3.3 mblg	96	Central Texas
1/30/1986	5:26 PM	32.066	-100.693	3.3 mblg	171	Western Texas
11/15/1990	6:44 AM	34.76	-97.59	3.9 mblg	170	Oklahoma
12/17/1992	2:18 AM	34.744	-97.581	3.6 mblg	169	Oklahoma
1/18/1995	10:51 AM	34.774	-97.596	4.2 mblg	171	Oklahoma

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 2 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
5/31/1995	11:49 PM	34.287	-96.732	3 mblg	150	Oklahoma
5/30/1997	10:26 PM	33.182	-95.966	3.4 mblg	122	Central Texas
9/6/1997	6:38 PM	34.66	-96.435	4.5 mblg	180	Oklahoma
4/28/1998	9:13 AM	34.782	-98.416	3.9 mb	175	Oklahoma
7/7/1998	1:44 PM	34.719	-97.589	3.2 mblg	167	Oklahoma
2/8/2002	11:07 AM	34.727	-98.361	3.8 mblg	171	Oklahoma
5/31/2002	4:57 AM	34.025	-97.619	3.3 mblg	119	Oklahoma
10/19/2002	9:18 PM	34.274	-96.079	3.4 mblg	168	Oklahoma
6/7/2004	7:15 PM	34.233	-97.254	3.5 mblg	137	Oklahoma
11/22/2004	6:42 PM	34.864	-97.672	3 mblg	177	Oklahoma
4/22/2005	12:17 AM	34.179	-95.192	3 mblg	198	Oklahoma
4/5/2006	1:46 PM	34.069	-97.314	3 mblg	125	Oklahoma
10/6/2006	5:13 PM	34.122	-97.625	3.5 mblg	126	Oklahoma
1/29/2008	5:24 AM	32.898	-100.842	3.3 mblg	183	Western Texas
10/31/2008	12:01 AM	32.836	-97.029	3 mblg	58	Northern Texas
1/28/2009	6:19 AM	35.163	-97.871	3.4 mblg	197	Oklahoma
2/3/2009	5:23 AM	34.589	-96.34	3.1 mblg	179	22 km NW of Coalgate, Oklahoma
2/24/2009	11:14 PM	34.735	-96.036	3.3 mblg	196	Oklahoma
5/16/2009	11:24 AM	32.795	-97.016	3.3 mblg	56	Northern Texas
5/16/2009	11:58 AM	32.85	-97.095	3 mblg	55	Northern Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 3 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
8/27/2009	3:22 AM	34.942	-96.618	3.4 mblg	194	Oklahoma
11/16/2009	11:00 PM	34.462	-97.532	3.1 mblg	150	Oklahoma
1/26/2010	11:59 PM	32.902	-100.833	3.1 mblg	183	Western Texas
4/14/2010	7:49 PM	34.705	-96.398	3 mblg	184	Oklahoma
4/15/2010	8:22 AM	34.631	-96.268	3.2 mblg	183	Oklahoma
6/14/2010	4:33 PM	34.865	-97.676	3.1 md	177	Oklahoma
8/7/2010	8:12 PM	32.896	-100.851	3.4 Mwr	183	Western Texas
9/25/2010	7:19 AM	34.109	-96.715	3.3 mblg	139	Oklahoma
10/9/2010	2:42 AM	32.929	-100.886	3.1 mblg	186	Western Texas
10/25/2010	3:53 PM	34.874	-97.741	3.2 mblg	177	Oklahoma
10/26/2010	1:56 AM	32.922	-100.85	3.1 mblg	184	Western Texas
12/24/2010	5:49 AM	34.69	-96.361	3 md	184	Oklahoma
12/27/2010	8:49 PM	34.696	-95.893	3.1 md	198	Oklahoma
2/28/2011	10:30 PM	32.876	-100.839	3.1 mblg	182	Western Texas
3/12/2011	10:22 AM	32.882	-100.896	3 mblg	186	Western Texas
3/13/2011	3:16 PM	32.995	-100.767	3.8 Mwr	180	Western Texas
3/13/2011	7:19 PM	32.964	-100.809	3 mblg	182	Western Texas
3/19/2011	6:34 PM	32.978	-100.766	3 mblg	180	Western Texas
3/28/2011	4:12 AM	32.913	-100.816	3 mblg	182	Western Texas
4/2/2011	5:05 PM	33.059	-100.761	3 mblg	181	Western Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 4 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
5/2/2011	2:07 PM	33.064	-100.79	3.2 mblg	183	Western Texas
7/17/2011	1:58 AM	32.424	-97.084	3 mblg	42	Northern Texas
8/18/2011	11:50 AM	34.881	-97.744	3 ml	178	Oklahoma
9/11/2011	7:27 AM	32.848	-100.769	4.3 Mwr	178	Western Texas
9/12/2011	9:18 AM	32.822	-100.871	3.5 Mwr	184	Western Texas
11/24/2011	6:15 PM	32.945	-100.845	3.1 mblg	184	Western Texas
12/9/2011	1:47 PM	32.935	-100.865	3.5 mblg	185	Western Texas
12/17/2011	9:46 AM	32.814	-100.852	3.2 mblg	182	Western Texas
1/18/2012	5:30 PM	32.372	-97.487	3.3 mblg	18	Northern Texas
4/3/2012	2:34 AM	34.635	-95.875	4.1 mb	195	Oklahoma
5/10/2012	10:15 AM	31.964	-94.465	3.9 mwr	196	Eastern Texas
6/15/2012	2:02 AM	32.462	-97.273	3.3 mblg	32	Northern Texas
6/24/2012	12:46 PM	32.474	-97.289	3.5 mblg	31	Northern Texas
9/29/2012	11:05 PM	32.842	-96.976	3.4 mblg	60	Northern Texas
9/29/2012	11:09 PM	32.815	-96.962	3.1 mblg	60	Northern Texas
1/22/2013	11:16 PM	32.894	-97.004	3 mblg	61	Northern Texas
3/4/2013	5:22 AM	34.191	-96.681	3.5 mblg	145	6 km SSE of Tishomingo, Oklahoma
4/27/2013	10:06 PM	34.135	-96.808	3.5 ml	139	13 km ENE of Dickson, Oklahoma
5/6/2013	6:11 PM	32.971	-100.846	3 mblg	184	25 km N of Snyder, Texas
5/27/2013	2:58 AM	34.075	-96.59	3.2 ml	141	15 km ENE of Kingston, Oklahoma

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 5 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
6/24/2013	6:07 PM	34.47	-96.283	3.2 ml	173	9 km SW of Coalgate, Oklahoma
6/29/2013	9:55 PM	34.097	-96.548	3 ml	143	9 km E of Madill, Oklahoma
9/2/2013	4:52 PM	31.9656	-94.5261	4.2 Mwr	193	14 km WNW of Timpson, Texas
9/2/2013	6:51 PM	31.9095	-94.4279	4.3 Mwr	199	3 km WNW of Timpson, Texas
9/23/2013	6:40 AM	33.9544	-97.1107	3.2 ml	121	2 km NNE of Marietta, Oklahoma
9/23/2013	8:56 AM	33.946	-97.161	3.4 ml	119	4 km WNW of Marietta, Oklahoma
10/11/2013	10:25 PM	34.086	-96.579	3 ml	142	16 km NE of Kingston, Oklahoma
11/9/2013	2:54 PM	32.9197	-97.6665	3 mb_lg	43	5 km SSE of Springtown, Texas
11/19/2013	7:40 PM	32.9116	-97.5509	3.6 mb_lg	44	1 km NNW of Azle, Texas
11/25/2013	2:43 AM	32.9195	-97.6182	3.4 mb_lg	44	4 km SW of Reno, Texas
11/28/2013	2:58 AM	32.9735	-98.0894	3.7 mb	50	18 km N of Mineral Wells, Texas
11/29/2013	1:14 AM	32.9093	-97.5205	3.1 mb_lg	45	1 km S of Pelican Bay, Texas
12/8/2013	1:10 AM	32.9144	-97.5817	3.6 mb_lg	44	3 km WNW of Azle, Texas
12/9/2013	4:23 AM	32.9576	-98.0594	3.7 mb_lg	48	17 km NNE of Mineral Wells, Texas
12/22/2013	12:31 PM	32.9619	-97.5552	3.3 mb_lg	48	2 km NE of Reno, Texas
12/23/2013	8:11 AM	32.9284	-97.5789	3.3 mb_lg	45	1 km S of Reno, Texas
1/13/2014	12:40 PM	32.9391	-97.5529	3.1 mb_lg	46	2 km ESE of Reno, Texas
5/14/2014	10:52 AM	32.7823	-100.8802	3.1 mb_lg	184	7 km NNE of Snyder, Texas
5/15/2014	10:35 PM	34.429	-96.3119	3 ml	170	14 km SW of Coalgate, Oklahoma
7/7/2014	9:38 AM	34.0713	-97.468	3.2 ml	124	10 km SSW of Wilson, Oklahoma

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 6 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
9/14/2014	4:18 AM	32.9083	-100.8184	3.2 mb_lg	182	23 km NNE of Snyder, Texas
9/22/2014	2:28 PM	34.6292	-97.5457	3.6 ml	161	23 km SSE of Lindsay, Oklahoma
9/23/2014	8:37 AM	34.6213	-97.556	3 ml	161	24 km S of Lindsay, Oklahoma
11/22/2014	10:15 PM	32.8346	-96.8932	3.3 mb_lg	64	5 km ENE of Irving, Texas
11/30/2014	12:52 AM	32.5035	-97.1328	3.4 mb_lg	41	6 km S of Mansfield, Texas
12/7/2014	3:57 PM	34.1752	-96.7559	3 ml	142	9 km N of Madill, Oklahoma
12/31/2014	1:31 PM	32.9473	-100.8401	3.2 mb_lg	184	26 km NNE of Snyder, Texas
1/6/2015	4:10 PM	32.835	-96.9027	3.5 mb_lg	63	4 km ENE of Irving, Texas
1/6/2015	4:55 PM	32.8662	-100.8647	3.5 mb_lg	184	17 km NNE of Snyder, Texas
1/6/2015	7:52 PM	32.847	-96.8922	3.6 mb_lg	64	6 km NE of Irving, Texas
1/7/2015	1:59 AM	32.8417	-96.9131	3.1 mb_lg	63	4 km NE of Irving, Texas
1/20/2015	3:25 PM	32.8221	-96.9055	3 mb_lg	63	4 km ENE of Irving, Texas
2/27/2015	7:18 AM	32.8336	-96.9098	3.1 mb_lg	63	4 km ENE of Irving, Texas
4/2/2015	5:36 PM	32.8588	-96.9356	3.3 mb_lg	63	5 km NNE of Irving, Texas
5/3/2015	10:11 AM	32.8511	-96.9514	3.2 mb_lg	62	4 km N of Irving, Texas
5/7/2015	5:58 PM	32.4817	-97.1006	4 Mwr	42	5 km N of Venus, Texas
5/18/2015	1:14 PM	32.8675	-96.9566	3.3 mb_lg	62	5 km N of Irving, Texas
7/14/2015	3:22 AM	34.9775	-97.6798	3.2 Mwr	185	17 km S of Blanchard, Oklahoma
12/4/2015	8:14 PM	34.8037	-97.8063	3.1 ml	173	13 km E of Rush Springs, Oklahoma
12/17/2015	5:29 PM	32.965	-97.3421	3 mb_lg	53	1 km SSE of Haslet, Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 7 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
1/9/2016	9:03 PM	32.9383	-100.8358	3.6 Mwr	183	25 km NNE of Snyder, Texas
1/17/2016	4:32 AM	32.8689	-100.8623	3.5 mb_lg	184	17 km NNE of Snyder, Texas
5/13/2016	10:39 PM	35.0531	-97.5573	3.1 ml	190	12 km SW of Goldsby, Oklahoma
6/29/2016	9:15 AM	35.0083	-97.795	3 ml	187	13 km ESE of Chickasha, Oklahoma
7/8/2016	2:06 PM	35.059	-97.6064	3.4 ml	191	9 km SSE of Blanchard, Oklahoma
7/31/2016	12:26 PM	35.0752	-97.572	3.1 mb_lg	192	10 km SE of Blanchard, Oklahoma
12/20/2016	4:32 AM	34.6053	-96.2282	3.1 ml	183	7 km N of Coalgate, Oklahoma
6/17/2017	7:06 AM	35.012	-97.5951	3.2 mb_lg	187	15 km SSE of Blanchard, Oklahoma
8/25/2017	6:41 AM	32.8775	-96.8887	3 mb_lg	66	5 km S of Farmers Branch, Texas
11/21/2017	9:04 AM	34.8772	-97.6821	3 ml	178	8 km WNW of Lindsay, Oklahoma
12/19/2017	9:33 AM	34.9544	-97.8208	3 ml	183	9 km E of Ninnekah, Oklahoma
2/4/2018	4:39 AM	34.6722	-97.4959	3.2 ml	164	18 km SSW of Maysville, Oklahoma
5/18/2018	7:45 PM	32.4813	-97.1671	3.4 Mwr	38	8 km NW of Venus, Texas
8/1/2018	5:11 AM	35.0409	-97.5912	3.4 Mwr	189	12 km SSE of Blanchard, Oklahoma
8/13/2018	2:08 PM	34.9882	-97.5381	3 ml	186	16 km W of Purcell, Oklahoma
9/4/2018	10:06 AM	31.9613	-94.4343	3.5 Mwr	198	7 km NNW of Timpson, Texas
9/26/2018	4:47 PM	34.0505	-97.4332	3 ml	122	12 km S of Wilson, Oklahoma
9/28/2018	2:07 AM	35.0418	-97.5829	3 ml	189	12 km SSE of Blanchard, Oklahoma
10/23/2018	6:29 AM	34.0524	-97.4131	3.4 ml	123	12 km S of Wilson, Oklahoma
10/28/2018	9:21 AM	32.9043	-100.9065	3.1 mb_lg	187	20 km N of Snyder, Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[(a)] (Sheet 8 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
10/31/2018	6:50 PM	32.8871	-100.9162	3 mb_lg	187	18 km N of Snyder, Texas
11/19/2018	1:12 PM	35.0272	-97.623	3 ml	188	12 km SSE of Blanchard, Oklahoma
11/26/2018	8:46 AM	34.6358	-96.3272	3.1 ml	182	14 km NW of Coalgate, Oklahoma
11/26/2018	8:52 AM	34.6437	-96.3232	3 ml	182	15 km NW of Coalgate, Oklahoma
11/26/2018	10:42 AM	34.053	-97.4342	3.1 ml	123	12 km S of Wilson, Oklahoma
11/27/2018	3:07 AM	34.6387	-96.3223	3.2 ml	182	14 km NW of Coalgate, Oklahoma
12/10/2018	1:23 AM	34.0395	-97.406	3 ml	122	13 km S of Wilson, Oklahoma
12/25/2018	11:23 PM	32.9543	-100.9086	3.3 ml	188	26 km N of Snyder, Texas
2/19/2019	1:08 PM	35.1046	-97.8624	3 mb_lg	193	8 km NE of Chickasha, Oklahoma
9/30/2019	4:47 PM	32.9236	-100.8619	4 Mwr	184	23 km NNE of Snyder, Texas
10/1/2019	2:14 AM	32.8939	-100.8895	3.8 Mwr	186	19 km N of Snyder, Texas
10/1/2019	3:21 AM	32.4911	-97.1714	3.2 mb_lg	38	8 km SSW of Mansfield, Texas
3/5/2020	8:42 PM	34.966833	-97.708	3.38 ml	184	18 km SSW of Blanchard, Oklahoma
3/13/2020	8:09 PM	32.877	-100.9283	3 mb_lg	188	17 km N of Snyder, Texas
3/19/2020	3:42 AM	35.105	-97.770833	3.02 ml	193	11 km WSW of Blanchard, Oklahoma
5/1/2020	7:50 PM	35.1015	-97.783667	3.26 ml	193	12 km ENE of Chickasha, Oklahoma
5/17/2020	6:10 AM	34.9745	-97.698833	3.05 ml	184	18 km S of Blanchard, Oklahoma
9/6/2020	6:08 AM	34.745	-97.573	3.43 ml	169	7 km SSE of Erin Springs, Oklahoma
11/14/2020	11:27 PM	32.9113	-100.8806	3.5 Mwr	185	21 km N of Snyder, Texas

Table 3.5-2 Historical Earthquakes > 3.0 Mb, 1970–2022[a] (Sheet 9 of 9)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from CPNPP (miles)	Approximate Location
4/15/2021	9:26 AM	34.9848333	-97.680167	3.26 ml	185	7 km SW of Dibble, Oklahoma
4/18/2021	3:54 PM	32.8646851	-101.00455	3.1 ml	192	18 km NNW of Snyder, Texas
4/19/2021	5:11 PM	34.9736667	-97.694833	3.47 ml	184	8 km SW of Dibble, Oklahoma
4/28/2021	12:51 AM	32.7163696	-100.683	3 ml	172	11 km NE of Hermleigh, Texas
6/3/2021	7:23 AM	34.9795	-97.684	3.31 ml	185	7 km SW of Dibble, Oklahoma
7/1/2021	12:33 AM	32.7145386	-100.68729	3.4 ml	172	11 km NE of Hermleigh, Texas
9/12/2021	6:26 AM	32.7667236	-100.66049	3.6 ml	171	17 km NNE of Hermleigh, Texas
12/29/2021	10:41 AM	31.6049194	-94.792183	3.1 ml	182	12 km W of Nacogdoches, Texas
12/29/2021	10:54 AM	32.7658081	-100.66371	3.1 ml	171	17 km NNE of Hermleigh, Texas

(USGS 2022)

a. All earthquakes within 200 miles (321.9 km) with a Richter magnitude of greater than 3.0.

mb = short-period body wave magnitude
mblg, mb_lg, lg = short-period surface wave magnitude
md = magnitude duration
ml = local magnitude
Mwr = regional magnitude

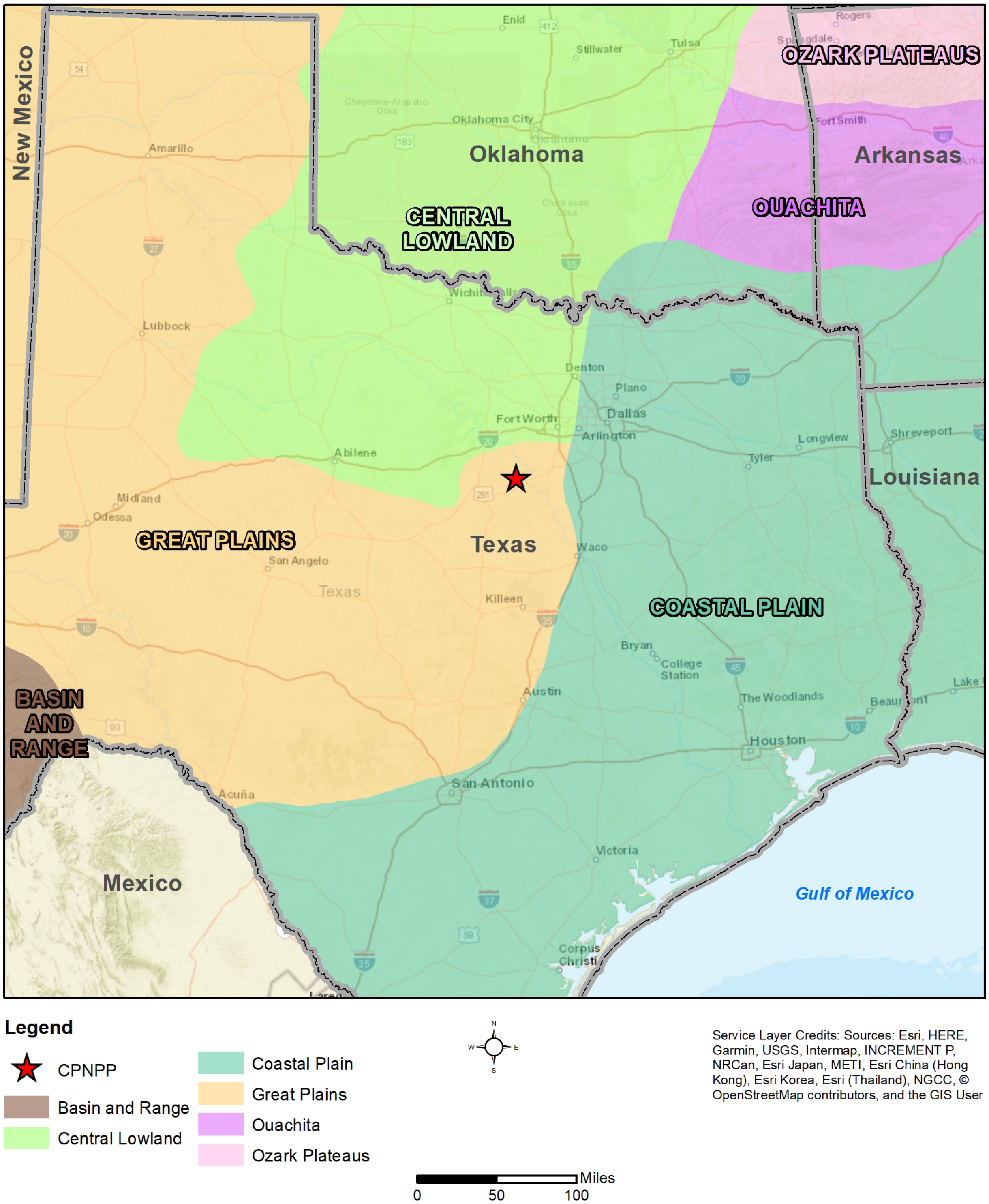


Figure 3.5-1 Physiographic Provinces

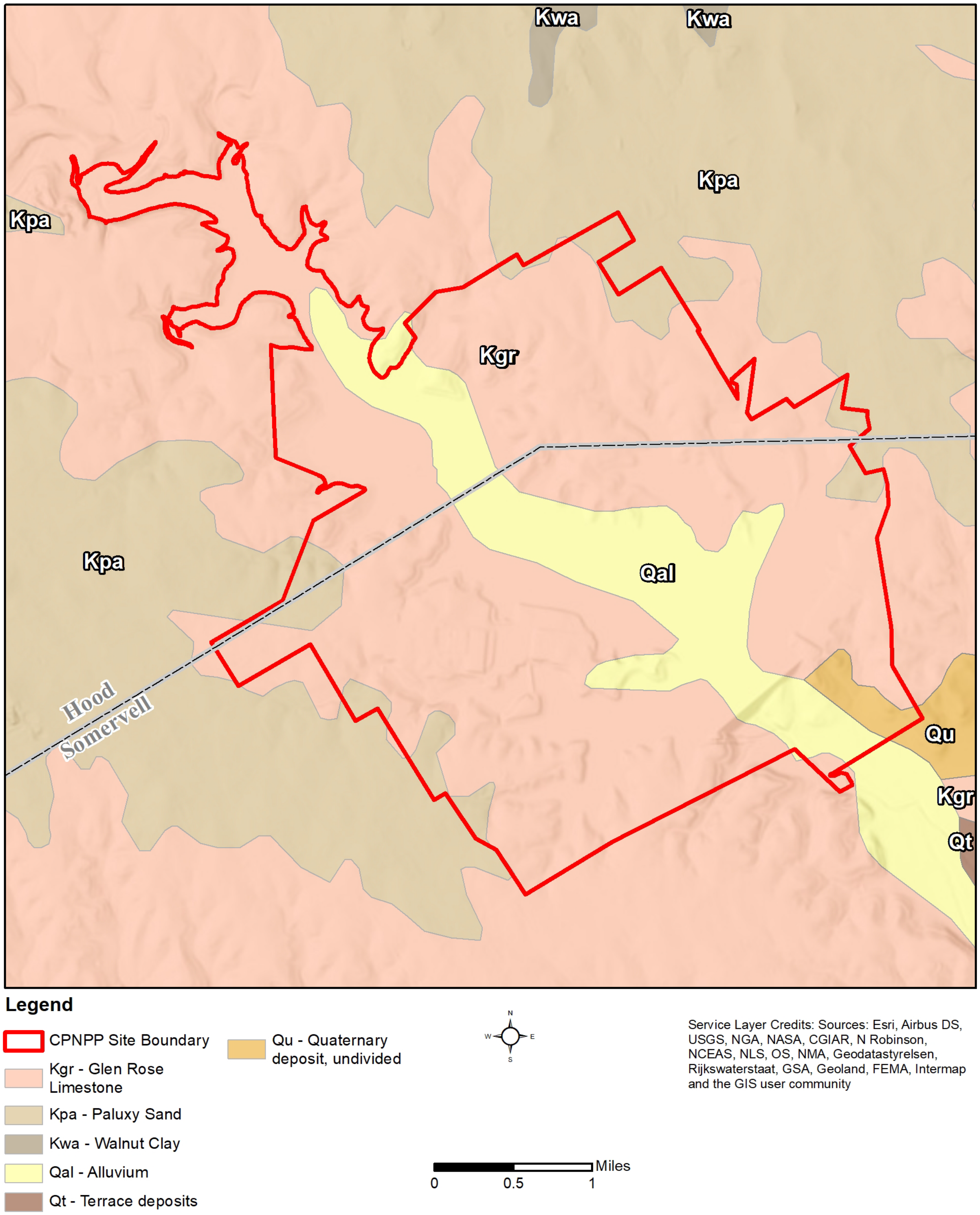


Figure 3.5-2 Surficial Geology

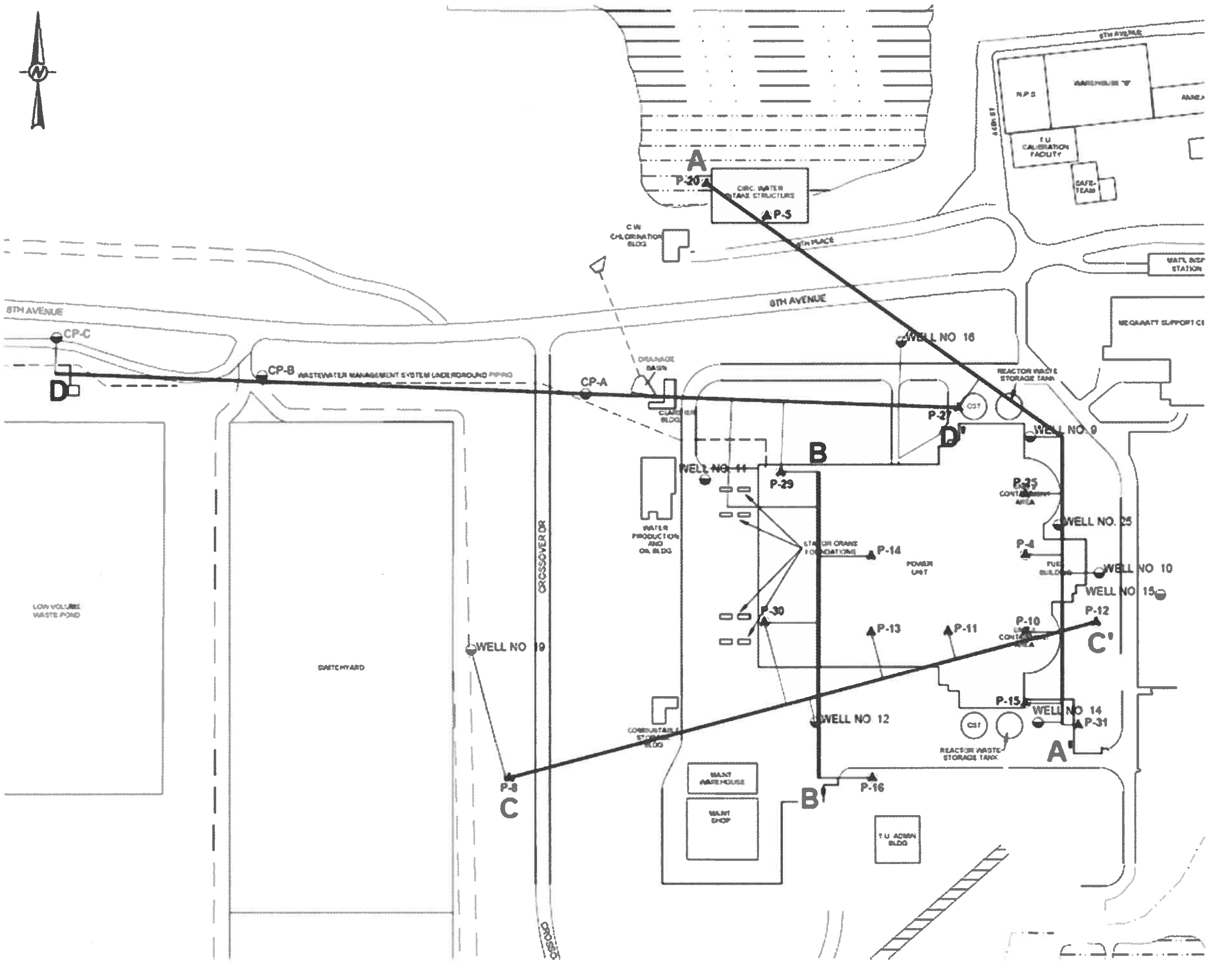


Figure 3.5-3a Cross Section Locations on CPNPP Site

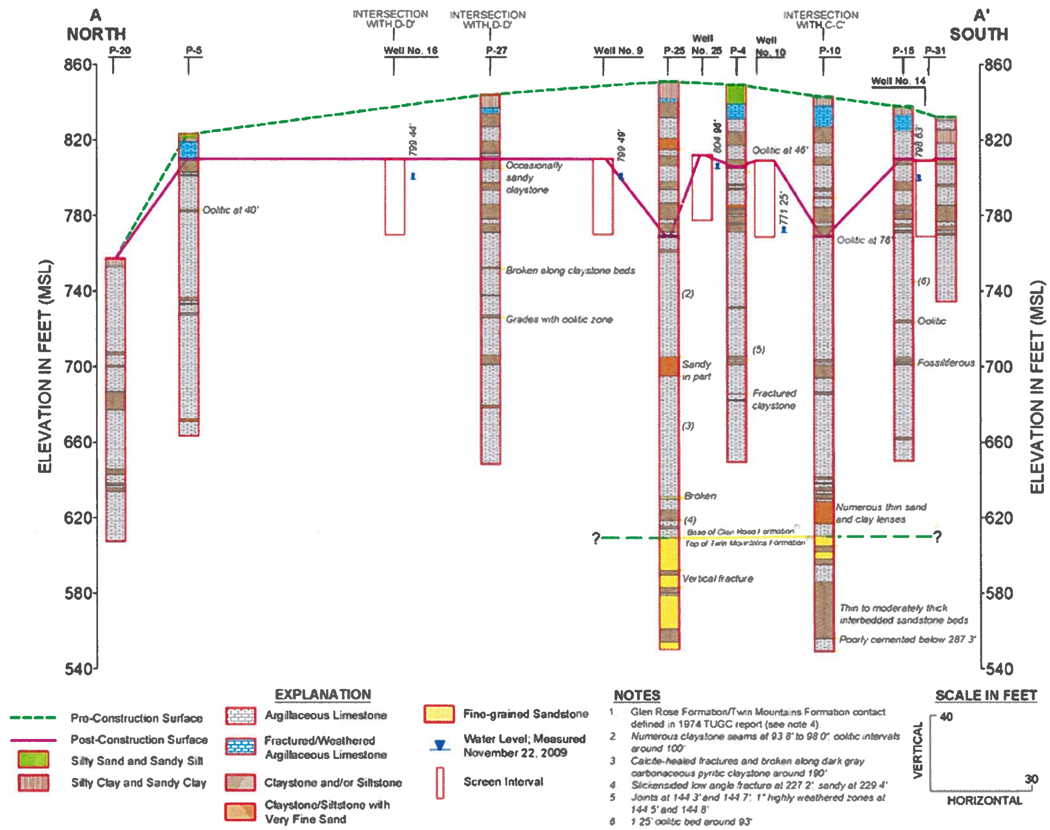


Figure 3.5-3b Cross Section A-A'

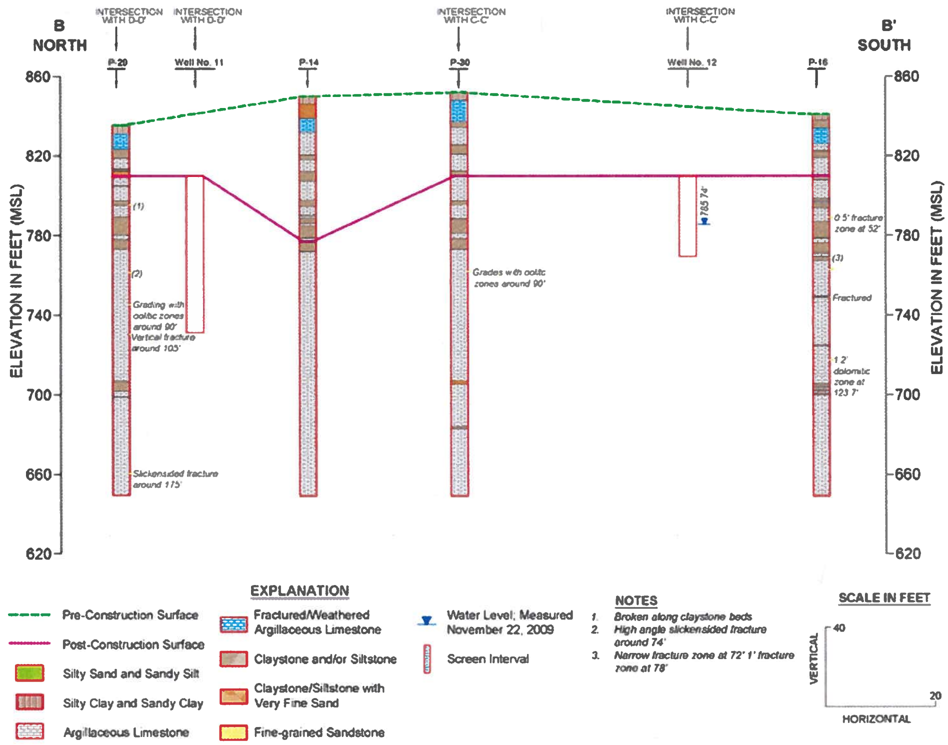


Figure 3.5-3c Cross Section B-B'

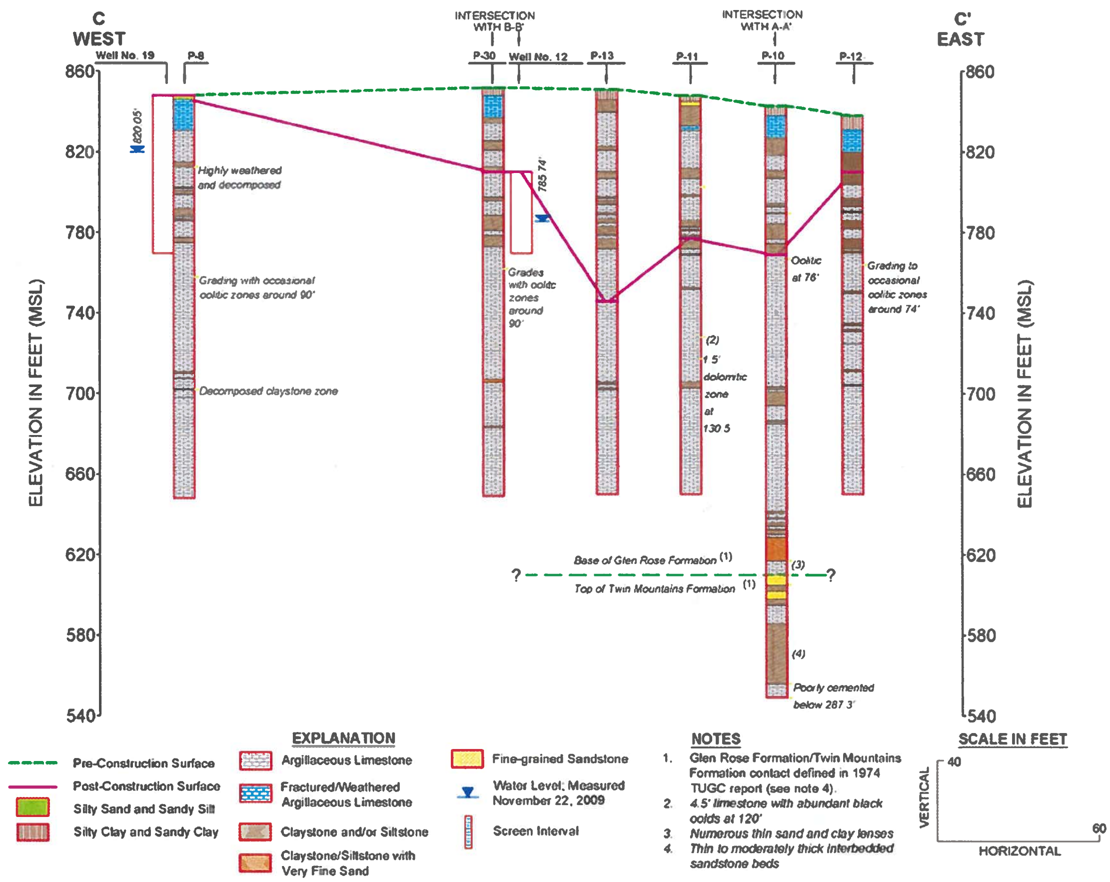


Figure 3.5-3d Cross Section C-C'

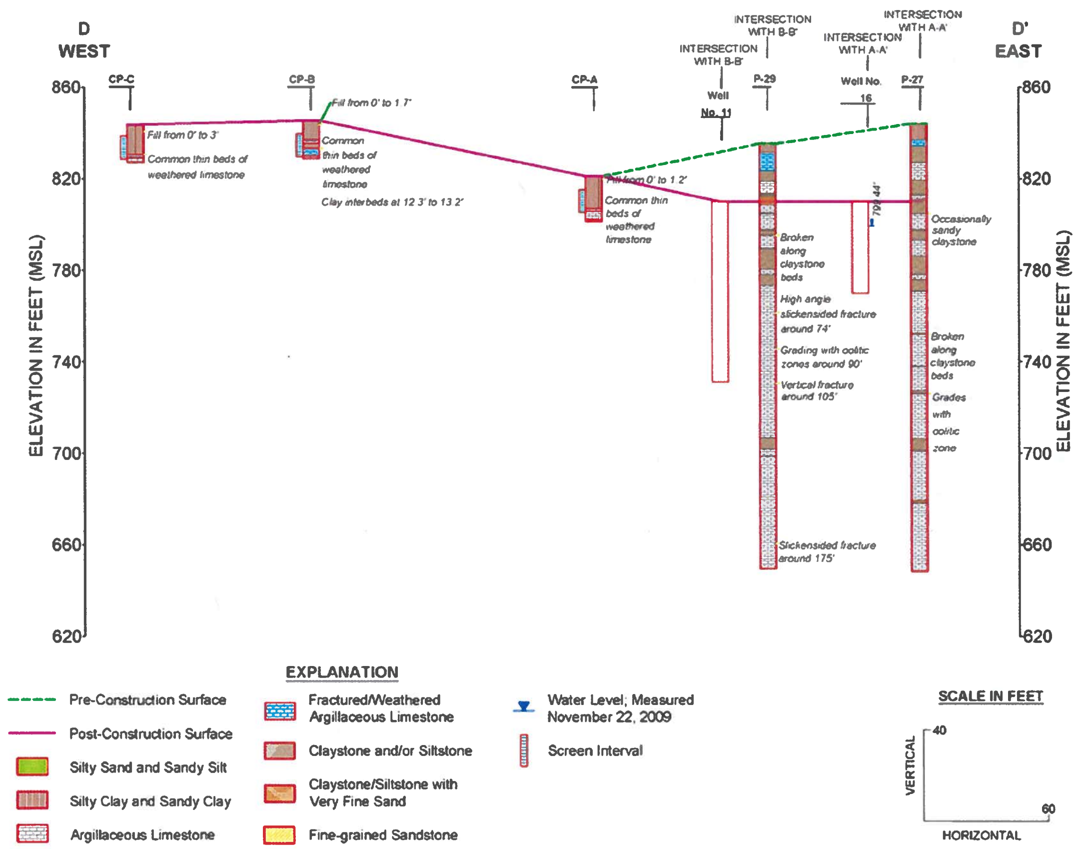


Figure 3.5-3e Cross Section D-D'

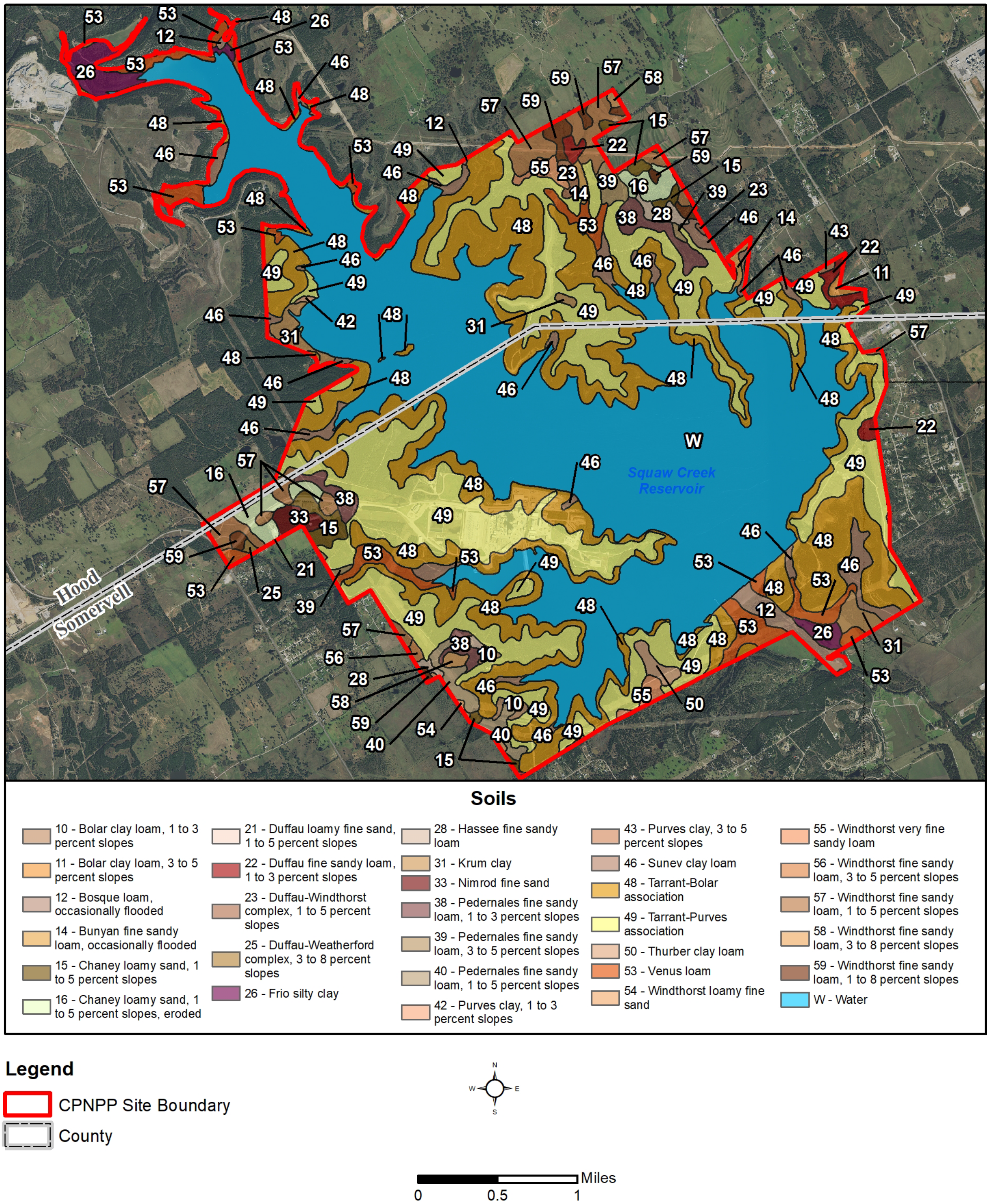


Figure 3.5-4 Distribution of Soil Units

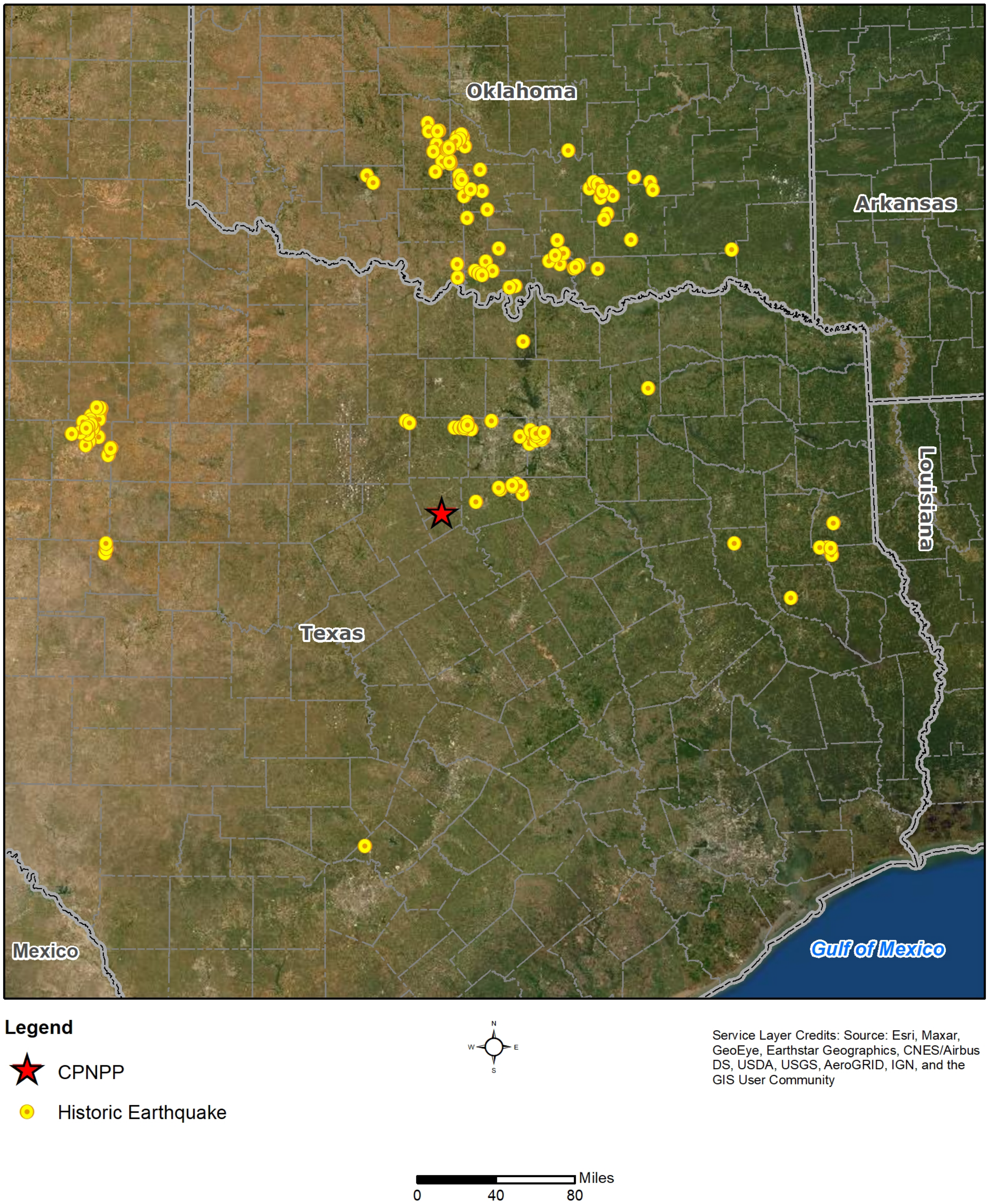


Figure 3.5-5 Historical Earthquakes

3.6 Water Resources

3.6.1 Surface Water Resources

CPNPP is located in rural Somervell and Hood counties in north-central Texas. The CPNPP site is situated on a peninsula formed by land between the southern shore of SCR and the CPNPP SSI. (Luminant 2013b, Section 2.3.1.1.1) The cooling water source for CPNPP is the SCR, an impoundment of the Brazos River (Luminant 2013b, Section 2.3.1.3.5). Lake Granbury, located approximately seven miles northeast of CPNPP, provides make-up water for SCR. The CPNPP site, comprising approximately 7,700 acres, is owned by CP PowerCo, and operated by Vistra OpCo. The SCR and Lake Granbury are the primary hydrologic features with which the plant interacts (Figure 3.6-1).

The Brazos River basin has the largest drainage area of all basins between the Rio Grande and the Red River in Texas. Total basin drainage area is approximately 45,700 square miles, of which approximately 43,000 square miles are in Texas; the remainder are in New Mexico. The CPNPP site, SCR, and Lake Granbury are located within the Brazos River basin, a portion of USGS Region 12 (Texas – Gulf Region). Region 12 is described as the drainage that discharges into the Gulf of Mexico from and including the Sabine Pass to the Rio Grande Basin, and includes parts of Louisiana, Texas, and New Mexico. Within Region 12, the Brazos River basin is divided into three subregions: the Brazos Headwaters, Middle Brazos, and Lower Brazos basins. The CPNPP site is located in the Middle Brazos basin. (Luminant 2013b, Section 2.3.1.1.1)

The Middle Brazos basin encompasses approximately 15,500 square miles and includes the Brazos River basin below the confluence of the Double Mountain Fork Brazos River and the Salt Fork Brazos River basins to and including the Castleman Creek basin. The Brazos River basin is further divided by the USGS into 25 hydrologic cataloging units each of which is assigned a hydrologic unit code (HUC). The CPNPP site is located in the Middle Brazos-Lake Whitney watershed USGS HUC 12060201. (Luminant 2013b, Section 2.3.1.1.1) The Middle Brazos-Lake Whitney watershed has a drainage area of approximately 2,500 square miles, which represent approximately 16 percent of subregion 1206, Middle Brazos, or about 5 percent of the entire Brazos River basin (Luminant 2013b, Section 2.3.1.1.3).

There are six intermittent streams that flow into the SCR within a 6-mile radius of CPNPP upstream of the Squaw Creek Dam. These streams include Squaw Creek, Panter Branch, Lollar Branch, Panther Branch, Million Branch, and an unnamed stream branch. (Luminant 2013b, Section 2.3.1.2) Squaw Creek is a small, intermittent stream which drains parts of Hood and Somervell counties and empties into the Paluxy River, upstream of the confluence of the Brazos and Paluxy rivers. Squaw Creek frequently has no flow during dry periods. Squaw Creek Dam impounds SCR for CPNPP cooling water approximately 4.3 stream miles north of the creek's entrance into the Paluxy River. At the conservation pool elevation (775 feet mean sea level [msl]), the lake has approximately 36 miles of shoreline and is 5 miles long. At the dam site, the

reservoir has a drainage area of 64 square miles. Squaw Creek Dam and Reservoir are owned by CP PowerCo and operated by Vistra OpCo. (Luminant 2013b, Section 2.3.1.3.5)

The Texas Water Commission issued Water Rights Permit No. 2871 on September 11, 1973, to Dallas Power and Light Company, Texas Electric Service Company, Texas Power and Light Company, and Texas Utilities Services Inc., Agent. This original permit authorized the permitees to construct a dam and reservoir on Squaw Creek with an impoundment capacity of 151,500 acre-feet of water. Permitees were also granted the right to construct a dam and reservoir (SSI) on Panther Branch. Permitees were authorized to maintain the reservoirs with available waters from Squaw Creek and to divert supplemental water from Lake Granbury. Yield analysis for SCR indicates a firm yield of 8,830 acre-feet in 2000 and 8,710 acre-feet in 2060. (Luminant 2013b, Section 2.3.1.3.5) An agreement with the Brazos River Authority (BRA) provides total use from Lake Granbury and/or Lake Possum Kingdom of 39,350 acre-feet per year (through August 31, 2066) and an additional 10,000 acre-feet per year available from the closed DeCordova Plant on Lake Granbury Contractual Permit CP-235 effective through December 31, 2030.

Squaw Creek Dam, completed in 1977, and appurtenant structures consist of an earthfill embankment 4,360 feet in length with a maximum height of 159 feet and a crest elevation of 796 feet msl. The service spillway is an uncontrolled concrete ogee type located between the right (southwest) end of the embankment and abutment. The crest of the spillway is 100 feet in width at elevation 775 feet msl. The emergency spillway is an earthcut channel through bedrock located at the left abutment, northeast of the embankment. The width of the channel is 2,200 feet with a crest elevation of 783 feet msl. The service outlet structure consists of a concrete tower housing three gate-controlled outlets with invert elevations of 764 feet, 715 feet, and 666.5 feet msl, respectively. The 30-inch diameter low-flow outlet has an invert elevation of 653 feet msl. Provisions for emergency discharges are provided that can discharge from the outlet tower through a 6-foot emergency gate and concrete encased conduit to be released downstream of the embankment. Routine discharges to maintain minimum Squaw Creek streamflow (1.5 cubic feet per second [cfs]) pass through either of these discharges via three roto-cone valves (two 12-inch and one 6-inch). (Luminant 2013b, Section 2.3.1.3.5)

A smaller reservoir known as the SSI is contained within the SCR. The SSI is designed to provide cooling water during an emergency situation to safely shut down CPNPP Units 1 and 2. The SSI dam is located on Panther Branch, a tributary of Squaw Creek. The safety-related dam is composed of a rock-fill embankment, approximately 1,520 feet long. The maximum height of the embankment is 70 feet above the natural streambed. The 40-foot-wide crest is at elevation 796 feet msl. The service/emergency spillway is a 40-foot wide by 400-foot long earthcut channel connecting the SSI facility to the main reservoir. This ingress/egress channel, located to the right (south) of the SSI dam, is also referred to as the equalization channel for the two reservoirs. The flow of water between the two reservoirs is controlled by a three-feet x three-feet concrete submerged weir that extends the width of the channel with a flowline elevation of 769.5 feet msl is provided to ensure sufficient emergency water is available in the event of Squaw Creek Dam failure. (Luminant 2013b, Section 2.3.1.3.5)

The results of a 2017 acoustic bathymetric survey indicate that the SSI alone has a capacity of 653 acre-feet at the conservation pool elevation of 775 feet msl. The survey determined that SCR (including the SSI) has a total capacity of 149,732 acre-feet and extends across 3,272 surface acres at the conservation pool elevation of 775 feet msl.

Current site surface water impoundments include the SCR, the CPNPP SSI, the CPNPP low volume wastewater ponds, and scattered cattle ponds. Six wastewater process impoundments are located on the approximate center of the CPNPP peninsula, west of the switchyard facilities. The impoundments occupy approximately 6 acres and consist of a surge basin and three low volume wastewater flow-through ponds, an oil-water separator, and a metal cleaning waste impoundment. The impoundments are double-lined with a 60-millimeter high-density polyethylene lining and utilize a leachate collection system. Low volume wastewater from CPNPP Units 1 and 2 operations is monitored within three of the ponds prior to discharge into SCR through a TPDES-permitted active process outfall. The metal cleaning waste impoundment, also permitted through the current CPNPP TPDES permit, has no installed discharge and has reportedly been used once to support Unit 1 steam generator cleaning. (Luminant 2013b, Section 2.3.1.3.8)

A number of small man-made ponds in the drainage basin, some of which are in creek channels and others which are off channel, have a total storage volume estimated to be about 1,150 acre-feet. There are three retaining ponds in the drainage basin for the purpose of mitigating potential releases to the SSI from a petroleum pipeline that crosses the CPNPP site. Other than these small ponds, there are no known control structures, weirs, or canals. (Luminant 2013b, Section 2.3. 1.3.8)

3.6.1.1 Potential for Flooding

The Brazos River channel is located in incised meanders, which are flanked by rock slopes that confine the river within a relatively narrow channel. The geometry of the riverbanks is typically characterized as steep on the outside of a meander bend and generally more gently sloping on the inside of a bend. Squaw Creek drains parts of Hood and Somervell counties and empties into the Paluxy River, upstream of the confluence of the Brazos River and Paluxy River. Squaw Creek is a small and intermittent stream, which often has no flow during dry periods and is upstream of SCR.

Historical floods in the Brazos River basin area pertinent to the CPNPP site have been due to precipitation runoff into streams and rivers. Seven floods with discharges greater than 40,000 cfs were recorded at the Brazos River Dennis Station (USGS 08090800) from 1969 to 2006. Four floods resulting in stream level increases above the NWS flood stage (25 feet) were recorded at the Brazos River Dennis Station from July 1987 to September 2007. Data from September 1995 to September 1998 were not available. (Luminant 2013b, Section 2.3.1.2.6) The 25-foot moderate flood stage was exceeded three times since 2006: June 2007, May, and June 2016. However, these events did not exceed the major flood stage of 27 feet. (USGS 2022) One uncertified flood control levee was identified on the Brazos River between Possum Kingdom Lake and Lake Granbury. The levee is within the limits of the City of Granbury and

provides flood protection for a park area. No other flood control levees were identified between Possum Kingdom Lake and Lake Granbury. Flow through De Cordova Bend Dam during flood conditions is based upon inflow into the reservoir and is monitored at the Brazos River Dennis Gauging Station. In cases where there is no local runoff, releases would be similar to the USGS Brazos River Dennis Gauging Station hydrograph. There can also be significant inflow to Lake Granbury from rainfall downstream of the Dennis gauge in which cases releases can be significantly higher than the Dennis gauge readings. The primary flood control reservoir in the Brazos River basin is Lake Whitney. Whitney Dam impounds Lake Whitney, approximately 100 river miles downstream of De Cordova Bend Dam and is the largest flood control reservoir in the Brazos River basin. The reservoir was built by the U.S. Army Corps of Engineers (USACE) in the 1950s specifically to hold flood water and provides 1.3 million acre-feet of flood storage minimizing the effects of flooding on downstream communities. In addition to Lake Whitney, there are eight other flood control lakes in the Brazos River basin that were built and are operated by the USACE. These reservoirs are located on tributaries of the Brazos River. (Luminant 2013b, Section 2.3.1.2.6)

The maximum known flood on the Brazos River occurred in 1876 well before flow monitoring began, and consequently, there is little quantitative data available on this flood. Flood records for the Brazos River at gaging station 8-0910, just upstream from the Paluxy River confluence, have been obtained since 1923. These records indicate that the highest water level recorded at gaging station 8-0910 was elevation 601.69 feet (May 27, 1957), corresponding to a discharge of 87,400 cfs. The mean annual, the 50-year, and the historical peak floods on the Brazos River correspond to flows of approximately 40,000 cfs, 110,000 cfs, and 97,600 cfs, respectively, at gaging station 8-0910. The stage reached at station 8-0910 during the 97,600 cfs flood (May 18, 1935) was less than that of the 87,400 cfs flood due to backwater effects from the Paluxy River discharge. The flood of record (elevation 601.69 feet) and the 1876 event are significantly lower than the CPNPP site grade (elevation 810 feet).

There was no monitoring on the Squaw Creek watershed prior to 1966. A crest-stage partial-record station was installed in 1966 on Panter Branch, a tributary to Squaw Creek. In 1973, a continuous recording gage was installed on Squaw Creek at the SH 144 bridge, 2.1 miles upstream from the mouth of the creek. CPNPP safety-related facilities are designed to safely withstand all floods and flood waves which are remotely possible at the site. The crest of the service spillway, elevation 775 feet, has been utilized as the pre-flood condition. The planned design assures that the safety-related facilities of the CPNPP will not be adversely affected by floods and flood waves.

The SCR has a service spillway crest elevation of 775 feet. The calculated probable maximum flood (PMF) level of SCR is 789.7 feet. The plant, which takes cooling water from one side of the peninsula and discharges to the other, has a site grade elevation of 810 feet.

As shown in Figure 3.6-2, the CPNPP property is an area of minimal flood hazard which surrounds the SCR (listed as without base flood elevation) (North American Vertical Datum 1988 [NAVD88]). (FEMA 2020) CPNPP safety-related facilities are designed to safely withstand

all floods and flood waves which are remotely possible at the site. The crest of the service spillway, elevation 775 feet, has been utilized as the pre-flood condition. The planned design assures that the safety-related facilities of the CPNPP will not be adversely affected by floods and flood waves.

The onsite drainage system discussed in Section 3.6.1.3, is designed to remove the water resulting from a rainfall of 6 inches in one hour and 7.5 inches in two hours, in such a manner that the runoff is accomplished without ponds forming on the ground. Further, the drainage system is designed to adequately drain a rainfall of 15 inches in one hour and 22 inches in two hours in such a way that there are no ponds which can back up into the structures and affect safety-related systems.

3.6.1.2 TPDES-Permitted Outfalls

Chemical additives approved by the TCEQ are used to control pH, scale, and corrosion in the circulating water system, and to control biofouling of plant equipment. Process wastewaters are monitored and discharged to SCR via TPDES Outfalls 001 and 002, and treated domestic wastewater is discharged to SCR via TPDES Outfall 003 in accordance with the CPNPP TPDES Permit No. WQ0001854000. The current TPDES permit authorizes discharges from five outfalls, three external (Outfalls 001, 002, and 003), and two internal (Outfalls 004 and 104). (Attachment B) The TPDES outfalls are active process discharges that flow into SCR and are depicted in Figure 3.6-3. Their associated effluent limits are listed in (Table 3.6-2).

3.6.1.3 Stormwater Runoff

The CPNPP site covers approximately 7,700 acres, which generally consists of gently to steeply rolling topography. Within the Squaw Creek drainage basin, approximately 64 square miles at the SCR dam site, elevations vary from over 1,100 feet msl near the origin of Squaw Creek to about 650 feet msl near the dam site. The topography is influenced by the underlying geology, which consists of sedimentary rocks of Lower Cretaceous age (poorly cemented sandstones, limestones, and shales) that dip gently to the east. (Luminant 2013b, Section 2.3.1.1.5)

The current onsite drainage system for CPNPP consists of engineered and natural drainage systems. The power block including all safety-related buildings are located at a high point, with the surrounding grounds sloping towards SCR to the north and the south. The ground east and west of the buildings slopes towards drainage ditches that discharge into the reservoir on both sides of the peninsula. (Luminant 2013b, Section 2.3.1.1.5; Attachment B)

The onsite drainage system is further enhanced by the use of an underground storm drain system within the protected area/vehicle barrier system (PA/VBS) boundary which is supported by a series of catch basins, paved swales, and rocked ditches. Surface runoff, including that collected by the storm drain piping within the PA/VBS, is discharged to the reservoirs on both sides of the peninsula either directly by a combination of open channel ditches and underground culverts or is collected at concrete designed drainage basins before being discharged to the applicable reservoirs via large underground pipe culvert systems. Site plan drainage

configuration changes and impact including that created by historical implementation and placement of new or modified design features, buildings, security-related features, and other structures have been analyzed to address the adequacy of the onsite drainage system consistent with the design basis rainfall intensities and drainage requirements as described below. A possible clogging of any ditch or storm drainpipe within the PA/VBS boundary has been analyzed to not affect the system's water removal capacity.

There are stormwater outfalls (Outfall SW-001 through Outfall SW-014) that discharge separately from the TPDES permitted wastewater outfalls listed in Section 3.6.1.2. The site is graded such that runoff drains away from the safety-related structures via drainage channels or sheet flow and subsequently to SCR through catch basins or as unobstructed overland flow. (Luminant 2013b, Section 2.3.1.1.5; Attachment B)

Stormwater discharges associated with CPNPP industrial activities are regulated and controlled through TPDES Permit No. WQ0001854000 issued by the TCEQ (Attachment B). CPNPP also has a Multi-Sector General Permit (MSGP) TXR050000 (Table 9.1-1). Vistra OpCo also maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs used to prevent or reduce the pollutants in stormwater discharges. Vistra OpCo collects stormwater runoff samples on a quarterly basis (when there is a flow) at 14 stormwater outfalls which receive runoff from the entire industrial area and conducts screening through visual observations for pollutants as specified in the SWPPP.

3.6.1.4 Sanitary Wastewaters

Sanitary waste is treated at an onsite sanitary wastewater treatment facility. The treated wastewater is discharged to the SCR through the current TPDES permitted Outfall 003 for Units 1 and 2. (Luminant 2013b, Sec. 5.5.1.4; Attachment B) Prior to discharge, the treated sanitary wastewater effluent is routed through an ultraviolet (UV) light disinfection unit and then to a holdup chamber. Disinfection chiefly occurs via UV light disinfection. The permit allows for an alternative disinfection system if the UV light unit is taken offline for repairs.

3.6.1.5 Dredging

No periodic maintenance dredging has occurred at CPNPP and no dredging activities in the vicinity of the intake and discharge are anticipated. The LVW ponds are wastewater treatment facilities and are not waters of the U.S. Removal of sediment does not require any federal or state dredging authorizations. The ponds are cleaned out (as needed), and liners require a 5-year P.E. certified inspection for leaks/releases per TPDES Permit WQ-0001854000.

3.6.1.6 Compliance History

As discussed in Chapter 9, there have been two notices of violation (NOVs) associated with CPNPP wastewater discharges to receiving surface waters. The first NOV was issued for failure to perform analyses of duplicate samples of wastewater analyzed for *E. coli* in October 2019 and July 2020 before discharge to Outfall 3. This NOV was resolved in January 2021 since the

collected samples for *E. coli* analysis are not diluted and therefore a blank analysis was not required. The second NOV was issued for the failure to calibrate the onsite sanitary wastewater treatment facility's flow meter at least annually to ensure accuracy. The flow meter was last calibrated on April 10, 2019. This NOV was also resolved in January 2021 after calibration of the flow meter.

3.6.1.7 Lake Water Temperatures Reporting

Cooling water discharge water temperatures for each unit are measured by CPNPP and the raw data are averaged for each month. The averaged values for 2016–2020 are plotted in Figure 3.6-4.

One of the factors that affect water quality in reservoirs is thermal stratification. Some reservoirs become thermally stratified in the summer when solar energy warms the surface water, leaving the bottom portions of the reservoir cooler. An operational study of temperature distribution in SCR was performed in August of 1993. The study showed that past operational surveys of SCR indicated a thermocline characterized by a slightly varying temperature (generally less than 4°F) to a depth of 40–50 feet, followed by a sharp temperature decrease to about 60 feet and then a gradual temperature decrease to bottom. Areas around the Units 1 and 2 discharge also showed influence of the thermal plume with only a 2–4°F decrease in temperature down to 15 feet. The deeper profiles, over 50 feet deep, generally showed a gradually decreasing temperature, 6–10°F, to 50 feet, followed by a steady decrease of about 34°F to bottom. Warmer water and vertical mixing with depth, below 20 feet, have been observed in the SCR since CPNPP Unit 1 became operational. In the first year that CPNPP was operational, temperatures below the thermocline down to 70.0 feet averaged about 4°F warmer than in 1991 when the CPNPP Unit 2 effect was minimal. The average of all deep-water areas surveyed at 50 feet were 3.8°F more than in 1991, while average temperatures at 60 feet and 70 feet were 6.4°F and 1°F warmer, respectively, than 1991. Temperatures at 80 feet, however, remained about 57°F since Unit 1 went online. The study concluded that the decreased thermocline and increased heat budget down to 70 feet appears to be the result of CPNPP Unit 2 operation. (Luminant 2013b, Sections 2.3.1.2.8 and 2.3.1.5.3)

3.6.2 Groundwater Resources

3.6.2.1 Groundwater Aquifers

Most of the groundwater in the site region occurs in bedrock. Some groundwater does exist in the shallow floodplain alluvium along stream valleys but is not withdrawn for use. In the order of increasing age, bedrock aquifers in the site vicinity include the Paluxy Formation, the Glen Rose Formation, the Twin Mountains Formation, and all of the Comanche series, Cretaceous age. Locally, CPNPP and SCR are situated on the Glen Rose Formation outcrop, which in turn, is underlain by the Twin Mountains Formation. The Paluxy Formation is absent at the CPNPP location and within the limits of SCR. (Luminant 2013b, Section 2.3.1.5.3)

The Twin Mountains and Paluxy formations are principally sandstone, but also have shale, limestone, claystone, and siltstone inclusions. Limestone is the dominant rock type in the Glen Rose Formation, but the stratum also contains significant quantities of shale, siltstone, and claystone. In these formations, groundwater percolates slowly along bedrock joints and fractures, and through interstices in the rock fabric. (Luminant 2013b, Section 2.3.1.5.3)

The Twin Mountains Formation is the only moderately productive bedrock zone in the site vicinity, though the Paluxy Formation has nominal pumpage near the site. The Glen Rose Formation yields very little water in the site area and is usually less productive than the others. At distances of 20–50 miles down-dip from the outcrop, the groundwater becomes saline, and the formations lose their importance as sources of fresh water. (Luminant 2013b, Section 2.3.1.5.3)

The principal origins of groundwater in the Twin Mountains Formation are rainfall and streamflow occurring in the outcrop area. Down-dip from the outcrop, groundwater in the Twin Mountains Formation is confined by fine-grained materials of the overlying Glen Rose Formation. Hydrostatic pressure in the Twin Mountains is great enough to create static water levels that rise above the formation and, sometimes, to cause flowing wells. (Luminant 2013b, Section 2.3.1.5.3)

Groundwater loss occurs in the outcrop area by evapotranspiration, localized springs, and seepage into drainage channels incised below the water table. Down-dip from the outcrop area where the formation is confined, the natural discharge is limited to a small upward movement into overlying formations. (Luminant 2013b, Section 2.3.1.5.3)

Although the Twin Mountains Formation is a moderately productive stratum in the site area, packer-pressure tests of 60 feet of this rock in a boring at CPNPP Units 1 and 2 did not result in water take. These data indicate there are essentially impermeable rock zones within this formation. (Luminant 2013b, Section 2.3.1.5.3)

The principal origins of groundwater in the Glen Rose Formation are rainfall in the outcrop area, and minor seepage from both the overlying Paluxy Formation and underlying Twin Mountains Formation. The results of packer tests conducted in 2007 indicated little to no water take into the Glen Rose Formation. These results indicate that this formation is essentially impermeable. The Glen Rose Formation is predominately limestone, but significant amounts of shale, siltstone, and claystone are also present. (Luminant 2013b, Section 2.3.1.5.3)

The Glen Rose limestones are essentially impermeable due to slight amounts of argillaceous impurities present. These limestones are resistant to solution effects: open voids, caverns, joints, collapse features, and fractures, which are frequent in some limestone formations but are notably absent in the Glen Rose Formation near the site. Groundwater, therefore, moves very slowly into and through the formation; entrance is afforded principally through existing joints and fractures. Occasional isolated sand lenses also contain groundwater. (Luminant 2013b, Section 2.3.1.5.3)

The Glen Rose Formation ranges from 160 to 270 feet thick (Vistra OpCo 2020a). The Glen Rose Formation discharges water naturally through springs and seeps. In confined portions of the formation, there is little transfer of water into overlying or underlying formations when differential pressures occur. (Luminant 2013b, Section 2.3.1.5.3)

The Paluxy Formation is predominately sandstone, but shale, siltstone, claystone, and limestone are also present. The top of the Twin Mountains Formation is approximately 230 feet below CPNPP. In the vicinity of the CPNPP site, the Twin Mountains Formation is more than 220 feet thick. Recharge to the Paluxy Formation occurs in the outcrop areas from infiltration of rainfall and seepage from streams. It also receives water from water-bearing units under greater hydraulic heads which adjoin the Paluxy Formation. South of the CPNPP site, the formation is confined by overlying fine-grained strata. (Luminant 2013b, Section 2.3.1.5.3)

Groundwater discharges from the Paluxy Formation as springs and seeps in some outcrop areas. Where the Paluxy Formation is confined, there is a limited water movement into overlying or underlying confining units when those units are at a lower hydraulic head. (Luminant 2013b, Section 2.3.1.5.3)

Groundwater in the Paluxy Formation, the Glen Rose Formation, the Twin Mountains Formation generally occurs under water table (unconfined) conditions at or near the formation outcrop and artesian (confined) conditions in the down dip direction (southeast) from the outcrop. The primary source of recharge to these units is precipitation on the outcrop area. Secondary sources include recharge from streams flowing across the outcrop and seepage from ponds and lakes. The average annual precipitation on the outcrop area is about 31 inches; only a small fraction is available for recharge due to the rate of runoff and high evapotranspiration.

The Twin Mountains Formation, which underlies the Glen Rose Formation, is the primary source of groundwater in the area surrounding CPNPP. The Twin Mountains Formation provides moderate to large quantities of fresh to slightly saline water to public supply, industrial and irrigation wells in north-central Texas. The remaining water supply wells installed at CPNPP are completed in the Twin Mountains Formation. The Glen Rose Formation is not considered a source of groundwater in the site vicinity. The high proportion of argillaceous (clayey) material and the absence of interconnected porosity in the Glen Rose Formation preclude the storage or flow of significant amounts of groundwater. Small amounts of groundwater occur in the Glen Rose Formation in isolated sandy or silty units, as local perched water tables, or in weathered material in the shallow subsurface. Such minor units are not generally tapped by wells. A few domestic water wells produce water from the Glen Rose Formation in counties north of CPNPP where the Glen Rose Formation is covered by outliers of the Paluxy Formation. The source of this water is probably leakage from the overlying Paluxy Formation.

The Paluxy Formation yields small to moderate quantities of fresh to slightly saline water to public supply, industrial, domestic, and livestock wells in the region. The Paluxy, which grades into the Antlers Formation in north Texas, produces water from shallow wells at or near its

outcrop in Somervell County. The Paluxy Formation does not occur at the CPNPP facility and is more important as a groundwater supply to the north and east of CPNPP.

3.6.2.2 Hydraulic Properties

The rate of flow (velocity) of groundwater depends on the hydraulic conductivity and porosity of the medium through which it is moving and the hydraulic gradient.

The Glen Rose Formation bedrock has a low overall hydraulic conductivity, as determined from packer tests and slug tests completed at the site. Regolith and undifferentiated fill overlying the bedrock exhibit higher hydraulic conductivity values than the underlying bedrock, consistent with characteristics of a porous medium. A portion of the subsurface flow through the bedrock occurs along bedding and joint planes that are sub-horizontal in orientation. Thus, groundwater movement through the subsurface is limited by the physical properties of the subsurface materials underlying the regolith and undifferentiated fill. (Luminant 2013b, Section 2.3.1.5.6) Section 3.6.2.3 provides a discussion about the general hydraulic gradient in the unweathered Glen Rose Formation and weathered Glen Rose Formation in the vicinity of Units 1 and 2.

The groundwater movement in the Twin Mountains Formation is down-dip to the east at a rate of approximately two feet per day. The current piezometric gradient is about 20 feet per mile. Permeability of the formation ranges from 90–240 gpd per square foot. Because the site is near the recharge area and because of the relatively small projected amount of future pumping, no significant change in groundwater level is expected in the site vicinity.

3.6.2.3 Potentiometric Surfaces

Groundwater flow direction within the regolith is toward SCR. Flow direction of groundwater within the shallow bedrock appears to flow eastward toward SCR. However, based on the limited groundwater availability within the bedrock, depicted by long-term, non-equilibrium water levels within most bedrock monitoring wells, groundwater flow within the upper bedrock is limited and likely linked to flow within the overlying perched groundwater in the regolith. (Luminant 2013b, Section 2.3.1.5.5)

The potentiometric surface maps indicate a general hydraulic gradient from east to west in the unweathered Glen Rose Formation near the power unit area. In contrast, monitoring wells completed in the weathered Glen Rose Formation indicate groundwater flow from west to east, which closely mimics the topography west of the power unit area. Actual groundwater flow paths are likely highly variable due to the presence, extent, orientation, and interconnectedness (if any) of joints, fractures, isolated sand lenses, and other secondary porosity features.

The current monitoring well network at CPNPP consists of eight groundwater monitoring wells (Well Nos. 9, 10, 11, 12, 14, 15, 16, and 25) completed in the unweathered Glen Rose Formation around the power unit block and four groundwater monitoring wells (Well Nos. 19, CP-A, CP-B, and CP-C) completed in the weathered Glen Rose Formation west of the power unit block. Three of the groundwater monitoring wells completed in the weathered Glen Rose

Formation (CP-A, CP-B, and CP-C) are located immediately adjacent to the wastewater management system underground piping system.

Groundwater level data for groundwater monitoring well Nos. 10 and 15, were not used to construct the contours on the potentiometric surface maps. The two monitoring wells are completed in the same zone as the other unweathered Glen Rose monitoring wells, but the water level elevations in well Nos. 10 and 15 were typically about 30 feet lower than those of the other nearby monitoring wells, suggesting a weak or non-existent hydrologic connection between monitoring well Nos. 10 and 15 and the other wells.

Groundwater contour (potentiometric surface) maps of the unweathered Glen Rose and weathered Glen Rose are provided as Figures 3.6-6 and 3.6-7, respectively. These groundwater potentiometric surface maps are based on groundwater level data collected on November 29, 2018, and June 27, 2019, as part of the Nuclear Energy Institute's (NEI)'s groundwater protection initiative (GPI) program, which is discussed in Section 3.6.2.4.

3.6.2.4 Groundwater Protection Program

In May 2006, the NEI implemented the GPI, an industry-wide voluntary effort to enhance nuclear power plant operators' management of groundwater protection (NEI 2007).

Industry implementation of the GPI identifies actions to improve licensee management and response to instances where the inadvertent release of radioactive substances may result in detectable levels of plant-related materials in subsurface soils and water, and also describes communication of those instances to external stakeholders. Aspects addressed by the initiative include site hydrology and geology, site risk assessment, onsite groundwater monitoring, and remediation. In August 2007, NEI published updated guidance on implementing the GPI as NEI 07-07, Industry Ground Water Protection Initiative-Final Guidance Document (NEI 2007). This guidance was further updated in February 2019. The purpose of NEI 07-07 is to improve the management of situations involving inadvertent radiological releases that get into groundwater and to improve communications with external stakeholders to enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment. (NEI 2019a)

CPNPP implemented a groundwater protection program in 2008. This initiative was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to ground water (NEI 2019a). As part of this program and discussed in Sections 3.6.2.3 and 3.6.4.2, Vistra OpCo monitors 12 wells completed in the un-weathered and weathered portions of the Glen Rose Formation. Several monitoring network wells are located in the immediate vicinity of the Refueling Water Storage Tank (RWST) tanks and the eastern exterior wall of the fuel building. Other monitoring network wells are located in the general down-gradient direction (west) from these areas. Three monitoring wells were placed along the wastewater management system underground piping to more adequately monitor potential radiological releases to groundwater in this area. The leachate basins (A, B, and C), which

receive discharge from the underground piping, were sampled quarterly as part of the groundwater sampling program to monitor potential radiological releases in this area prior to 2016. (Vistra OpCo 2020a, Vistra OpCo 2021a)

No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples from 2016 - 2020.

In conjunction with the GPI, Vistra OpCo performs groundwater monitoring from a total of 12 onsite locations to monitor for potential radioactive releases to groundwater, environmental conditions, and groundwater elevation in accordance with site procedures. Figure 3.6-5 shows locations of the groundwater monitoring wells with construction details presented in Table 3.6-3.

3.6.2.5 Sole Source Aquifers

A sole source aquifer (SSA), as defined by the EPA, is an aquifer which supplies at least 50 percent of the drinking water consumed by the area overlying the aquifer, and there is no reasonably available alternative drinking water source should the aquifer become contaminated. The SSA program was created by the U.S. Congress as part of the Safe Drinking Water Act and allows for the protection of these resources. (EPA 2021d)

CPNPP is located in EPA Region 6, which has oversight responsibilities for the public water supply in Texas, Oklahoma, New Mexico, Louisiana, and Arkansas and 66 tribal nations. The EPA has designated four aquifers in Region 6 as SSAs. One of these SSAs, the Edwards Aquifer in Texas, is divided into four zones:

- Edwards Aquifer I (San Antonio Area) SSA – Streamflow Source Area
- Edwards Aquifer I (San Antonio Area) SSA – Recharge Zone
- Edwards Aquifer II (Austin Area) SSA – Streamflow Source Area
- Edwards Aquifer II (Austin Area) SSA – Recharge Zone

This SSA is located approximately 142 miles from CPNPP. Therefore, CPNPP's property is not situated over this designated SSA. (EPA 2021d)

3.6.3 Water Use

3.6.3.1 Surface Water Use

The SCR is a 3,272-acre cooling reservoir located on Squaw Creek, which is not used for navigation. An SSI on the Panther Branch of the SCR impounds water for the SSWS. SCR is the source of water for cooling and auxiliary water systems at CPNPP. The SCR, which has an approximately 64-square mile catchment, is impounded by Squaw Creek Dam approximately 4.3 stream miles north of Squaw Creek's confluence with the Paluxy River. Supplemental water from Lake Granbury on the Brazos River is conveyed by pipeline to SCR. The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 MGD. Substantially more than the required amounts will be available to SCR from Lake Granbury under terms of an existing

agreement with the BRA. This agreement covers total use from Lake Granbury and/or Lake Possum Kingdom of 39,350 acre-feet per year and an additional 10,000 acre-feet available from the closed DeCordova Plant on Lake Granbury. The dependable yield of Lake Granbury has been evaluated as at least 69,200 acre-feet per year, exclusive of the additional yield which could be made available by releases from Lake Possum Kingdom. The 70,000 acre-feet per year of potential supply is more than adequate to provide the necessary net diversions to SCR, plus anticipated requirements of other facilities which might also draw on Lake Granbury.

As presented in Section 2.2.3.1, CPNPP uses a once-through condenser cooling system. The cooling water for normal plant operation is withdrawn from the SCR by eight 275,000-gpm-capacity circulating water pumps for both units. The circulating water system intake structure is located north of the plant on the SCR and supplies approximately 1,100,000 gpm of cooling water to each unit. The heated water of the circulating water system is discharged to the SCR (at a point southeast of the plant) via a tunnel discharging into an open structure, circulating water discharge structure. The discharge structure is located at an adequate distance from the circulating water intake structure to ensure sufficient water mixing and evaporative cooling.

No water rights have been issued on Squaw Creek, but two potential surface water users (irrigation) have filed claims to withdraw water. In due course, these claims will be evaluated by the Texas Water Rights Commission and either upheld or dismissed. The points of potential withdrawal are located within SCR limits, adjacent to the Hood-Somervell County line. No surface water users are known on the Paluxy River, downstream of the Squaw Creek confluence. Cattle are watered from Squaw Creek and also probably from the Paluxy River.

There are numerous parties on the Brazos River downstream of the site vicinity who have applied for and/or received water allocations (hereafter called water users for non-irrigational and irrigational use). The nearest irrigational water user below Squaw Creek Dam is approximately 3 stream miles downstream from the confluence of the Paluxy and Brazos rivers. The nearest extraction of water for public supply is at Waco, approximately 109 stream miles downstream of this confluence. There are no other known extractors of water for potable uses between Squaw Creek Dam and Waco.

According to the 2017 acoustic bathymetry survey discussed in Section 3.6.1, the reservoir, including the SSI, has a capacity of 149,732 acre-feet encompassing a surface area of 3,272 acres at the conservation elevation of 775 feet above msl. As mentioned earlier, the dam controls a drainage area of about 64 square miles. Table 3.6-1a presents monthly water levels for SCR in 2020 along with long-term mean, maximum, and minimum for 2008 through 2020. In addition, Table 3.6-1b presents monthly water levels for Lake Granbury in 2020 along with long-term mean, maximum, and minimum for 1987 through 2020.

The average surface water withdrawal rate for SCR by CPNPP in 2020 was reported as 2,880.23 MGD and averaged 2,916.69 MGD between 2016 and 2020 (Table 3.6-4a). For Lake Granbury, the average surface water withdrawal rate by CPNPP is 43.74 MGD and averaged 42.38 MGD between 2016 and 2020 (Table 3.6-5a). A summary of monthly surface water

withdrawals reported by CPNPP from 2016–2020 is included as Table 3.6-4b for SCR and Table 3.6-5b for Lake Granbury.

In 2015, total surface water withdrawals in Somervell County were reported as 2,106.2 MGD, of which 2,105.15 MGD was used for power generation. The total surface water withdrawals in Hood County to the north were reported as 7.63 MGD, of which 4.59 MGD was withdrawn for irrigation, with 2.49 MGD for power generation. Excluding power generation, surface water use for Somervell County in 2015 was reported as 1.05 MGD. (USGS 2021b) A summary of surface water use in Somervell and Hood counties is presented in Table 3.6-6.

3.6.3.2 Groundwater Use

Generally, in the CPNPP site vicinity water use from the Paluxy and Glen Rose formations is small and individual wells are of very limited capacity. The recharge areas (outcrop areas) of the Paluxy and Glen Rose formations are located near CPNPP to the west. The aquifers are variable in their hydraulic characteristics and also in the quality of water they yield. Water extraction from these formations has no identifiable effect on regional piezometric levels. Groundwater use is not expected to increase significantly in the future because these formations are poor aquifers and would probably not be developed for water supply by either cities or industries, or for large scale irrigation. More favorable water supplies are available from surface sources or from the Twin Mountains. (Luminant 2013b, Section 2.3.1.5.4)

The Twin Mountains Formation is the primary source of groundwater used in the region although this use is not extensive.

North of the site, a few wells are completed in the Glen Rose Formation. The presence of adequate and reliable supplies of groundwater in the Glen Rose Formation is dependent on a sandstone cover (the Paluxy Formation). This sandstone cap results in prolonged percolation to the Glen Rose and results in relatively high-water levels, even during drought conditions.

There are currently no discharges to groundwater from CPNPP requiring permits by regulatory agencies and none are expected during the PEO.

Four onsite water supply wells were plugged on November 20, 2013, and the CPNPP site public water system (PWS) was deactivated on December 12, 2013. As of November 1, 2013, all connections to onsite treatment, pressure maintenance, and storage facilities were physically removed and the Somervell Training Center water supply well (PWS #2130042) became the sole source of potable water for the CPNPP facility. The TCEQ approved of the regulatory status change (inactivating CPNPP's PWS) on May 16, 2014.

The Somervell Training Center PWS (#2130042) was deactivated on September 27, 2018, and the Somervell Training Center water well is used to supply water for cattle with groundwater withdrawal limited by the Prairie Lands Groundwater Conservation District to 281,750 gallons per year (gpy). Two other PWSs located in SCP were deactivated on November 5, 2018. The SCP Office and Boat Dock water wells associated with the deactivated PWSs are non-potable

(with non-potable signs posted). The SCP Office water well had a maximum withdrawal of 32,104 gallons in 2017 and 44,740 gallons in 2018. The SCP Boat Dock water well had a maximum withdrawal of 162,060 gallons in 2017 and 97,200 gallons in 2018. SCP is currently closed to the public but is expected to reopen to visitors on a seasonal basis in the future. On August 24, 2021, the one remaining PWS (PW#2130037) associated with the recreation/training water supply well (also referred to as the Rifle Range Well) was deactivated. The Rifle Range Well had a permitted maximum withdrawal rate of 82,000 gpy (0.16 gpm). The locations of these wells are shown on Figure 3.6-5.

As presented in Table 3.6-9a, the average groundwater withdrawal rate for the CPNPP Rifle Range Well in 2020 was reported as 98.09 gpd and averaged 143.27 gpd between 2016 and 2020. Table 3.6-9b shows the monthly withdrawal quantities reported from 2016–2020.

In 2015, groundwater withdrawals in Somervell County were reported as 1.16 MGD with no withdrawal for power generation. Domestic supply and mining withdrawals are reported as the largest consumer of groundwater, reported at 0.41 MGD each in Somervell County. Public water supply is the largest consumer of groundwater in Hood County, reported at 4.66 MGD and the next largest in Somervell County reporting withdrawals of 0.21 MGD. (USGS 2021b) A summary of groundwater use in Somervell and Hood counties is presented in Table 3.6-7.

A list of 39 offsite registered groundwater wells within 2 miles of the CPNPP boundary (Figure 3.6-8) is presented in Table 3.6-8. The majority of these wells withdraw groundwater from the Twin Mountains Formation aquifer and are primarily used for public water supply and some domestic purposes.

3.6.4 Water Quality

3.6.4.1 Surface Water Quality

No impaired waters were identified on the TCEQ's 2020 303(d) list of impaired waters for the SCR and Lake Granbury or their tributaries within Somervell and Hood counties (TCEQ 2020).

The known permitted discharges to the SCR are limited to those from the existing units. These sources and permitted discharge limits are described in the TPDES permit. (Attachment B) CPNPP is in compliance with its TPDES permit, as discussed in Section 3.6.1.2.

3.6.4.2 Groundwater Quality

The quality of water obtained from the Glen Rose Formation is variable; in localized areas it is not potable. Northwest of the site, water is produced from the Glen Rose Formation where it is capped by an outlier of Paluxy Formation.

Water in the Twin Mountains Formation is a sodium bicarbonate type with a dissolved solids content varying generally from 200 to 900 mg/L. In and near the outcrop areas, Twin Mountains water is used for irrigation. At the site, however, the water is unsuitable for irrigation due to the local soil conditions and the increased sodium content of the water. The results of physical and

chemical analyses performed on groundwater samples taken from production and observation wells during the years of 1975–1976 show the sodium content of the water samples ranges from 100 to 150 mg/L, with dissolved solids content varying from 300–500 mg/L. The temperature of groundwater follows the seasonal atmospheric average temperature values, and ranges from 20° to 26°C (68° to 79°F). The conductivity values vary between 550 to 1,300 mhos. In addition, groundwater samples were collected from five monitoring wells (MW-9 through MW-12 and MW-14) on July 27, 2021, and analyzed for chloride and sulfate. The pH of each groundwater sample was recorded. Chloride results ranged from 51.5 to 152 mg/l, which are below the Secondary Drinking Water Standard Maximum Contaminant Level (SMCL) of 250 mg/l. pH ranged from 7.46 to 7.86 Standard Units (SU), which is within the SMCL range of 6.5-8.5 SU. Sulfate results ranged from 328 to 983 mg/l versus an SMCL of 250 mg/l. Sulfates cause a salty taste and are not toxic.

The monitoring well network for the Groundwater Protection Program (GPP) at CPNPP includes 12 wells completed in the unweathered and weathered portions of the Glen Rose Formation. Two monitoring wells are located near the refueling water storage tank (one at each RWST). Three wells are near or down-gradient of the fuel building (east side). Four other wells are situated on the periphery north, south, and west of the power block. Three monitoring wells were placed along the wastewater management system underground piping to more adequately monitor potential radiological releases to groundwater in this area. Each well is sampled on a quarterly frequency to test for contamination via gamma spectroscopy and liquid scintillation. The leachate basins, which receive discharge from the underground piping, are also sampled quarterly as part of the groundwater sampling program to monitor potential radiological releases in this area. (Vistra OpCo 2020a; Vistra OpCo 2021a)

In 2013, the source of tritium in groundwater was found to be from a leaking pipe that goes from the water treatment plant and microfiltration building sumps to the LVW pond. The leaking pipe was repaired in January of 2017. All of these tritium results were well below the state drinking water reportable criteria of 20,000 picoCuries per liter (pCi/L) and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2016; Vistra OpCo 2018a)

In 2015, the water treatment plant's filter water storage tank (FWST) lining began leaking treated SCR water. Because SCR water contains a low background tritium concentration, SCR water that leaks from the water plant will contain a similar concentration of tritium. The sentinel well CP-A near the water plant and groundwater monitoring well No. 11 (MW-11, which is located directly down gradient from CP-A) had intermittent positive results detected for tritium. The FWST leak was repaired mid-2016. (Vistra OpCo 2016; Vistra OpCo 2017a)

In 2016, wells CP-A and MW-11 continued showing intermittent positive results for tritium from the leak in the FWST and from a leak in piping from the LVW pond to the water treatment waste sump. The FWST leak was repaired mid-2016 and the LVW pipeline leak was repaired in January of 2017. All of these tritium results were well below the state drinking water reportable criteria of 20,000 picoCuries per liter (pCi/L) and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2017a)

Following the LVW pipeline leak repair in January 2017, the sentinel well CP-A's tritium decreased to less than detectable. Samples collected from sentinel well CP-A in the third and fourth quarters of 2017 continued to indicate the tritium concentration was less than detectable. Wells used to monitor CPNPP for tritium leaks into the groundwater all had results that were less than detectable during 2018 and 2019. All of these tritium results were well below the state drinking water reportable criteria of 20,000 picoCuries per liter (pCi/L) and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2018a)

During 2020 and 2021, wells used to monitor CPNPP for tritium leaks into the groundwater all had results that were less than the minimum detectable activity (MDA) of 1,040 pCi/L, with the exception of MW-11. Tritium levels detected in MW-11 indicated slightly positive results above the MDA with detections ranging from 1,040 to 1,890 pCi/L in 2020 and 3,360 pCi/L to less than the MDA in December 2021. The primary source of tritium intrusion to MW-11 is likely from the percolation of treated SCR water from the water treatment plant's FWST. Because SCR water always contains low background concentrations of tritium, SCR water used in the plant will contain similar concentrations. All of these sample results were much less than the drinking water limit of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2021a)

Other areas also monitored, but not considered part of the groundwater monitoring program included storm water catch basin, evaporation pond storm drain and the old steam generator storage facility. These sample points are from surface water and not indicative of groundwater tritium. (Vistra OpCo 2021a)

Hydrogeology studies showed that CPNPP has perched water above an impermeable layer of bedrock. The 160- to 270-foot-thick Glen Rose Formation (the top layer) is not considered a source of useful groundwater in the vicinity of CPNPP as it carries very little water and is unreliable in times of drought. The thickness and mostly impermeable nature of the Glen Rose Formation prevents migration of potentially contaminated groundwater to the underlying Twin Mountains Formation. (Vistra OpCo 2020a)

As part of the CPNPP Radiological Environmental Monitoring Program (REMP), groundwater samples are collected from five groundwater monitoring locations. Groundwater supplies in the site area are not affected by plant effluents and are sampled only to provide confirmation that groundwater is not affected by plant discharges. Groundwater samples were collected quarterly, in accordance with CPNPP's GPP procedure and analyzed for gamma isotopes and tritium at each location. (Vistra OpCo 2021b)

A total of 20 groundwater samples were collected from the five different monitoring locations per year as part of the REMP. There were no radionuclides identified in any of the groundwater samples collected in 2016–2020 samples. All required lower limits of detection (LLDs) were met for each required gamma emitting radionuclide. Tritium analysis was performed on twenty samples, all indicated less than the required LLD. The results confirm that plant discharges are

having no effect on groundwater in the area surrounding CPNPP. (Vistra OpCo 2017b, 2018b, 2019b, 2020b, 2021b)

Industrial practices at CPNPP that involve the use of chemicals are those activities typically associated with painting, cleaning of parts/equipment, refueling of onsite vehicles/generators, fuel oil and gasoline storage, and the storage and use of water treatment additives. The use and storage of chemicals at CPNPP are controlled in accordance with Vistra OpCo procedures and a site-specific spill prevention plan. In addition, as presented in Section 2.2.7, nonradioactive waste is managed in accordance with CPNPP's waste management procedure, which contains preparedness and prevention control measures.

3.6.4.2.1 History of Radioactive Releases

As presented in Section 3.6.4.2, a tritium release occurred in 2013 from a leaking pipe (LVW line) and in 2015 when the water treatment plant's FWST lining began leaking treated SCR water. The FWST leak was repaired mid-2016 and the LVW pipeline leak was repaired in January of 2017.

For 2018 and 2019, there were no radionuclides identified in any of the groundwater samples. All required LLDs were met for each required gamma emitting radionuclide. No unplanned radioactive liquid or gaseous releases were reported in 2018 and 2019. In 2020, as presented in Section 3.6.4.2, tritium levels detected in MW-11 with detections ranging from 1,040 to 1,890 pCi/L were less than the required lower limit of discrimination of 2,000 pCi/L and much less than the drinking water limit of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. (Vistra OpCo 2019a; Vistra OpCo 2020a; Vistra OpCo 2021a).

Based on this information and the guidance in NEI 07-07, there is no requirement for notification to the NRC or local officials and no requirement for remediation as it is considered previously monitored licensed material. Continued monitoring of these perched water sample points will occur as part of the groundwater monitoring program and any new sources of tritium or increase in the activity will be evaluated and remediated, as necessary. These perched water sample points (the seepage pump and Leachate Basins A, B, and C) are part of the GPP. (Vistra OpCo 2020a)

An inadvertent release of tritium in a demineralized water and resin mixture occurred on November 6, 2021. A courtesy notification, provided to the TCEQ on November 29, 2021, states that approximately 2.7 millicuries of tritium was released from a quantity of over 100 gallons of demineralized water from a buried pipe (four feet deep). This amount of tritium is well below the reportable quantity of 100 Curies. The release occurred just outside the Unit 2 Turbine Building within the fenced protected area. The cause of the release was a pipe failure during a routine transfer of resin from the Condensate Polishing System to a decant basin. No further transfers of resin are planned until the pipe has been repaired. The demineralized water consists of microfiltered lake water with a tritium concentration ranging from 10,000 to 14,200 pCi/L. The demineralized water and resin mixture released was analyzed for a tritium concentration of 72,100 pCi/L. The release material was excavated and the resin/water mixture that could be

recovered was collected/containerized and taken to waste management area and either placed in the dewatering area that discharges to Outfall 004 after normal monitoring via permanent plant piping/system or if solid material, disposed via normal processes (containerized) to Class I landfill in Itasca Texas.

3.6.4.2.2 History of Nonradioactive Releases

Based on the review of site records from the five years from 2016–2020, there has been no inadvertent nonradioactive release that would be classified as an incidental spill.

More recently on June 8, 2021, Vistra OpCo provided the TCEQ a courtesy notification that approximately 100 gallons of mineral oil was released on June 7, 2021. The spill was caused by a Unit 2 transformer fire due to mineral oil overflow of containment for the transformer when the deluge system was initiated. Clean up of the spill was completed on June 11, 2021, and the TCEQ acknowledged by e-mail that the spill did not meet the criteria for a reportable-quantity spill.

Table 3.6-1a SCR Water Levels, 2008–2020

Month	2020	Mean	Maximum		Minimum	
			Level	Year	Level	Year
January	774.01	775.12	777.15	2012	773.47	2020
February	774.34	774.87	775.78	2012	773.69	2015
March	774.51	774.54	775.69	2008	773.46	2015
April	775.45	774.93	776.58	2019	773.64	2015
May	775.50	775.41	775.61	2016	774.27	2014
June	775.42	775.36	778.61	2016	774.63	2014
July	775.31	775.22	775.87	2017	774.42	2014
August	775.19	775.12	775.58	2017	774.00	2019
September	775.51	775.11	775.89	2020	773.43	2019
October	775.26	775.11	777.62	2018	773.40	2019
November	775.38	775.09	777.12	2015	773.48	2019
December	775.21	775.04	776.67	2015	773.38	2019
Annual	775.09	775.08	—	—	—	—

(USGS 2021c)

Table 3.6-1b Lake Granbury Water Levels, 1987–2020

Month	2020	Mean	Maximum		Minimum	
			Level	Year(s)	Level	Year
January	692.65	691.4	692.84	1988, 2020	682.49	2015
February	692.73	691.6	692.91	1997	682.83	2015
March	692.55	691.67	692.87	1997, 2018	682.98	2014
April	692.65	691.71	692.82	2018	682.31	2014
May	692.65	691.79	692.96	1989	681.79	2014
June	692.61	691.83	692.82	2017	681.5	2014
July	692.49	691.78	692.82	2004	685.4	2013
August	691.96	691.82	692.81	1995	685.36	2013
September	692.5	691.38	692.81	1996	684.34	2014
October	692.63	691.33	692.86	1991	683.12	2014
November	692.61	691.37	692.95	1994	682.66	2014
December	692.55	691.34	692.84	2015	682.49	2014
Annual	692.53	691.56	—	—	—	—

(USGS 2021d)

Table 3.6-2 TPDES Water Quality Monitoring Program (Sheet 1 of 2)

Outfall	Description	Parameter	Permit Requirement	Frequency
001	Unit 1 & Unit 2 once-through and auxiliary cooling waters discharge to SCR	Flow rate	3,168 MGD daily average and daily maximum	Record continuously
		Temperature	113°F daily average 116°F daily maximum	Record continuously
		Free available chlorine	440 lbs/day, 0.2 mg/L daily average 1,101 lbs/day, 0.5 mg/L daily maximum	Weekly grab
		Total residual chlorine	880 lbs/day daily maximum 0.2 mg/L daily maximum	Weekly grab
002	Auxiliary cooling water from the service water system and stormwater runoff from the SSI discharge to SCR	Flow rate	No limit, monitor and report total daily average and maximum in MGD	Daily estimate
		Total suspended solids	30 mg/L daily average, 100 mg/L daily maximum	Weekly grab
		Oil and grease	15 mg/L daily average, 20 mg/L daily maximum	Weekly grab
		pH	6.0–9.0 SU	Weekly grab
003	Treated domestic wastewater discharge to SCR	Flow rate	No limit, monitor and report total daily in MGD	Daily estimate
		Total suspended solids	20 mg/L limit, daily average 45 mg/L limit, daily max, single grab	Twice monthly
		BOD 5-day	20 mg/L limit, daily average 45 mg/L limit, daily max, single grab	Twice monthly
		Escherichia coli 2	126 mg/L limit, daily average 399 mg/L limit, daily max, single grab	Weekly
		pH	6.0–9.0 SU	Twice monthly

Table 3.6-2 TPDES Water Quality Monitoring Program (Sheet 2 of 2)

Outfall	Description	Parameter	Permit Requirement	Frequency
004	Stormwater runoff, low-volume waste sources 1 and previously monitored effluent (metal cleaning waste) discharge to SCR	Flow	No limit, monitor and report total daily average and maximum in MGD	Daily estimate
		Total suspended solids	30 mg/L limit, daily average 100 mg/L limit, daily max	Weekly grab
		Oil and grease	15 mg/L limit, daily average 20 mg/L limit, daily max	Weekly grab
		pH	6.0–9.0 SU	Daily estimate
104	Metal cleaning waste discharge to SCR	Flow	No limit, monitor and report total daily average and maximum in MGD	Daily estimate
		Iron, total	1 mg/L limit, daily average 1 mg/L limit, daily max	Weekly grab
		Copper, total	0.5 mg/L limit, daily average 1 mg/L limit, daily max	Weekly grab

(Attachment B)

Table 3.6-3 CPNPP Groundwater Monitoring Well Details

Well	Well Diameter[a]	Elevations (feet msl)					
		Top of Casing	Top of Filter[b]	Top of Screen[b]	Bottom of Screen[b]	Bottom of Filter[b]	Well Construction Material
MW-9	2	810.29	--	--	--	--	PVC
MW-10	2	809.55	--	--	--	--	PVC
MW-11	2	809.46	--	--	--	--	PVC
MW-12	2	810.44	--	--	--	--	PVC
MW-14	2	809.43	--	--	--	--	PVC
MW-15	2	808.88	--	--	--	--	PVC
MW-16	2	810.14	--	--	--	--	PVC
MW-19	2	848.15	--	--	--	--	PVC
MW-25	2	812.26	--	--	--	--	PVC
CP-A	2	823.75	819.75	817.75	807.75	806.75	PVC
CP-B	2	845.59	841.59	839.79	829.79	828.89	PVC
CP-C	2	843.76	839.76	838.76	828.76	827.06	PVC

a. Measured in inches.

b. Approximate measurement.

c. Dashed cells indicate data were not reported.

Table 3.6-4a CPNPP Yearly Surface Water Withdrawal Summary, SCR

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	MGM	101,330.72	101,336.77	101,332.32	101,337.99	101,234.91	101,337.99
	gpm_a	2,270,210	2,270,089	2,270,169	2,270,278	2,270,089	2,270,278
Monthly Average	MGM	91,330.29	85,319.76	90,583.11	89,222.63	87,847.09	88,860.58
	gpm_a	2,080,016	1,946,567	2,067,471	2,036,035	1,999,890	2,025,996
Monthly Minimum	MGM	66,930.12	64,395.32	59,629.71	69,568.59	71,833.37	59,629.71
	gpm_a	1,499,331	1,490,632	1,335,791	1,558,436	1,720,148	1,335,791
Yearly Total	MGY	1,095,964	1,023,837	1,086,997	1,070,672	1,054,165	1,066,327
	MGD	2,994.44	2,797.37	2,978.07	2,933.35	2,880.23	2,918.22

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

gpm_a = average gallons per minute for the month

Table 3.6-4b CPNPP Monthly Surface Water Withdrawal Summary, SCR (Sheet 1 of 2)

Month-Year	CW Intake 004 (MGM)	Total (gpm)
January-2016	76,742.30	1,719,137.54
February-2016	75,156.00	1,799,712.64
March-2016	89,585.55	2,006,844.76
April-2016	98,073.05	2,270,209.57
May-2016	66,930.12	1,499,330.65
June-2016	98,071.80	2,270,180.56
July-2016	101,313.62	2,269,570.34
August-2016	101,327.65	2,269,884.63
September-2016	98,068.16	2,270,096.24
October-2016	101,330.72	2,269,953.41
November-2016	98,070.30	2,270,145.83
December-2016	91,294.26	2,045,122.34
January-2017	76,845.66	1,721,452.99
February-2017	70,360.09	1,745,041.91
March-2017	92,704.49	2,076,713.49
April-2017	64,395.32	1,490,632.41
May-2017	101,336.77	2,270,089.00
June-2017	83,830.06	1,940,510.65
July-2017	76,774.41	1,719,856.85
August-2017	97,254.47	2,178,639.56
September-2017	98,060.22	2,269,912.44
October-2017	69,135.34	1,548,730.76
November-2017	94,562.22	2,188,940.28
December-2017	98,578.05	2,208,289.65
January-2018	76,459.84	1,712,810.04
February-2018	69,356.59	1,720,153.52
March-2018	84,120.66	1,884,423.39
April-2018	98,049.15	2,269,656.25
May-2018	101,220.36	2,267,481.16
June-2018	98,054.84	2,269,787.96
July-2018	101,319.68	2,269,706.09
August-2018	101,326.72	2,269,863.80

Table 3.6-4b CPNPP Monthly Surface Water Withdrawal Summary, SCR (Sheet 2 of 2)

Month-Year	CW Intake 004 (MGM)	Total (gpm)
September-2018	98,056.13	2,269,817.82
October-2018	101,332.32	2,269,989.25
November-2018	98,071.32	2,270,169.44
December-2018	59,629.71	1,335,790.99
January-2019	69,568.59	1,558,436.15
February-2019	70,174.40	1,740,436.51
March-2019	80,546.04	1,804,346.74
April-2019	80,033.88	1,852,636.11
May-2019	70,816.97	1,587,409.72
June-2019	98,076.03	2,270,278.47
July-2019	101,336.69	2,270,278.47
August-2019	101,332.60	2,269,995.52
September-2019	98,058.41	2,269,870.60
October-2019	101,337.99	2,270,116.26
November-2019	98,018.89	2,268,955.79
December-2019	101,326.10	2,269,849.91
January-2020	83,392.12	1,868,103.05
February-2020	71,833.37	1,720,147.75
March-2020	78,965.43	1,768,938.84
April-2020	72,235.10	1,672,108.80
May-2020	95,095.50	2,130,275.54
June-2020	98,073.79	2,270,226.62
July-2020	101,234.22	2,267,791.67
August-2020	101,234.91	2,267,807.12
September-2020	98,040.55	2,269,457.18
October-2020	78,089.16	1,749,309.21
November-2020	97,101.18	2,247,712.44
December-2020	78,869.79	1,766,796.37

MG = millions of gallons

MGM = millions of gallons per month

gpm = gallons per minute for the month

Table 3.6-5a CPNPP Yearly Surface Water Withdrawal Summary, Lake Granbury

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	MGM	1,869.02	1,795.99	1,787.00	1,721.01	1,775.01	1,869.02
	gpm_a	41,869	41,574	41,366	39,537	39,763	41,869
Monthly Average	MGM	1,222.67	1,338.34	1,223.33	1,338.09	957.50	1,215.98
	gpm_a	27,743	30,387	27,785	30,565	21,557	27,608
Monthly Minimum	MGM	0	82.99	0	625	139.99	0
	gpm_a	0	2,058	0	14,001	3,352	0
Yearly Total	MGY	14,672	16,060	14,680	16,057	16,010	15,496
	MGD	40.09	44.00	40.22	43.99	43.74	42.38

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

gpm_a = average gallons per minute for the month

Table 3.6-5b CPNPP Monthly Surface Water Withdrawal Summary, Lake Granbury (Sheet 1 of 2)

Month-Year	Intake (MGM)	Total (gpm)
January-2016	474.99	10,640.52
February-2016	0	0
March-2016	1.01	22.63
April-2016	1,226.99	28,402.59
May-2016	1,421.00	31,832.52
June-2016	952.98	22,059.81
July-2016	1,650.99	36,984.53
August-2016	1,734.99	38,866.35
September-2016	1,714.00	39,675.93
October-2016	1,839.00	41,196.24
November-2016	1,787.00	41,365.74
December-2016	1,869.02	41,868.64
January-2017	1,789.00	40,076.16
February-2017	82.99	2,058.39
March-2017	586.01	13,127.47
April-2017	1,795.99	41,573.91
May-2017	1,621.01	36,312.97
June-2017	1,718.99	39,791.54
July-2017	1,736.00	38,888.97
August-2017	1,495.00	33,490.24
September-2017	1,369.00	31,689.81
October-2017	1,405.00	31,474.11
November-2017	1,380.01	31,944.71
December-2017	1,081.01	21,216.19
January-2018	953.99	21,370.83
February-2018	0	0
March-2018	165.01	3,696.48
April-2018	1,787.00	41,365.74
May-2018	1,605.00	35,954.30
June-2018	1,724.00	39,907.70
July-2018	1,684.00	37,723.97
August-2018	1,746.98	39,134.97

Table 3.6-5b CPNPP Monthly Surface Water Withdrawal Summary, Lake Granbury (Sheet 2 of 2)

Month-Year	Intake (MGM)	Total (gpm)
September-2018	1,641.00	37,986.11
October-2018	646.00	14,471.32
November-2018	972.00	22,500.00
December-2018	1,755.00	39,314.54
January-2019	1,721.01	38,553.20
February-2019	1,338.99	33,209.00
March-2019	625.00	14,000.90
April-2019	1,685.00	39,004.63
May-2019	1,676.99	37,029.78
June-2019	976.00	22,592.56
July-2019	1,338.99	29,995.23
August-2019	1,653.01	37,029.78
September-2019	1,708.01	39,537.34
October-2019	1,644.02	36,828.32
November-2019	808.01	18,704.00
December-2019	882.01	19,758.37
January-2020	1,775.01	39,762.73
February-2020	139.99	3,352.15
March-2020	894.00	20,026.88
April-2020	1,717.00	39,745.37
May-2020	1,717.98	38,485.31
June-2020	1,531.99	35,462.70
July-2020	1,634.01	36,604.22
August-2020	1,703.00	38,149.53
September-2020	1,457.99	33,749.72
October-2020	1,395.00	31,250.02
November-2020	1,336.00	30,925.93
December-2020	708.01	15,860.42

MG = millions of gallons

MGM = millions of gallons per month

gpm = gallons per minute for the month

Table 3.6-6 Surface Water Usage Summary in MGD, 2015

Category	Somervell County	Hood County
Public Supply	0.97	0.19
Domestic, Self-Supplied	0.00	0.00
Industrial, Self-Supplied	0.00	0.00
Irrigation	0.00	4.59
Livestock	0.08	0.24
Aquaculture	0.00	0.00
Mining	0.00	0.12
Power Generation (Thermoelectric)	2105.15	2.49
Total	**2106.20**	**7.63**

(USGS 2021b)

Table 3.6-7 Groundwater Usage Summary in MGD, 2015

Category	Somervell County	Hood County
Public Supply	0.21	4.66
Domestic, Self-Supplied	0.41	1.14
Industrial, Self-Supplied	0.00	0.01
Irrigation	0.10	1.84
Livestock	0.03	0.20
Aquaculture	0.00	0.00
Mining	0.41	0.78
Power Generation (Thermoelectric)	0.00	0.00
Total	**1.16**	**8.63**

(USGS 2021b)

Table 3.6-8 Offsite Registered Water Wells within 2 Miles of CPNPP Site Boundary (Sheet 1 of 2)

TWDB[a] Unique ID	Distance[b] (miles)	Well Depth (feet)	Use Description	Aquifer Name
3242903	1.4	479	Unknown	Twin Mountains Formation
3242803	1.5	360	Public Supply	Twin Mountains Formation
3242802	1.5	360	Public Supply	Twin Mountains Formation
3242805	1.6	396	Unknown	Twin Mountains Formation
3242502	1.7	352	Domestic	Twin Mountains Formation
3242804	1.8	420	Public Supply	Twin Mountains Formation
3242901	1.9	350	Stock	Twin Mountains Formation
3242902	2.0	318	Unknown	Twin Mountains Formation
3242801	2.1	352	Domestic	Twin Mountains Formation
3242501	2.3	300	Unknown	Twin Mountains Formation
3242907	2.4	Not reported	Unknown	Not reported
3243415	2.6	383	Public Supply	Twin Mountains Formation
3243407	2.7	383	Public Supply	Twin Mountains Formation
3243706	2.8	400	Public Supply	Twin Mountains Formation
3243707	2.8	340	Public Supply	Twin Mountains Formation
3243413	2.8	400	Public Supply	Twin Mountains Formation
3243412	2.8	378	Public Supply	Twin Mountains Formation
3243414	2.8	517	Public Supply	Twin Mountains Formation
3243401	3.0	330	Domestic	Hensell Sand Member of Travis Peak Formation
3242904	3.1	500	Public Supply	Twin Mountains Formation
3242905	3.1	340	Public Supply	Twin Mountains Formation
3242906	3.3	281	Unknown	Twin Mountains Formation
3243701	3.5	230	Domestic	Travis Peak Formation
3243402	3.6	200	Stock	Hensell Sand Member of Travis Peak Formation
3243404	3.6	200	Stock	Hensell Sand Member of Travis Peak Formation
3243104	3.6	500	Irrigation	Twin Mountains Formation

Table 3.6-8 Offsite Registered Water Wells within 2 Miles of CPNPP Site Boundary (Sheet 2 of 2)

TWDB(a) Unique ID	Distance(b) (miles)	Well Depth (feet)	Use Description	Aquifer Name
3243416	3.7	512	Public Supply	Twin Mountains Formation
3243103	3.7	360	Domestic	Twin Mountains Formation
3242401	3.7	352	Domestic	Twin Mountains Formation
3243417	3.9	425	Domestic	Hosston Formation
3243418	3.9	255	Domestic	Unknown
3243410	3.9	420	Public Safety	Twin Mountains Formation
3242402	4.1	335	Domestic	Twin Mountains Formation
3243419	4.1	400	Unknown	Unknown
3243405	4.2	Unknown	Stock	Quaternary Alluvium
3243411	4.2	260	Industrial	Twin Mountains Formation
3242302	4.6	396	Private, potable	Twin Mountains Formation
3242203	5.5	344	Potable domestic(d)	Twin Mountains Formation
3242101	5.9	331	Potable domestic(d)	Twin Mountains Formation

(TWDB 2020)

a. Well information provided in this table were retrieved from the Texas Water Development Board (TWDB).

b. Distance is from the CPNPP center point and rounded to the nearest tenth of a mile. Wells listed are limited to those within a 2-mile radius from the site boundary.

Table 3.6-9a CPNPP Yearly Groundwater Withdrawal Summary, Recreation/Training (Rifle Range) Well

Year		2016	2017	2018	2019	2020	2016–2020
Monthly Maximum	gallons	13,600	6,100	12,100	4,400	7,500	13,600
	gpm_a	0.305	0.137	0.280	0.099	0.168	0.305
Monthly Average	gallons	4,292	4,375	6,833	3,317	2,992	4,362
	gpm_a	0.098	0.100	0.156	0.076	0.068	0.100
Monthly Minimum	gallons	2,200	2,300	2,700	2,200	800	800
	gpm_a	0.049	0.052	0.060	0.051	0.018	0.018
Yearly Total	gallons/year	51,500	52,500	82,000	39,800	35,900	52,340
	gpd_a	140.71	143.84	224.66	109.04	98.09	143.27

MGY = millions of gallons per year

gpm_a = average gallons per minute for the month

Table 3.6-9b CPNPP Monthly Groundwater Withdrawal Summary (Sheet 1 of 2)

Month-Year	Recreation/Training Well (gals)	Total (gpm_a)
January-2016	3,500	0.078
February-2016	4,600	0.114
March-2016	2,800	0.063
April-2016	3,800	0.088
May-2016	4,500	0.101
June-2016	4,100	0.095
July-2016	13,600	0.305
August-2016	4,100	0.095
September-2016	2,800	0.063
October-2016	3,300	0.074
November-2016	2,200	0.051
December-2016	2,200	0.049
January-2017	3,200	0.072
February-2017	2,800	0.069
March-2017	6,100	0.137
April-2017	5,400	0.125
May-2017	2,300	0.052
June-2017	4,700	0.109
July-2017	3,900	0.087
August-2017	3,800	0.088
September-2017	4,400	0.099
October-2017	5,500	0.123
November-2017	4,400	0.102
December-2017	6,000	0.134
January-2018	4,940	0.111
February-2018	4,360	0.108
March-2018	5,800	0.130
April-2018	12,100	0.280
May-2018	10,100	0.226
June-2018	7,900	0.183
July-2018	7,400	0.166
August-2018	6,300	0.146

Table 3.6-9b CPNPP Monthly Groundwater Withdrawal Summary (Sheet 2 of 2)

Month-Year	Recreation/Training Well (gals)	Total (gpm_a)
September-2018	4,600	0.103
October-2018	8,000	0.179
November-2018	7,800	0.181
December-2018	2,700	0.060
January-2019	3,200	0.072
February-2019	3,700	0.092
March-2019	3,300	0.074
April-2019	3,700	0.086
May-2019	2,900	0.065
June-2019	3,500	0.081
July-2019	4,400	0.099
August-2019	3,300	0.076
September-2019	3,400	0.076
October-2019	3,600	0.081
November-2019	2,200	0.051
December-2019	2,600	0.058
January-2020	1,500	0.034
February-2020	1,100	0.026
March-2020	800	0.018
April-2020	1,300	0.030
May-2020	1,500	0.034
June-2020	3,700	0.086
July-2020	2,200	0.049
August-2020	3,200	0.074
September-2020	1,100	0.025
October-2020	7,500	0.168
November-2020	5,300	0.123
December-2020	6,700	0.150

gpm_a = average gallons per minute for the month

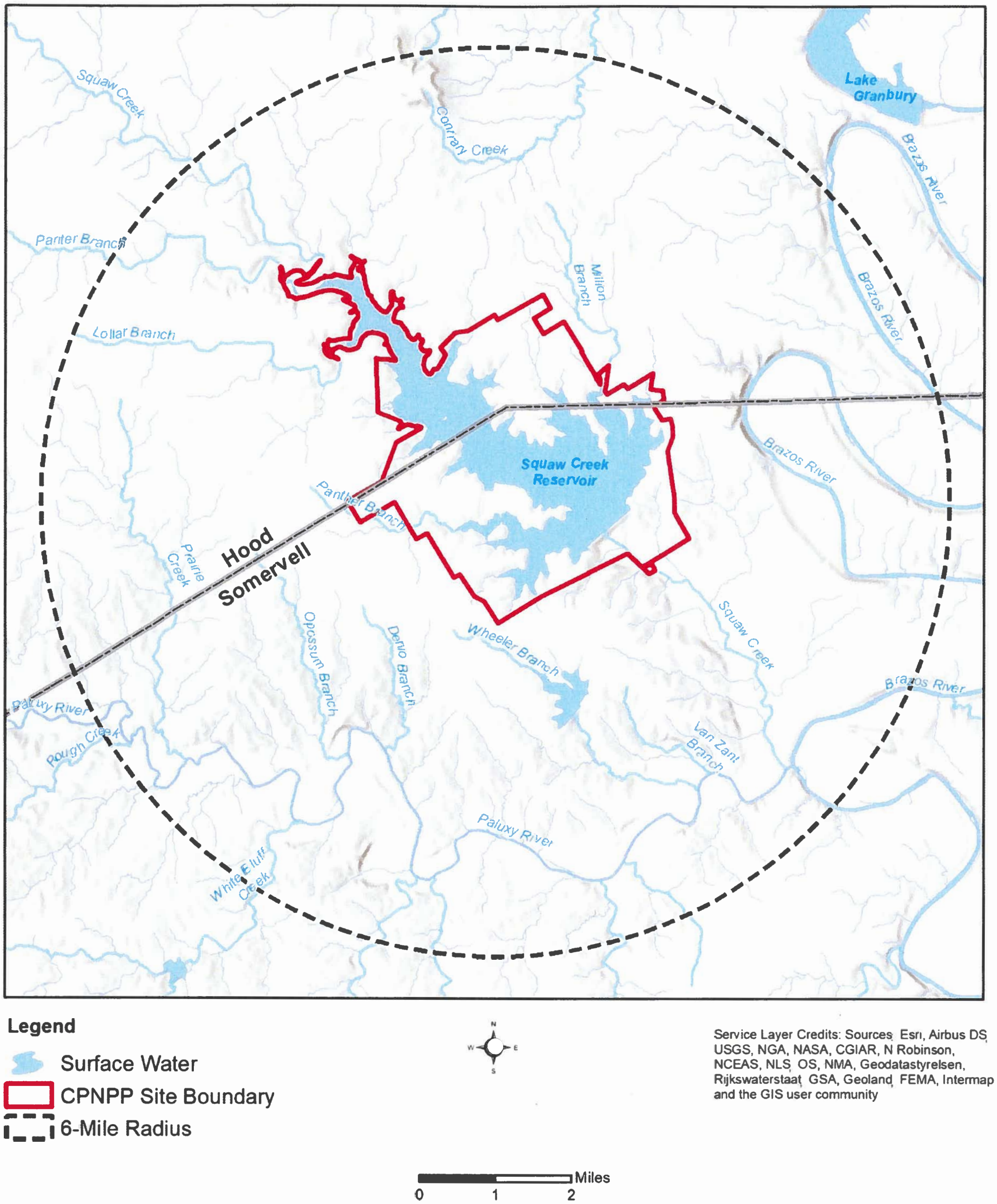


Figure 3.6-1 Vicinity Hydrological Features

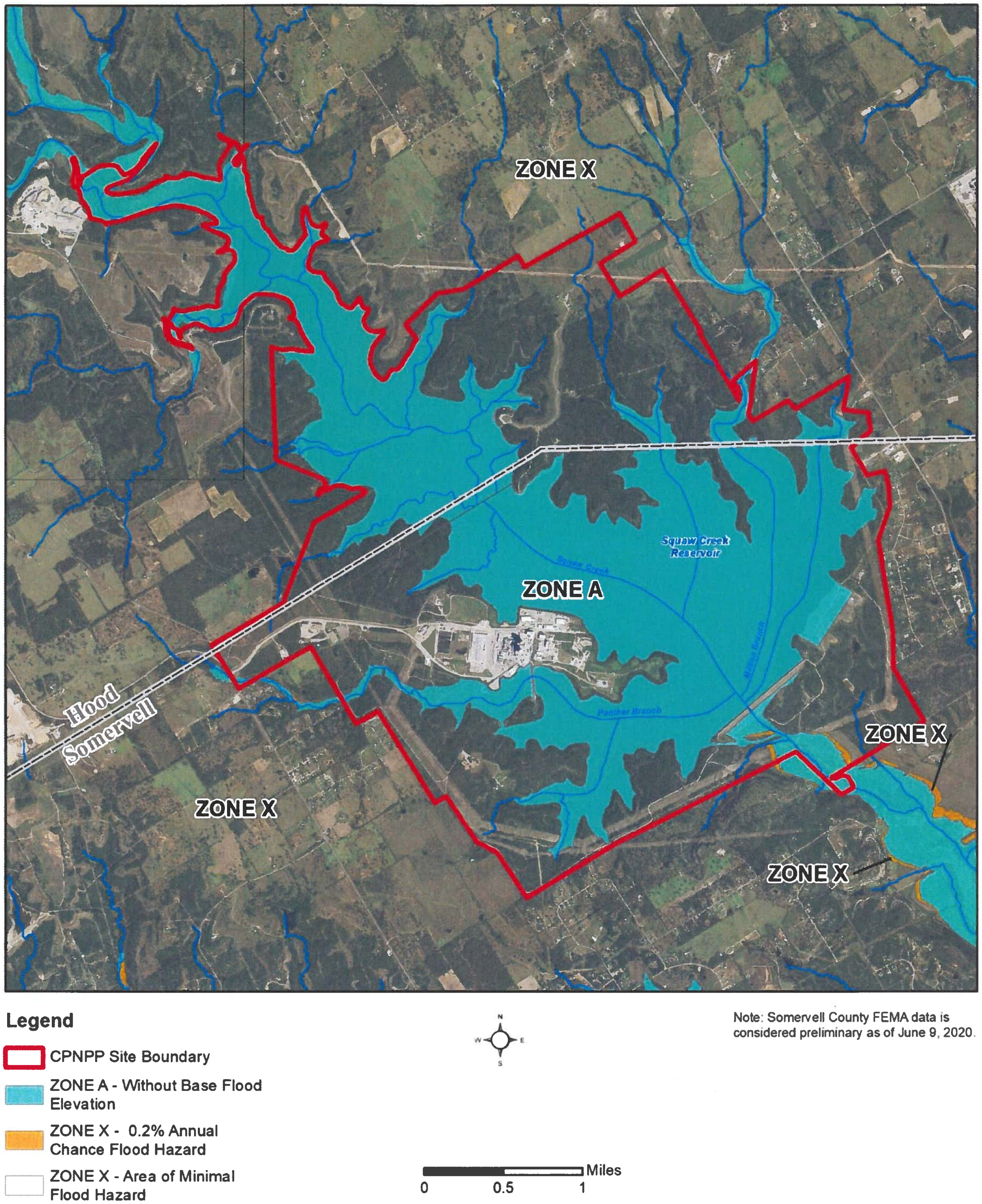


Figure 3.6-2 FEMA Floodplain Zones at CPNPP

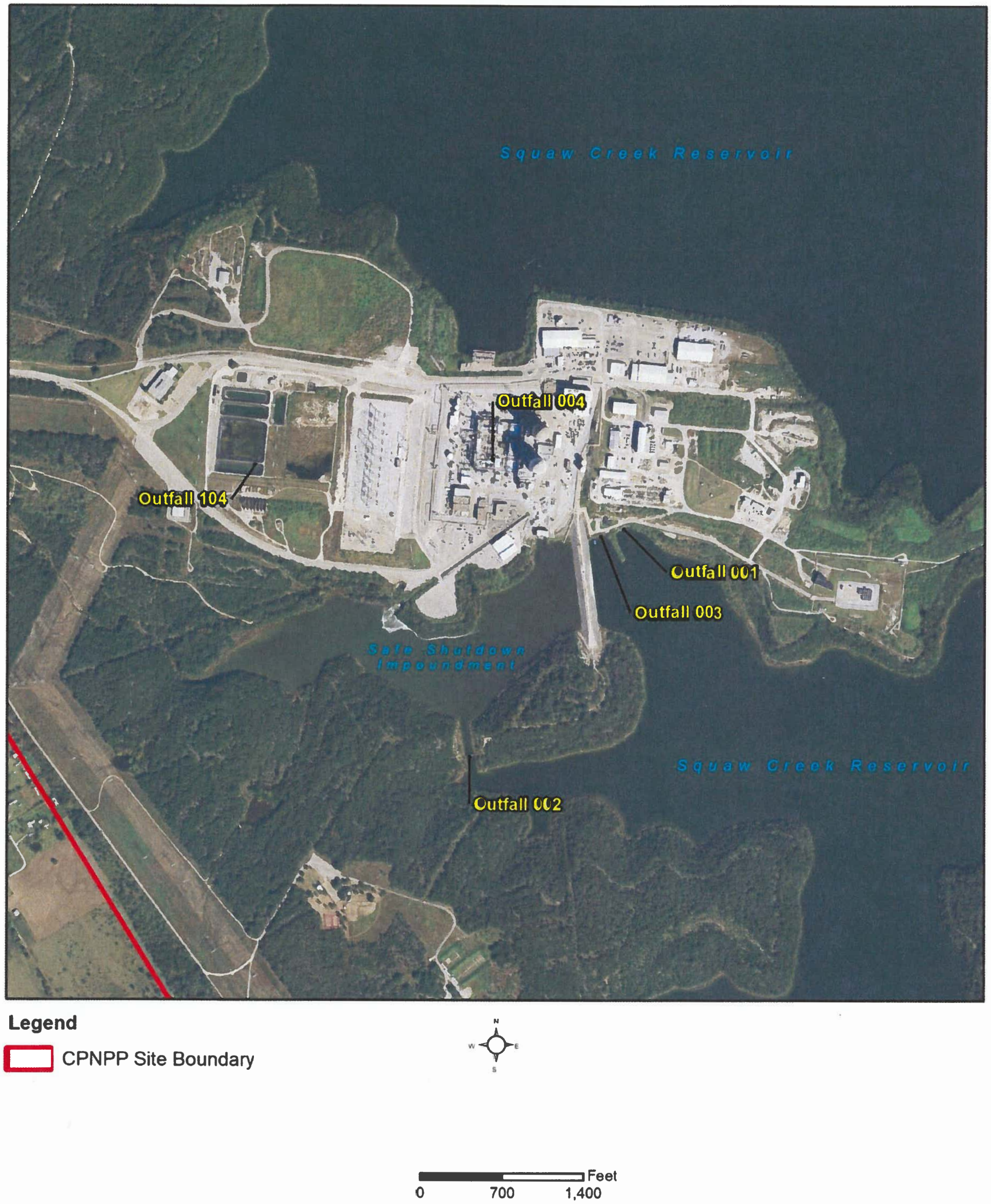


Figure 3.6-3 TPDES Outfalls

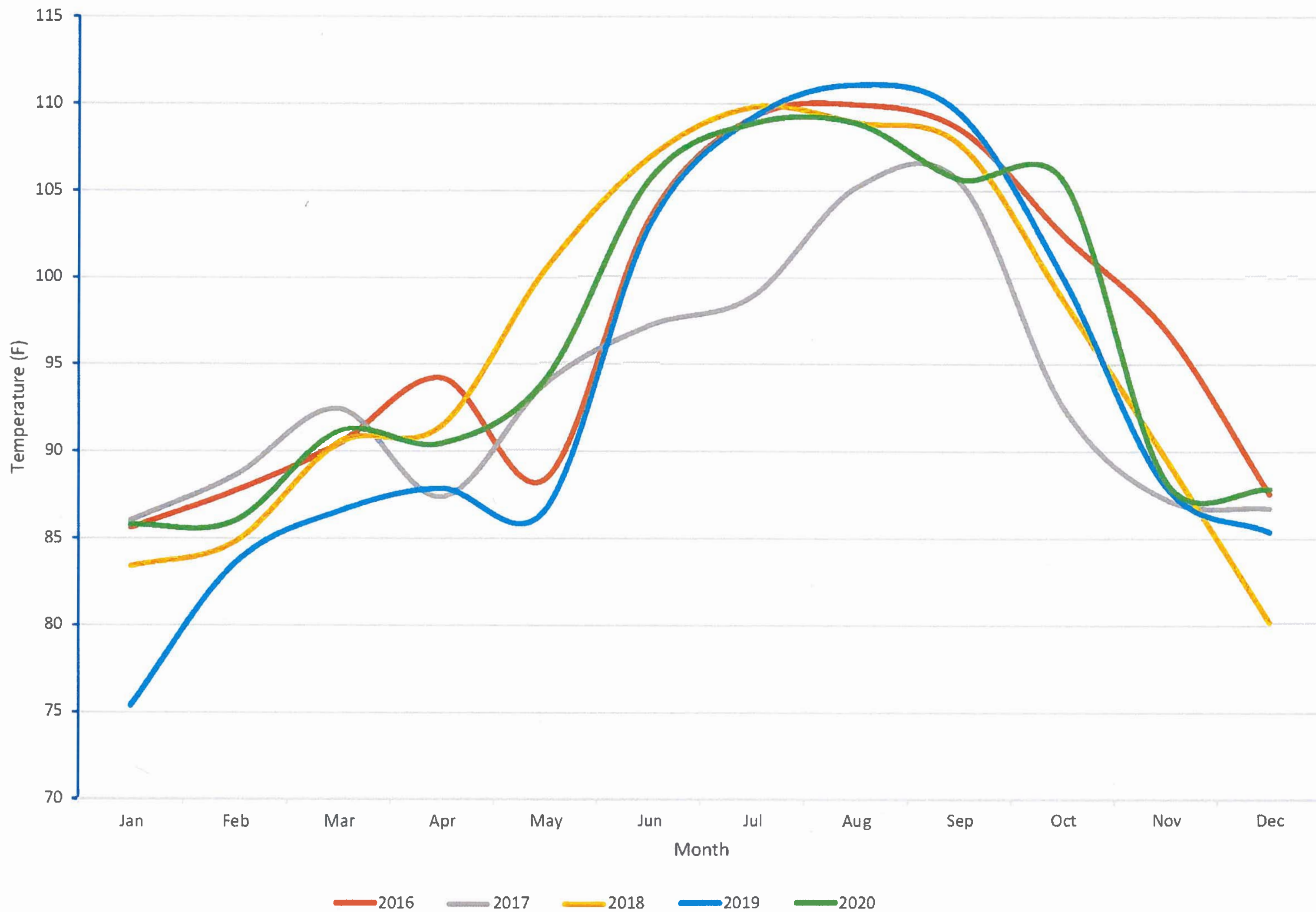
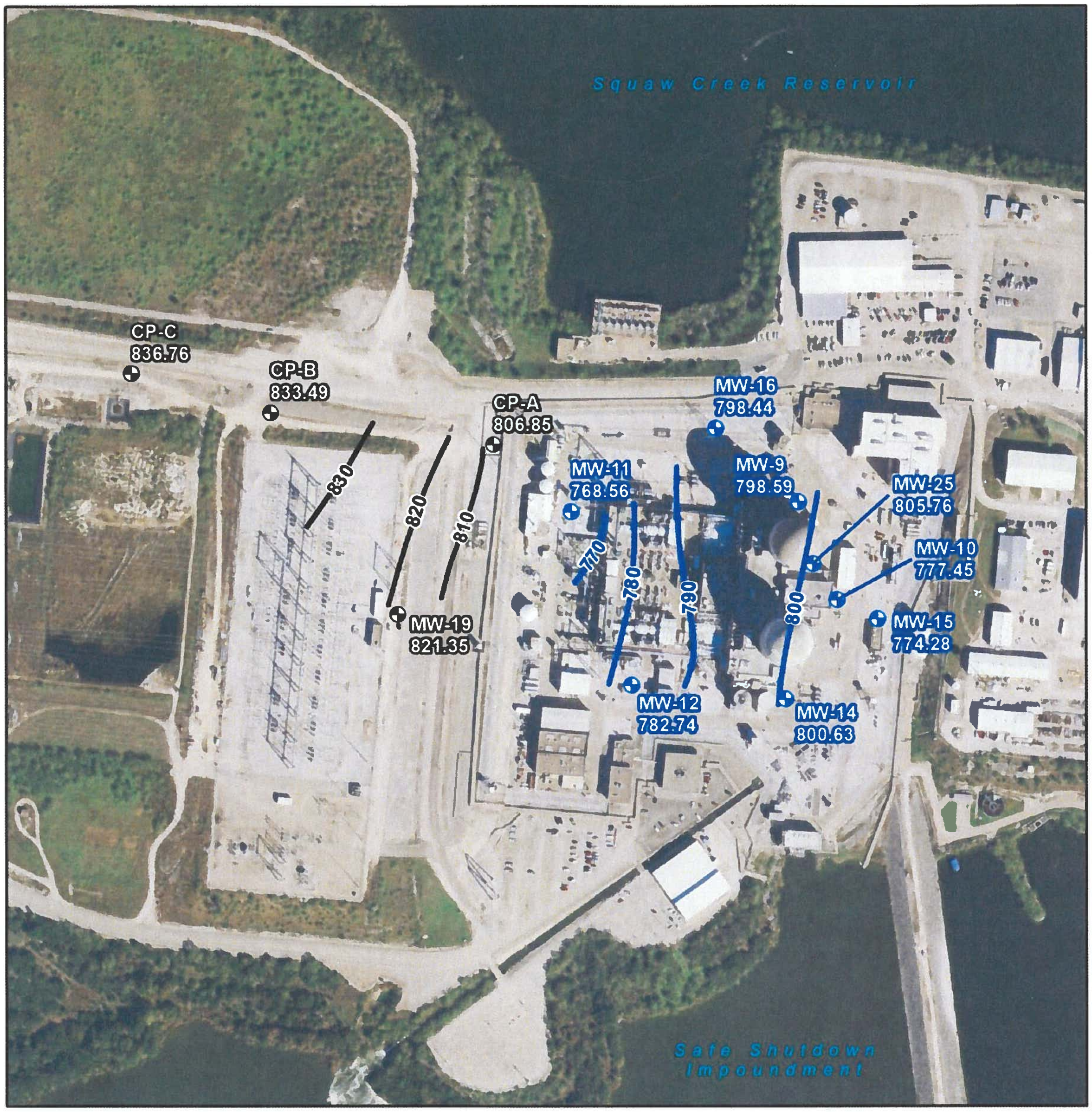


Figure 3.6-4 Average Condenser Discharge Temperatures

Figure 3.6-5 Onsite Wells

Figure 3.6-6 November 29, 2018, Potentiometric Map



Legend

Monitoring Well (Unweathered Glen Rose)

Monitoring Well (Weathered Glen Rose)

Unweathered Glen Rose Contour

Weathered Glen Rose Contour

Feet 0 250 500

Figure 3.6-7 June 27, 2019, Potentiometric Map

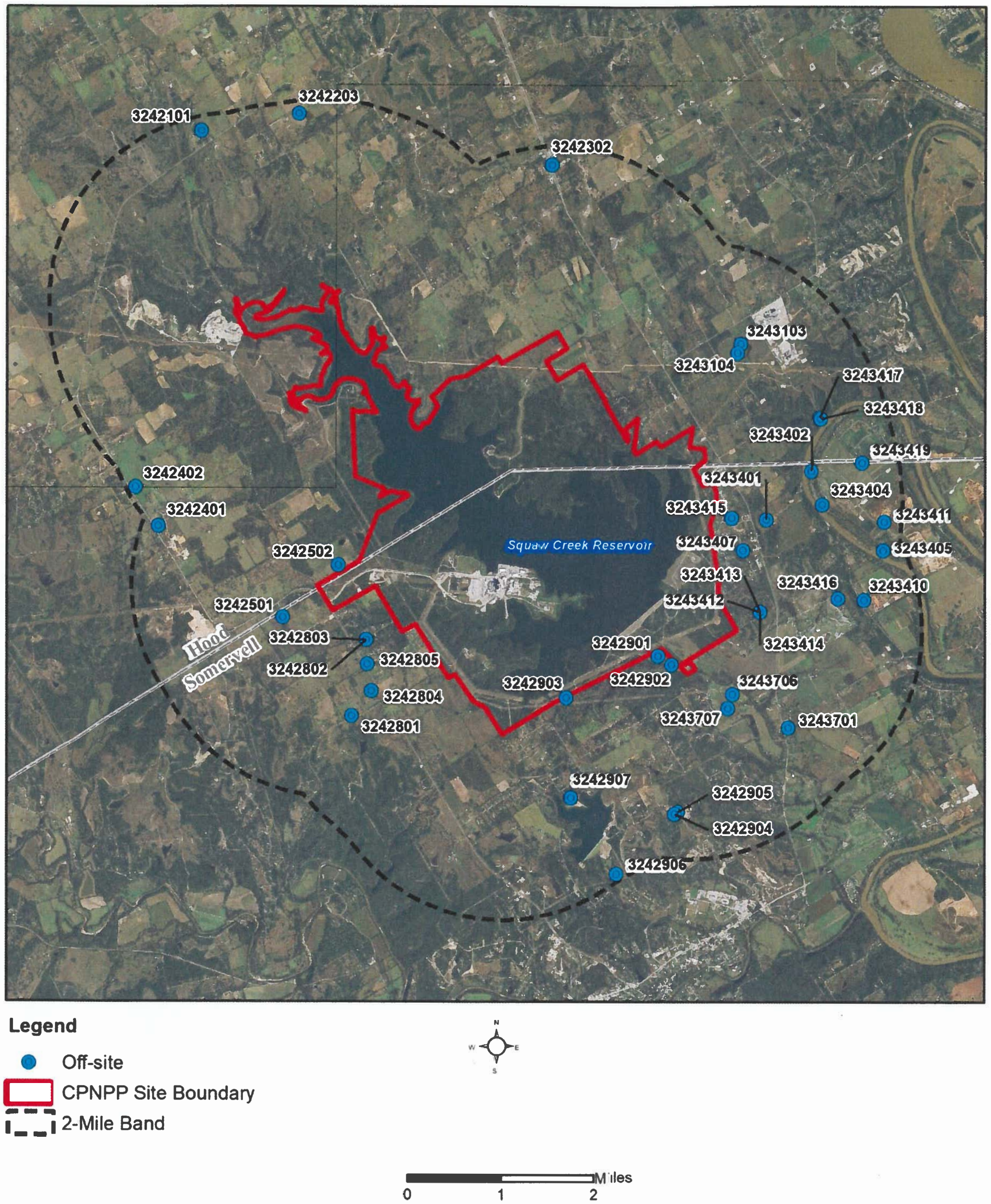


Figure 3.6-8 Offsite Registered Water Wells within 2 Miles of CPNPP

3.7 Ecological Resources

Local ecology is greatly influenced by the geomorphic and physiographic characteristics of the region. Soils determine the basic fertility of the land, which in turn determines the types of plants that may grow there. Further, the vegetation present greatly influences the type and number of animals that reside in the region. Climatological factors such as temperature, day length, and precipitation further refine the plants and animals that may live in a locale. The following sections detail the ecological resources present at or within six miles of CPNPP.

3.7.1 Aquatic Communities

The aquatic environment near the CPNPP site is associated with the Brazos River basin. The Brazos River basin encompasses about 45,700 square miles and extends from northeastern New Mexico through northwestern Texas and continues south to the Gulf of Mexico. Major tributaries of the Brazos River include the Salt Fork Brazos River, Clear Fork Brazos River, Paluxy River, Nolan River, North Bosque River, Leon River, Lampasas River, San Gabriel River, Little River, and Navasota River. (Luminant 2013b)

CPNPP is located on Squaw Creek, a tributary of the Paluxy River and therefore the Brazos River. SCR was impounded for station cooling by the construction of a dam approximately 4.5 miles upstream of its confluence with the Paluxy and Brazos rivers. SCR serves as both the cooling water source and discharge source for CPNPP.

This section describes the aquatic environment and biota near the CPNPP site and other areas potentially affected by the continued operation of CPNPP. It includes a description of the aquatic ecosystems at or near the site, a description of representative important species that are present or are expected to occur, and the location of critical habitats or other areas carrying special designations.

3.7.1.1 Squaw Creek Reservoir

SCR is located about four miles north of the city of Glen Rose in Somervell County. The reservoir is owned and operated by Vistra OpCo, for condenser's cooling for CPNPP. Construction of the reservoir began in 1970s and was completed in 1979. The dam is an earth-filled embankment approximately 4,700 feet long, with a maximum height of 158 feet from the streambed. The top of the dam is at elevation of 796 feet above mean sea level. The uncontrolled emergency spillway is located near the left end of the dam and is cut on the natural ground with crest of 2,200 feet in length at elevation of 783 feet above mean sea level. The service spillway is located beside the right end of the dam and is a type of broad-crested weir with crest of 100 feet in length at elevation of 775 feet above mean sea level. The results of a 2017 acoustic bathymetric survey indicate that the SSI alone has a capacity of 653 acre-feet at the conservation pool elevation of 775 feet msl. The survey determined that SCR (including the SSI) has a total capacity of 149,732 acre-feet and extends across 3,272 surface acres at the conservation pool elevation of 775 ft. msl.

A screenhouse structure is recessed from the shoreline, on the north side of the peninsula in the area of the circulation water intake structure. Trash racks are installed across the screenhouse to prevent large debris from entering the intake bays. Traveling water screens are located behind the trash racks to strain out smaller debris. Circulating water pumps are located downstream of the traveling water screens to convey screened flow to the condensers. Circulating water is withdrawn through a single screenhouse with 12 intake bays. Each bay is 11 feet, 2 inches wide and has a vertical traveling water screen. A trash rack is located along the upstream face of the structure. The trash rack consists of 4-inch x 1/2-inch-wide steel bars with a 2-inch clear spacing. Twelve 10-foot-wide traveling water screens with bottom are located downstream from the trash racks. The screens have 3/8-inch square mesh openings. The screens are on a timed rotation schedule and are cleaned with a high-pressure front spray wash. The screens are typically timed to rotate every four hours or can be set to rotate automatically based on differential pressures across the screen due to high debris loading. The screens are set for continuous operation when temperatures reach below 38°F. Screen wash water for each screen is at 329 gpm with a pressure of 100 pounds per square inch (psi). Fish and debris from the screens are washed into a trough located directly upstream of the screens and collected in a bin and disposed.

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 2.7 cfs (1,200 gpm) of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens. Each circulating water pump provides a total of 613 cfs (275,000 gpm) to the condensers for the units. The facility's maximum design flow is about 2,200,000 gpm (3,168 mgd) for the eight pumps for both units. Under normal conditions, four pumps operate per unit; however, with lower winter lake temperatures, three pumps operate per unit. The plant can operate at reduced loads operating two or three pumps per unit.

SCR is stocked and managed by Texas Parks and Wildlife Department (TPWD). Fish stocking began in 1979 by the TPWD and was completed in 1996. Fish stocked in the impoundment included: smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), palmetto bass (*Morone saxatilis* x *Morone chrysops*), threadfin shad (*Dorosoma petenense*), channel catfish (*Ictalurus punctatus*), and walleye (*Sander vitreus*). (BWI 2008)

Ecological studies on SCR were performed in 1981 and 1987 prior to the start of operations of CPNPP. The results from these studies showed that the fish community was young but stabilizing. In the 1981 survey, 21 species of fish were collected. The dominant game fishes were hybrid striped bass and largemouth bass. Although smallmouth bass were stocked in the reservoir, they were not doing well, and further stocking of the species was not recommended. The 1987 study of SCR revealed 26 species of fish (Table 3.7-2). Species composition changed slightly from 1981 with bluegill sunfish (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), black bullhead (*Ameiurus melas*), redear sunfish (*Lepomis microlophus*), largemouth bass, longear sunfish (*Lepomis megalotis*), and yellow bullhead (*Ameiurus natalis*) being the most abundant. Predominant predatory fish in the reservoir were hybrid striped bass, channel catfish, walleye, and largemouth bass. (Luminant 2013b)

A four-season ecological study to characterize the aquatic vegetation, fish, benthic, and plankton communities, and general water quality within SCR was initiated in February 2007. All field sampling efforts were completed on January 9, 2008 (BWI 2008). A total of 458 fishes representing 12 different species were captured at all sites combined in 2007 and 2008. The most common fish identified in the gill nets were channel catfish, largemouth bass, and freshwater drum. No smallmouth bass, walleye, or hybrid striped bass were found in 2007. Further, the study found that while the reservoir cannot support a cool water fish community, it does support a warmwater fish community and that community appears stable. (BWI 2008; Luminant 2013b)

A total of 3,117 benthic invertebrates representing at least 59 different genera were collected in Squaw Creek and SCR in 2007. In every season, chironomids (midges) were the most numerous (2,198 individuals) and most diverse (18 genera) invertebrates discovered in the study sites. Chironomids are a very diverse family and occupy a wide variety of habitats, which is why they are so numerous. In addition, they can tolerate a wider range of water quality than most other invertebrates. *Parachironomus* were the most common genera in this family and were found in each season except winter. (BWI 2008)

The planktonic communities of SCR were also characterized in the 2007 study (Table 3.7-1). Sampling results revealed rotifers to be the dominant organism followed by juvenile copepods in all seasons except summer. Summer samples revealed that juvenile copepods far outnumbered all other taxa. Other taxa found in the samples included two families of water fleas (Bosminidae and Daphniidae). No golden algae were found in the summer samples which may be attributable to the water temperature in SCR. (BWI 2008; Luminant 2013b)

Current sport fish in SCR include largemouth bass and channel catfish. Palmetto Bass were the last species stocked into the main reservoir in 1996. Palmetto Bass are still stocked privately into the stilling basin for biological control of shad populations but are rarely observed in surveys. The reservoir was closed from 2001 to 2010 following security concerns following 9/11, and no fisheries work was conducted during that time. Electrofishing was discontinued in 2011 due to increasing water conductivity and historically poor electrofishing results for target species. Data were collected on largemouth bass (in addition to catfishes and temperate bass) during 2015, and beginning in 2019, gill netting became the only monitoring tool used to collect data on sport and forage fishes. Recent management efforts include maintaining aquatic invasive species (AIS) signage and educating constituents about the threat of AIS, especially zebra mussels, whenever possible. (Baird and Tibbs 2019)

Several incidents related to fish kills have been documented at CPNPP over the last 5 years. All events were not environmentally reportable. One of the largest contributors is the makeup pump tripping during the summer months. This creates hypoxic water conditions and a rapid increase in water temperature, resulting in fish die-off. Another report in 2017 identified a "milky white" appearance of water within SCR and a small associated fish kill. It was determined that the cloudy appearance was due to a higher hydrogen sulfide concentration, compounded by low

flow conditions, reacting with the natural occurring limestone minerals in the creek bed forming a colloidal suspension of gypsum (i.e., calcium sulfate).

Further, the SSI experienced fish kills prior to 2013, some of which were attributed to blooms of the toxin-producing golden alga (*Prymnesium parvum*). The NRC questioned potential impacts of a massive fish kill in the SSI on its ability to provide water during an emergency. This concern focused on the large numbers of threadfin shad inhabiting the SSI. As a result, the facility decided to reduce threadfin shad biomass in the SSI. Measures to control shad have included applications of rotenone (a pesticide used to kill fish) in 2012 and 2013 and stocking of palmetto bass in 2013 and 2014. However, shad numbers may also have rebounded in 2018 since the last rotenone treatment in May 2013. Golden algae monitoring was implemented in 2013-2014 to help understand its potential to cause major fish kills in the SSI. Golden algae were not observed in the plankton in the eight samples collected from March 2018 through January 2019. Further details of invasive species and their monitoring and management are discussed in Section 3.7.5. All events, regardless of if reportable, are reported to the TPWD kills and spills team.

In order to capture debris and dead fish in the SSI and minimize fish population and migration from SCR, a debris/fish barrier is installed approximately 200 feet from the intake structure within the SSI.

Aquatic life monitoring in the SSI was conducted in 2011–2013, 2015, 2016, and 2018–2019 as part of the tri-annual aquatic studies completed at CPNPP. The sampling conducted in the SSI in 2018–2019 analyzed water quality, adult mud crabs, zebra mussels, larval fish and mud crabs, golden algae, filamentous algae, and zooplankton. Data were collected quarterly adjacent to the buoy in front of the intake. Results from the 2018 and January 2019 sampling yielded that golden alga were not observed. If present, their concentration was less than 110 cells per milliliter. Large filamentous algae were only detected in the December ichthyoplankton sample and were at a concentration less than one filament per liter. Larval zebra mussels and Asiatic clams were not observed in plankton samples. In regard to zooplankton, rotifers, and copepod nauplii were common. Large crustacean zooplankton, like adult and subadult copepods and Cladocera, were present in low concentrations. Further, larval mud crabs were present at a concentration of 110 per liter in the April 2018 sample. *Daphnia lumholtzii* were observed at concentrations below 1 per liter in September and December 2018 ichthyoplankton samples. *D. lumholtzii* is an exotic species of cladoceran from Africa that was first detected in Texas in 1990. The average density of pelagic fish in 2018 was 3,200 acre-feet, which was considerably higher than surveys in 2015 and 2016. The total number of fish estimated in the upper 13 feet of the reservoir in June 2018 was 1.4 million (average total length of 4 inches). The upper 13 feet of the reservoir contain about 68 percent of the reservoir volume. The increase in pelagic fish density (and likely biomass) result from several factors. Tilapia numbers have increased substantially since 2012. The reservoir system has also gradually become more eutrophic since it was constructed in the 1970s. As water evaporated, nutrients and dissolved minerals have been concentrated, which support higher fish biomass. Shad numbers may have also returned to levels documented in 2012 since the rotenone applications have ceased.

Similarly, the numbers of Palmetto Bass appear to have decreased, likely through natural attrition and escape from the SSI. Reduced numbers of Palmetto Bass would reduce predation on smaller, pelagic species.

3.7.1.2 Wheeler Branch Reservoir

Wheeler Branch Reservoir is a 180-acre impoundment located within the Paluxy River system in Somervell County, Texas. It has a maximum depth of 85 feet. The water level is maintained by pumping water from the Paluxy River during periods of high flow. Wheeler Branch Reservoir is an oligotrophic reservoir with water transparencies typically ranging from 10 to 15 feet. Habitat features consist of flooded cedars around the periphery, flooded standing timber in deeper water, brush piles, rock piles and ledges. (Tibbs and Baird 2018)

Similar to SCR, Wheeler Branch is stocked and managed by TPWD. It opened to the public on September 1, 2011. Prior to opening, the reservoir was stocked with Florida largemouth bass, smallmouth bass, walleye, bluegill, threadfin shad, inland silverside, longear and redear sunfish, and was sampled extensively with electrofishing and gill netting. Since the reservoir's opening, Wheeler Branch has been sampled annually with one or more years including fall electrofishing, spring gill netting, and spring bass-only electrofishing. Additionally, a year-long angler creel survey was implemented from June 2013 through May 2014. A public relations campaign began within the district to inform and educate constituents about zebra mussels in order to prevent their spread into Wheeler Branch Reservoir. Somervell County employees were trained about zebra mussels, and how to inspect boats and trailers entering the reservoir. (Tibbs and Baird 2018)

Within the results of the 2018 survey, the forage base consisted primarily of bluegill. Gizzard shad are present in low density. Channel catfish were collected in good numbers, and all individuals approached or exceeded the preferred size category of 24 inches. Largemouth bass catch rate declined, but size structure improved. Smallmouth bass are present in the reservoir but weren't collected in the most recent electrofishing survey. Walleye were collected in low numbers in the 2015 and 2017 gill netting surveys, but none were collected in the 2018 gill netting survey. (Tibbs and Baird 2018)

3.7.1.3 Paluxy River

Rising in northeast Erath County, the Paluxy River flows southeast for 38 miles through Hood and Somervell counties to join the Brazos River. The river is formed by the junction of the North and South Forks, both of which are small streams that contain insufficient water flows for normal recreational use. In addition, the primary stream is feasible for recreational use only during periods of heavy rains. The Paluxy River is a scenic waterway containing clean, clear water flowing over sand and rocks, and surrounded by cedar-covered hills and limestone bluffs. (TPWD 2020a)

The stretch between Paluxy and Glen Rose contains the famous Dinosaur Valley State Park where well-exposed dinosaur tracks have been found in the riverbed. The river at the park is a

small, narrow waterway which occasionally has sufficient water for recreational use. During periods of heavy rainfall, the river reportedly contains numerous rapids. Scenic hardwood bottomlands consisting of oak, elm, and cedar are common along the entire section. Many outcroppings of limestone exist, and in some places, the riverbed itself is composed entirely of limestone. Many sand bars are present which, when combined with the state park, insure ample areas for camping and day use. Access, however, remains somewhat of a problem since some of the road crossings are fenced. In general, the Paluxy River is a picturesque river providing excellent recreational conditions when sufficient water levels are present. (TPWD 2020a)

The TWDB completed construction of a dam on the Paluxy River in 2007 to hold back (seasonal) flow near Glen Rose. This dam catches the water and pumps it north of Glen Rose into Wheeler Branch Reservoir. Somervell County utilizes this water for its drinking water supply. The pool above the dam is stocked with trout in the winter by TPWD. Summer stocking largely includes catfish. (Crise 2009)

The Paluxy River is known for its colorful green perch. These are often crossed between "natives" and fish that came in from stocking trucks supplying fish from fish farms to local farm ponds and tanks after the spring floods and natural flows relocate or wash the fish, fish eggs, and fry into the river. There is a natural restocking of the river when the floods come bringing rising waters from the Brazos River and Lake Whitney. The Paluxy River is known as the fastest rising river in Texas. The floodwaters bring sand bass, catfish, gar, spotted bass, and others to gravitate up to holding pools that are formed in the bottom of this river. (Crise 2009)

3.7.1.4 Brazos River

The Brazos River is the largest river between the Rio Grande and the Red River and has a total length of about 840 miles from the source of its longest fork. The river comprises approximately 45,700 square miles, 43,000 of which are located in Texas, and flows through most of the major physiographic regions in the state (Luminant 2013b, TPWD 2020b). The Brazos has three distinct segments: the upper, middle, and lower Brazos. Portions of the Brazos within 6 miles of CPNPP are classified as the middle Brazos. (TWDB 2012)

The Brazos River largely supports riparian vegetation, including bottomland hardwoods consisting of flood tolerant tree and shrub species. Riparian vegetation is an important component of maintaining the health of aquatic ecosystems. Riparian vegetation stabilizes stream banks, reduces sediment by filtration, moderates water temperature through shading during periods of high ambient air temperatures, and provides woody debris to the aquatic environment that may be used by aquatic organisms for a variety of life functions. (TWDB 2012) A 2004 middle Brazos River watershed riparian wildlife habitat evaluation indicated that common riparian species included black walnut (*Juglans nigra*), bur oak (*Quercus macrocarpa*), pecan (*Carya illinoinensis*), cedar elm (*Ulmus crassifolia*), sugar hackberry (*Celtis laevigata*), Ashe juniper (*Juniperus ashei*), cottonwood (*Populus deltoides*), Bois d' Arc (*Maclura pomifera*), American elm (*Ulmus americana*), post oak (*Quercus stellata*), and live oak (*Quercus virginiana*). Common understory species were characterized as black walnut, pecan, live oak, and red oak (*Quercus* spp.). Soft mast species found in the shrub layer included gum bumelia

(*Sideroxylon lanuginosum*), greenbrier (*Smilax* spp.), sugar hackberry, poison ivy (*Toxicodendron radicans*), tickletongue (*Zanthoxylum* spp.), Ashe juniper, yaupon (*Ilex vomitoria*), Eve's necklace (*Styphnolobium affine*), buttonbush (*Cephalanthus occidentalis*), sumac (*Rhus* spp.), chinaberry (*Melia azedarach*), red mulberry (*Morus rubra*), mustang grape (*Vitis mustangensis*). (Hale 2004) The riparian corridor has been highly encroached upon and fragmented throughout the Brazos River basin as a result of land clearing for a variety of human purposes and therefore riparian vegetation management and studies will continue to play an important role in understanding the Brazos River aquatic systems. (TWDB 2012)

The freshwater fish community within the Middle Brazos includes upland, plains, and lowland forms and a diversity of trophic (piscivore, invertivore, omnivore, herbivore) and reproductive (broadcast, substrate, floodplain, nest-building guilds). The mainstream of the middle Brazos River supports a limited number of fluvial specialists and a high abundance of habitat generalists. Four federal candidate species are known to occur in the Brazos River basin including two fishes, the smalleye shiner (*Notropis buccula*) and the sharpnose shiner (*Notropis oxyrhynchus*), and two mussels, the Texas fawnsfoot (*Truncilla macrodon*) and the smooth pimpleback (*Quadrula houstonensis*). However, the sharpnose shiner and smalleye shiner are considered extirpated from the middle Brazos River. In addition, the Brazos water snake (*Nerodia harteri*) is currently on the state's threatened list due to its limited range in the middle reaches of the Brazos River. (TWDB 2012)

Of these, the Texas fawnsfoot (Section 3.7.8.1.5) and the Brazos water snake (Section 3.7.8.2.5) have been identified within a 6-mile radius of CPNPP.

3.7.1.5 Lake Granbury

Lake Granbury is an 8,700-acre impoundment of the Brazos River and is operated by the BRA. Primary water uses include storage of flood and storm waters, municipal water supply, makeup water for CPNPP, and recreation. The lake is eutrophic, with a mean depth of 18 feet and maximum depth of 75. Lake features consist of bulk heading, natural shoreline, boat docks and piers, and emergent aquatic vegetation. Littoral vegetation is dominated by stands of giant reed (*Arundo donax*), cattail (*Typha* spp.), American water-willow (*Justicia americana*), and bulrush (*Scirpus* spp.). (Baird and Tibbs 2018)

No problematic species of aquatic vegetation currently exist in the reservoir. Habitat management work, funded by the BRA, includes the installation of crappie condos and mossback safe haven structures to enhance fish habitat. Sport fish include largemouth bass, channel catfish, white bass, and striped bass. Sport fishes are currently managed with statewide regulations with the exception of a 16-inch minimum length limit on largemouth bass. In 2013, management efforts began focusing on invasive species education and prevention. Recent management efforts include aquatic vegetation and boater access surveys conducted during summer 2017, a tier III largemouth bass age and growth sample during fall 2017, trap netting in winter 2017, and additional trap netting and standard gill netting during spring 2018. (Baird and Tibbs 2018)

Frequent golden algae blooms from 2001 to 2012 severely impacted sport fish populations in the lake. Efforts to mitigate these losses included increasing sampling effort, stocking striped bass annually, as well as stocking Florida largemouth bass to supplement the population. Golden alga blooms have not caused any major fish kills in recent years. (Baird and Tibbs 2018, TPWD 2020e)

A total of 49,350 acre-feet/year of supplemental water is pumped from Lake Granbury to SCR via an underground pipeline for the operation of CPNPP Units 1 and 2 (Luminant 2013b) and to control the concentration of dissolved solids in SCR. The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 MGD. To allow for one pumping unit being temporarily out of service, the pumping station on Lake Granbury includes four pumps with 21.7 MGD of rated capacity each, for a total installed name-plate capacity of 86.8 MGD. The Lake Granbury diversion pump intakes contain protective screens. The screens contain 1/4-inch diameter bars, spaced 2 inches apart in each direction. The outer face of the screen is curved in a cylindrical configuration, 4 feet high by 8 feet in diameter. The outer surface area of the screen is approximately 68.5 square feet for each pump, so that the maximum velocity attained by the approaching water immediately before passage through the screen is 0.49 fps. A return water pipeline from SCR to Lake Granbury exists but has reportedly never been used. (Luminant 2013b) The current TPDES permit for the CPNPP site only permits discharges to SCR.

3.7.2 Terrestrial and Wetland Communities

CPNPP consists of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass. A large portion of the site also consists of SCR, which is bordered by an intermixed mosaic of woodland and grassland habitats. Grounds maintenance consists of mowing roadside habitat periodically during the growing season, tree trimming in the spring and fall, as well as regular cleaning of the yards. Pipeline maintenance is not regularly scheduled; however, vegetation management and leak repairs were performed in 2019. Additional maintenance outside of scheduled activities is completed through a preventative maintenance work order.

CPNPP's stormwater management procedure implements the SWPPP that includes BMPs for any ground-disturbing activities. This procedure provides guidance for meeting the terms and conditions of TPDES general permit No. TXR050000 for monitoring and reporting stormwater outfall discharges. In addition, monthly monitoring activities identified in the procedure are intended to go beyond SWPPP compliance by including proactive measures to minimize potential environmental impacts of station activities. These measures include quarterly visual monitoring, a monthly comprehensive site evaluation, as well as weekly equipment inspections.

These following sections identify terrestrial and wetland ecological resources and describes species composition and other structural and functional attributes of terrestrial biotic assemblages that could be affected by the continued operation and maintenance of the facilities.

3.7.2.1 Physiographic Province

CPNPP is located within the Great Plains physiographic province of the United States. This province stretches from Montana south through Texas and is bordered on the west by the Rocky Mountains. It covers portions of Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, and Texas. The province is 450,000 square miles and slopes downward to the east. The region is underlain by bedrock composed of shales, limestones, sandstones, conglomerates, and lignite. (NPS 2018)

3.7.2.2 Ecoregion

CPNPP is situated within the Grand Prairie ecoregion, a subset of the larger Crosstimbers ecoregion. The Grand Prairie ecoregion is an undulating plain that exists on lower cretaceous limestones with embedded marl and clay. The landscape consists of wide lowlands and limestone mesa uplands. The topography is generally considered hilly with well drained soils. (Griffith et. al 2004)

The area used to predominantly consist of tallgrass prairie, where fire was historically dominant on the landscape and helped keep woody plant growth abated. However, fire suppression following settlement of the region has allowed for species such as Ashe juniper and mesquite (*Prosopis glandulosa*) to become more common. Rainfall averages between 20 and 30 inches per year. The ecoregion is not as arable as others to the east and west, therefore land is often used as rangeland or pastureland including grazing on ridges with shallow soils and farming of corn, grain sorghum, and wheat on the deeper soils on the flats. (Griffith et al. 2004; Griffith et al. 2007; TAMFS 2020)

Grand Prairie grasses include big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), hairy grama (*Bouteloua hirsute*), Texas wintergrass (*Nassella leucotricha*), sideoats grama (*Bouteloua curtipendula*), and Texas cupgrass (*Eriochloa sericea*). Some common Great Plains animals, such as black-tailed jackrabbit and the scissortail flycatcher, range farther east through the Grand Prairie, creating an overlap in Great Plains and eastern forest species. (Griffith et al. 2007)

Ten dominant habitat types exist within a 6-mile radius of CPNPP (TEAM 2021). Six other habitat types were mapped but were not considered dominant (each occupies less than 1 percent of the total habitat types) and are outlined in Section 3.7.2.2.11. A brief description of habitat types and subsystems, including state listed natural communities, is provided below.

3.7.2.2.1 Edwards Plateau Limestone Savanna and Woodland

The Edwards Plateau Limestone Savanna and Woodland is the largest habitat type within the 6-mile radius consisting of approximately 25,022 acres. It contains a rolling to level topography, often on plateau tops but can also be found on gentle slopes. It is primarily found on Cretaceous limestones of the Edward Plateau and Lampasas Cutplain. The soils generally consist of loams, clay loams, or clays with a typical limestone parent material. The upland system of this ecosystem is typified by a mosaic of evergreen oak and juniper forests, woodlands, and

savannas over shallow soils of rolling uplands and adjacent upper slopes within the Edwards Plateau and some adjacent ecoregions where limestone is present. (Elliott 2014; TEAM 2021)

Significant open areas dominated by grasses may resemble prairies. Species such as plateau live oak (*Quercus fusiformis*) or Ashe juniper often dominate the canopy of this system. Other canopy species may include Texas oak (*Quercus buckleyi*), lacey oak (*Quercus laceyi*), cedar elm (*Ulmus crassifolia*), Texas ash (*Fraxinus texensis*), white shin oak (*Quercus sinuata* var. breviloba), and Vasey shin oak (*Quercus vaseyana*). The shrub layer may be fairly well-developed, containing overstory species, as well as midstory species such as Texas persimmon (*Diospyros texana*), agarito (*Mahonia trifoliolata*), Texas mountain laurel (*Sophora secundiflora*), and honey mesquite (*Prosopis glandulosa*). The understory can contain various graminoid species, such as little bluestem, sideoats grama, cane blustem (*Bothriochloa barbinodis*), silver bluestem (*Bothriochloa laguroides* ssp. torreyana), Texas wintergrass (*Nassella leucotricha*), Indiangrass, curlymesquite (*Hilaria belangeri*), buffalograss (*Bouteloua dactyloides*), big bluestem, hairy grama, Texas grama (*Bouteloua rigidiseta*), seep muhly (*Muhlenbergia reverchonii*), Lindheimer muhly (*Muhlenbergia lindheimeri*), purple threeawn (*Aristida purpurea*), and/or cedar sedge (*Carex planostachys*). The composition of the grassland component is driven by grazing, fire, and climate. (Elliott 2014)

3.7.2.2.2 Crosstimbers Oak Forest and Woodland

The Crosstimbers oak forest and woodland ecosystem type is the second largest habitat within the 6-mile radius of CPNPP, consisting of approximately 21,692 acres, and contains gently rolling, moderately dissected uplands, and irregular plains. The soils largely consist of sandy loams, some with a claypan. This system is generally described as a savanna or woodland dominated by post oak and/or blackjack oak (*Quercus marilandica*). Other species in the canopy may include cedar elm, plateau live oak, sugarberry (*Celtis laevigata*), and eastern redcedar (*Juniperus virginiana*). The understory may have been historically dominated by little bluestem, but current understory composition may be largely determined by land use history and grazing pressure. (Elliott 2014; TEAM 2021)

In the east, where precipitation is greater, tallgrass species such as big bluestem and Indiangrass may be important components of the understory or occupy prairie patches. In the drier west, shortgrass species such as buffalograss become dominant. Non-native species such as rescuegrass (*Bromus catharticus*), bermudagrass (*Cynodon dactylon*) and King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*) frequently dominate the herbaceous layer. Fire suppression has significantly converted the composition of this ecotype, altering the once open understory into a near continuous to ground level closed canopy. (Elliot 2014)

3.7.2.2.3 Edwards Plateau Limestone Shrubland

This habitat type is the third largest, consisting of approximately 4,924 acres, and is often found on massive limestone formations. It may occur on plateaus of slopes and can form a discontinuous band around a plateau edge. It can occur as extensive continuous shrub cover or occur as discontinuous shrubland. White shin oak (*Quercus sinuata* var. *breviloba*), plateau live

oak, and/or Ashe juniper may be dominant within this ecotype. Evergreen sumac (*Rhus virens*), prairie sumac (*Rhus lanceolata*), Texas redbud (*Cercis canadensis* var. *texensis*), elbowbush (*Forestiera pubescens*), netlead forestiera (*Forestiera reticulata*), Mexican buckeye (*Ungnadia speciosa*), Texas mountain laurel, Texas persimmon, mejorana (*Salvia ballotiflora)*, fragrant mimosa (*Mimosa borealis*), brasil (*Condalia hookeri*), skunkbrush sumac (*Rhus trilobata*), Lindheimer pricklypear (*Opuntia engelmannii* var. *lindheimeri*), and agarito may also be dominant shrub species. Herbaceous cover may be patchy and consists of species including little bluestem, sideoats grama, Texas grama (*Bouteloua rigidiseta*), red grama (*Bouteloua trifida*), curlymesquite (*Hilaria belangeri*), silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), Texas wintergrass (*Nassella leucotricha*), hairy tridens (*Erioneuron pilosum*), and threeawn (*Aristida* spp.). Disturbances such as fire can be an important process in maintaining this system. (EMST n.d.; TEAM 2021)

3.7.2.2.4 Southeastern Great Plains Floodplain Forest

The Southeastern Great Plains Floodplain Forest habitat type is typically found in relatively broad flats at low topographic positions along large streams and rivers, such as the Brazos, where alluvial deposition dominates. Approximately 4,655 acres of this habitat type exist within the 6-mile radius. It is characterized by bottomland ecological sites with loamy, sandy, and clayey soils. Canopy dominants may include pecan, white ash (*Fraxinus americana*), water oak (*Quercus nigra*), cedar elm, sugarberry, American elm, live oak, American sycamore (*Platanus occidentalis*), boxelder (*Acer negundo*), common honey locust (*Gleditsia triacanthos*), bur oak, red mulberry (*Morus rubra*), green ash (*Fraxinus pennsylvanica*), and western soapberry (*Sapindus saponaria* var. *drummondii*). Along river margins, species such as American sycamore, eastern cottonwood (*Populus deltoides*), and black willow (*Salix nigra*) may dominate. (Elliott 2014)

Overgrazing and/or over-browsing may influence recruitment of overstory species and composition of the understory and herbaceous layers. Shrub species may include American beautyberry (*Callicarpa americana*), common buttonbush (*Cephalanthus occidentalis*), deciduous holly (*Ilex decidua*), yaupon, gum bumelia, common persimmon (*Diospyros virginiana*), farkleberry (*Vaccinium arboreum*), eastern redcedar, roughleaf dogwood (*Cornus drummondii*), and rusty blackhaw (*Viburnum rufidulum*). These species may occur as dense patches in areas of disturbance but are otherwise fairly sparse. Non-native grasses that may dominate these sites include bermudagrass, King Ranch bluestem, and Johnsongrass (*Sorghum halepense*). Herbaceous cover may be quite high, especially in areas where shrub cover is low. The non-native trees such as Chinese tallow (*Triadica sebifera*) and chinaberry (*Melia azedarach*) may be present. (Elliott 2014)

3.7.2.2.5 Urban Low Intensity

This type includes areas that are built-up but not entirely covered by impervious cover, including most of the area within cities and towns. Approximately 4,520 acres of the 6-mile radius are considered urban low intensity. (Elliott 2014; TEAM 2021)

3.7.2.2.6 Open Water

In addition to large lakes, rivers, and marine water, ephemeral ponds may be mapped as open water. Some mapped areas may support vegetation with pioneering species such as black willow, eastern cottonwood, Chinese tallow, seepweeds (*Suaeda* spp.), sea ox-eye daisy (*Borrichia frutescens*), saltwort (*Batis maritima*), rushes (*Juncus* spp.), sedges (*Carex* spp.), cattails (*Typha* spp.), and spikerushes (*Eleocharis* spp.). The majority of this habitat type is identified as SCR. Approximately 3,517 acres of this habitat type exists within the 6-mile radius. (Elliott 2014; TEAM 2021)

3.7.2.2.7 Southeastern Great Plains Riparian Forest

This habitat type is found within buffer zones of headwater streams. Approximately 2,450 acres of Southeastern Great Plains Riparian Forest exist within the 6-mile radius. Typically, this habitat type is found in areas with erosional processes that dominate over alluvial deposition. Trees that may be present in stands of this system include sugarberry, cedar elm, American sycamore, eastern cottonwood, plateau live oak, water oak, willow oak (*Quercus phellos*), western soapberry, black willow, white ash, green ash, common honey locust, honey mesquite, and pecan. Shrub layer development is variable, sometimes with species such as indigo bush (*Amorpha fruticosa*), swamp privet (*Forestiera acuminata*), deciduous holly, yaupon, gum bumelia, eastern redcedar, common persimmon, roughleaf dogwood, brasil, huisache (*Acacia farnesiana*), and/or rusty blackhaw. A few sites may be shrub-dominated without an overstory canopy. (Elliott 2014; TEAM 2021)

Herbaceous cover can be variable and depends on overstory and shrub canopies and recent flooding history. Herbaceous species may include Virginia wildrye (*Elymus virginicus*), frostweed (*Verbesina virginica*), woodoats (*Chasmanthium latifolium*), narrowleaf woodoats (*Chasmanthium sessiliflorum*), eastern gammagrass (*Tripsacum dactyloides*), Drummond's aster (*Symphyotrichum drummondii* var. *texanum*), common broomweed (*Amphiachyris dracunculoides*), western ragweed (*Ambrosia psilostachya*), white avens (*Geum canadense*), Canada snakeroot (*Sanicula canadensis*), switchgrass (*Panicum virgatum*), beadstraw (*Galium* spp.), and sedges. Upland species such as little bluestem, Texas wintergrass (*Nassella leucotricha*), and Indiangrass may be common. Woody vines such as saw greenbrier (*Smilax bona-nox*), poison ivy, peppervine (*Ampelopsis arborea*), and grapes (*Vitis* spp.) may be common. (Elliott 2014)

Non-native grass species that may be common to dominant on these sites include giant reed, bermudagrass, and Johnsongrass. Non-native shrubs, such as privets (*Ligustrum* spp.) and Chinese tallow, may also be encountered. (Elliott 2014)

3.7.2.2.8 Edwards Plateau Dry-Mesic Slope Forest and Woodland

Approximately 1,795 acres of this habitat type exists within the 6-mile radius. The Edwards Plateau Dry-Mesic Slope Forest and Woodland habitat type is found on slopes within the Edwards Plateau and adjacent ecoregions. Cuestas of cretaceous chalk in the Blackland Prairie and calcareous slopes of the Crosstimbers may also be occupied by this system. Soils are

generally dark clay to clay loam and are typically shallow. The canopy is typically dominated or co-dominated by Texas oak, lacey oak, white shin oak, Texas ash, cedar elm, escarpment black cherry (*Prunus serotina* ssp. *eximia*), Arizona walnut (*Juglans major*), and/or netleaf hackberry (*Celtis laevigata* var. *reticulata*). Plateau live oak and Ashe juniper are often present and are sometimes co-dominant with deciduous species of this system. (Elliott 2014; TEAM 2021)

Canopy closure is variable, and this ecotype can either be categorized as forests or woodlands. The shrub layer may be well-represented, especially where the overstory canopy is discontinuous. Species such as red buckeye (*Aesculus pavia* var. *flavescens*), Texas redbud, elbowbush, Mexican buckeye, Jersey tea (*Ceanothus herbaceus*), Carolina buckthorn (*Frangula caroliniana*), Texas mountain laurel, rusty blackhaw, sumac, grape, and silktassel (*Garrya ovata*) may be present in the shrub layer. With the large amount of exposed rock, frequent accumulation of leaf litter, and significant canopy closure, herbaceous cover is generally sparse, with cedar sedge often present. Woodland forbs such as widowstears (*Tinantia anomala*), silver-puff (*Chaptalia texana*), baby blue-eyes (*Nemophila phacelioides*), cedar sage (*Salvia roemeriana*), Texas lespedeza (*Lespedeza texana*), and various ferns may also be present, if patchy. Grasses such as little bluestem and gramas (*Bouteloua* spp.) may occur, typically scattered and patchy. (Elliott 2014)

3.7.2.2.9 Native Invasive: Mesquite Shrubland

This habitat type comprises approximately 1,341 acres within the 6-mile radius. The Mesquite Shrubland type is characterized by a dominantly invasive honey mesquite landscape. In addition, species such as huisache, sugar hackberry, Ashe juniper, cedar elm, lotebush (*Ziziphus obtusifolia*), agarito, winged elm (*Ulmus alata*), sumacs, brasil, common persimmon, Texas persimmon, granjelo (*Celtis ehrenbergiana*), and Lindheimer prickly pear (*Opuntia engelmannii* var. *lindheimeri*) may also be important. Trees such as plateau live oak, live oak, or post oak may form a sparse canopy. (Elliott 2014; TEAM 2021)

3.7.2.2.10 Row Crops

Row crops include all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation frequently, and year-round cover crops are generally mapped as grassland. Approximately 1,162 acres of row crops exist within a 6-mile radius of CPNPP. (Elliott 2014; TEAM 2021)

3.7.2.2.11 Other Habitat Types

Six additional habitat types make up the remainder of the acreage within the 6-mile radius but were not considered dominant (these types occupy less than 1 percent of the total radius or 660 acres or less). The remaining habitat includes urban high intensity, barren land, grass farms, swamps, marshes, and southeastern coastal plain cliff types. (TEAM 2021)

3.7.2.3 Wetlands

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do

support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (USACE 1999).

Thirteen functions and values are typically considered by regulatory and conservation agencies when evaluating wetlands. These are used as part of the New England method. These include groundwater recharge/discharge; flood flow alteration; fish and shellfish habitat; sediment/toxicant/pathogen retention; nutrient removal/retention/transformation; production export (nutrient); sediment/shoreline stabilization; wildlife habitat; recreation (consumptive and non-consumptive); educational/scientific value; uniqueness/heritage/visual quality/aesthetics; and threatened or endangered species habitat. (USACE 1999)

The U.S. Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory (NWI), which integrates digital map data along with other resource information to produce current information on the status, extent, characteristics, and functions of wetland, riparian, and deepwater habitats in the United States. (USFWS 2002)

Based on a review of USFWS NWI maps of the site (USFWS 2020a), there are approximately 4,869.06 acres of wetlands within a 6-mile radius of CPNPP, composed of the following types (Figure 3.7-1):

- Freshwater emergent wetlands covering approximately 43.78 acres (0.90 percent of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 335.64 acres (6.89 percent of total wetland habitat)
- Freshwater ponds covering approximately 256.39 acres (5.27 percent of total wetland habitat)
- Lakes covering approximately 2,904.26 acres (59.65 percent of total wetland habitat)
- Riverine waters covering approximately 1328.99 acres (27.29 percent of total wetland habitat)

The CPNPP property is approximately 7,700 acres in size and completely contains SCR. Based on the NWI data (USFWS 2020a), a total of 3,268.26 acres of wetlands, lakes, ponds, and riverine waters are located on the CPNPP site (Figure 3.7-2). Several freshwater forested/shrub wetlands are mapped as occurring along the edge of SCR.

Based on the NWI data, the following wetland water types are located on the CPNPP site:

- Freshwater emergent wetlands covering approximately 30.24 acres (0.93 percent of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 285.36 acres (8.73 percent of total wetland habitat)
- Freshwater ponds covering approximately 17.8 acres (0.54 percent of total wetland habitat)

- Lakes covering approximately 2,902.74 (88.82 percent of total wetland habitat)
- Riverine waters covering approximately 32.12 acres (0.98 percent of total wetland habitat)

3.7.2.4 Terrestrial Animal Communities

The terrestrial community at CPNPP consists of savannas and forested areas interspersed with mesquite woodland and shrublands, developed open space, and developed areas (TEAM 2021). Wildlife species found primarily in the wooded areas are those typically found in the central Texas ecological landscape. Terrestrial species that are federally and/or state listed as endangered or threatened and known to occur in the vicinity of CPNPP are discussed in detail in Section 3.7.8. Suitable habitat likely exists within the vicinity of CPNPP for several state and federally listed protected terrestrial species, including black rail (*Laterallus jamaicensi*), golden cheeked warbler (*Setophaga chrysoparia*), interior least terns (*Sternula antillarum athalassos*), piping plovers (*Charadrius melodus*), rufa red knots (*Calidris canutus rufa*), white-faced ibis (*Plegadis chihi*), whooping cranes (*Grus americana*), Brazos water snakes, and Texas horned lizards (*Phrynosoma cornutum*) (THL). Table 3.7-3 includes terrestrial species that are likely to be observed in Hood and Somervell counties. None of the species observed or reported at the site are unusual for the region.

Mammals commonly seen on and in the vicinity of CPNPP or animals suited to the habitat surrounding the site include white-tailed deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), bobcats (*Lynx* spp.), raccoons (*Procyon lotor*), beavers (*Castor* spp.), skunks (*Mephitis mephitis*), opossums (*Didelphis Virginiana*), armadillos (*Dasypus* spp.), fox-squirrels (*Sciurus niger*), rabbits (*Oryctolagus cuniculus*), small rodents and wild boars (*Sus scrofa*).

Reptiles and amphibians likely to inhabit the CPNPP site and its surrounding areas include common grass snakes (*Natrix* spp.), rattlesnakes (*Crotalus* spp.), Texas spiny lizard (*Sceloporus olivaceus*), western ratsnake (*Pantherophis obsoletus*), eastern hognose snake (*Heterodon platirhinos*), Blanchard's cricket frog (*Acris crepitans*), and gulf coast toad (*Incilius valliceps*) (iNaturalist 2020a; iNaturalist 2020b).

Bird populations on the CPNPP site include year-round residents, seasonal residents, and transients (birds stopping briefly during migration). Year-round residents include Carolina chickadees (*Poecile carolinensis*), Bewick's wrens (*Thryomanes bewickii*), northern mockingbirds (*Mimus polyglottos*), mallards (*Anas platyrhynchos*), rufous-crowned sparrow (*Aimophila ruficeps*), and great-tailed grackles (*Quiscalus mexicanus*). (Haynie 2017) Summer seasonal residents include common nighthawks (*Chordeiles minor*), eastern kingbirds (*Tyrannus tyrannus*), ash-throated flycatchers (*Myiarchus cinerascens*), white-throated swifts (*Aeronautes saxatalis*), cliff swallows (*Petrochelidon pyrrhonota*), and chimney swifts (*Chaetura pelagica*). Winter seasonal residents include sandhill cranes (*Antigone canadensis*), common loons (*Gavia immer*), Canada geese (*Branta canadensis*), peregrine falcons (*Falco peregrinus*), American coots (*Fulica americana*), brown thrashers (*Fulica americana*), and blue-headed vireos (*Fulica americana*) (Lockwood 1997)

In addition, the Texas Natural Diversity Database (TXNDD) identified one wading bird rookery at the north end of SCR. The exact species assemblage is not identified (TPWD 2020c).

While there are resident bird populations, the region serves as a pass-through area for semi-annual migrations of neotropical birds that may range between South America and Canada, as well as seasonal migrations of waterfowl. The CPNPP site is located within the central flyway, a major migratory route for birds during the spring and fall. The central flyway extends from northern Canada south through Texas. Migrating birds often fly these routes at night and land to rest early in the morning. Before dawn they seek out suitable habitat, called stopovers, in which to feed and avoid predators. Large natural barriers such as mountains and deserts, or large bodies of water, create especially crowded stopovers. These stopovers are very important because flight over the barrier will mean a long stretch without any opportunity to stop for food, rest, or cover. Along the central flyway, rivers and lakes often provide stopover habitat for migratory birds. Common migrants that pass through the area include, but are not limited to, American golden-plovers (*Pluvialis dominica*), chimney swifts (*Chaetura pelagica*), ruby-throated hummingbirds (*Archilochus colubris*), purple martins (*Progne subis*), Northern parulas (*Setophaga americana*), black-throated green warblers (*Setophaga virens*), yellow-throated warblers (*Setophaga dominica*), black-and-white warblers (*Mniotilta varia*), Hudsonian godwits (*Limosa haemastica*), buff-breasted sandpipers (*Tryngites subruficollis*), olive-sided flycatchers (*Contopus cooperi*), yellow-billed cuckoo (*Coccyzus americanus*), golden-winged warblers (*Vermivora chrysoptera*), cerulean warblers (*Setophaga cerulea*) (Shackelford et al. 2005).

3.7.2.5 Transmission Lines

Physical features (e.g., length, width, route) of each of the in-scope transmission lines are described in Section 2.2.5.1. Only those transmission lines that connect the power plant to the switchyard where electricity is fed into the regional distribution system (encompassing those lines that connect the nuclear plant to the first substation of the regional electric power grid) and power lines that feed the plant from the grid during outages are considered within the regulatory scope of license renewal environmental review (NRC 2013a, Section 3.1.6.5). The transmission corridors are situated within the Great Plains physiographic province. All in-scope transmission lines are located completely within the CPNPP EAB as shown in Figure 2.2-2. The in-scope transmission line corridors consist almost entirely of developed land; however, there is some vegetation present within the northern and southern transmission line corridors. The transmission corridors do not cross any state or federal parks or sensitive resources.

3.7.3 Potentially Affected Water Bodies

The major water resource in the vicinity of CPNPP is SCR. SCR is a 3,272-acre impoundment located on Squaw Creek in Hood and Somervell counties. As previously mentioned, the reservoir was built in 1979 by Vistra OpCo to serve as a cooling reservoir for CPNPP. The reservoir has a mean and maximum depth of 46 and 135 feet and is considered mesotrophic. Within SCR, an SSI was created by Vistra OpCo to form a separate enclosed water compartment to provide cooling water for normal and emergency purposes. The water level within the SSI is maintained by an equalization channel between the SSI and SCR. If the water

level in SCR is depleted, a concrete weir, approximately 4 feet below the surface of the equalization channel, will prevent the SSI from draining. The primary source of water for both reservoirs is water pumped from Lake Granbury on the Brazos River (via an intake structure containing vertically mounted pumps housed on a pier) into the northeast cove of SCR.

Approximately 43,350 acre-feet/year of supplemental water is pumped from Lake Granbury to SCR for the operation of CPNPP Units 1 and 2 (Luminant 2013b). The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 MGD. To allow for one pumping unit being temporarily out of service, the station includes four pumps with 21.7 MGD of rated capacity each, for a total installed name-plate capacity of 86.8 MGD. The Lake Granbury diversion pump intakes contain protective screens. The screens contain 1/4-inch diameter bars, spaced 2 inches apart in each direction. The outer face of the screen is curved in a cylindrical configuration, 4 feet high by 8 feet in diameter. The outer surface area of the screen is approximately 68.5 square feet for each pump, so that the maximum velocity attained by the approaching water immediately before passage through the screen is 0.49 fps. A return water pipeline from SCR to Lake Granbury also exists but has reportedly never been used. (Luminant 2013b)

The plant has two nuclear generating units and is located on a peninsula surrounded by SCR. CPNPP has a screenhouse structure that is recessed from the shoreline, on the north side of the peninsula in the area of the circulating water intake structure. The screenhouse contains trash racks installed to prevent large debris from entering the intake bays. In addition, traveling water screens are located behind the trash racks to prevent smaller debris from entering and to help reduce entrainment. Circulating water pumps are located downstream of the traveling water screens to transport the screened flow to the condensers.

CPNPP utilizes a once-through cooling system. CPNPP withdraws cooling water from SCR at a peak rate of about 3,168 MGD for both units, which is equivalent to recirculating the entire volume of water in the reservoir every 16 days. Make-up water is permitted to be diverted from Lake Granbury on the Brazos River to maintain conservation pool level. The power plant intakes cooling water from about the midpoint of the main axis of the reservoir and discharges to the south arm through a submerged discharge structure. Circulating water is pumped through the condenser tubes, where its temperature will increase approximately 15°F above the temperature at the intake. It is then routed back to the reservoir via a discharge tunnel which terminates in an open discharge structure. The discharge velocity of the water re-entering the reservoir is approximately 9.8 ft/sec. The low discharge velocity encourages stratification of the heated circulating water. CPNPP operates all four pumps per unit for the rate of 3,168 MGD; during the winter, three pumps per unit are operated for a rate of 2,376 MGD.

The travelling screens are on a timed rotation schedule and are cleaned with a high-pressure front spray wash. The screens are typically timed to rotate every 4 hours or can be set to rotate automatically based on differential pressures across the screen due to high debris loading. The screens are set for continuous operation when temperatures drop below 38°F. Wash water for each screen is employed at 329 gpm with a pressure of 100 psi. Fish and debris from the

screens are washed into a trough located directly upstream of the screens and collected in a bin and disposed.

Of note, the circulating water system is treated with chlorine on a daily basis to prevent bacterial and algal growth, however, residual chlorine will be monitored and limited to a maximum of 0.5 mg/L to minimize effects on the aquatic system.

Both SCR and Lake Granbury are subject to stratification in the summer months. Stratification will begin as surface temperatures approach 75°F. Accompanying this stratification will be a lowering of dissolved oxygen (DO) at levels below the thermocline. Low amounts of DO often result in the exclusion of most aquatic biota from the affected area. Make-up water received from Lake Granbury during warm weather periods can have low DO levels, and therefore a cascade system is utilized to reaerate the water before entry to SCR.

Temperature distribution was studied shortly after initial operation of Units 1 and 2 in 1993. The results indicated that the thermocline decreased very slightly (less than 4°F) from 40 to 50 feet and then temperatures dropped sharply at 60 feet and then decreased slowly to the bottom of the reservoir. The area around the thermal plume at the time decreased only 2-4°F down to 15 feet. Warmer water and vertical mixing with depth, below 20 feet, have been observed in SCR since CPNPP Unit 1 became operational. In the first year that Units 1 and 2 were operational, temperatures below the thermocline down to 70 feet averaged about 4°F warmer than in 1991 when the CPNPP Unit 2 effect was minimal. The average of all deep-water areas surveyed at 50 feet were 3.8°F more than in 1991, while average temperatures at 60 feet and 70 feet were 6.4°F and 1°F warmer, respectively, than 1991. Temperatures at 80 feet, however, have remained about 57°F since Unit 1 became operational. The study concluded that the decreased thermocline and increased heat budget down to 70 feet is likely result of CPNPP Unit 2 operation. (Luminant 2013b).

A thermal study was conducted in 2007 to assess increasing the thermal uprate to 3,650 MWt. The report utilized a compilation of previous studies as well as additional modelling techniques to evaluate intake temperatures and evaporation rates from the increase in thermal output. The three-dimensional model was run with full load conditions using the current reactor thermal output of approximately 3,458 MWt per unit with a waste heat load of 2,260 MWt per unit, also called the "base case." The base case was used for comparison of intake temperatures and evaporation rates against the "uprate case." The uprate case includes the nominal 3,650 MWt thermal output per unit and an equivalent waste heat load of 2,400 MWt per unit. The results indicated that there was a small increase in temperature at both the intake and discharge locations. The difference between the base case and the uprate case at the discharge and intake structures, respectively were 1.2 and 0.6 degrees F, respectively. Another study in 2017 was conducted to model the temperature changes in SCR due to the thermal plume. Results from the models indicated that the dilution effect of the submerged outfall location reduced the discharge temperature rise. The plume is estimated to be the largest during the mid-winter and smallest during the hottest part of the summer. The differential heat loss from the plume is driven by hydrometeorology. Colder temperatures imply a lower rate of heat dissipation and a

correspondingly larger plume. Similarly, a higher wind speed entails higher heat transfer and a smaller plume. The mid-winter scenario is dominated by the much lower water temperatures hence a much-enlarged plume with the model indicating a size of 1,864 acres during the normal-late summer, and 2,914 acres during normal mid-winter.

Cleaning and maintenance procedures at the intake and discharge structures at SCR are primarily in association with cleaning the travelling water screens. No dredging has occurred, is planned, or is anticipated for CPNPP.

3.7.4 Places and Entities of Special Ecological Interest

This section documents the occurrence, location and description of communities and habitats of special ecological interest within the plant vicinity. Areas of scientific interest, public interest, or areas that may be ecologically sensitive are recorded below.

3.7.4.1 Dinosaur Valley State Park

Dinosaur Valley State Park is an approximately 1,587-acre national natural landmark that opened in 1972 to display historic dinosaur tracks. It sits along the Paluxy River in Somervell County approximately 3.5 miles from CPNPP. While many people travel to see the dinosaur tracks, the park is situated at the intersection of several ecoregions, which makes it a prime location to spot a variety of unique plants and animals. Visitors can participate in a variety of recreational activities including camping, picnicking, hiking, mountain biking, swimming, fishing, and horseback riding. (TPWD 2021c)

Around 113 million years ago, the park area was thought to be at the edge of an advancing and retreating sea. Calcium carbonate deposits from the shells of sea crustaceans formed a limey mud that created the perfect consistency to preserve the tracks. Herbivorous dinosaurs came to browse the large tropical palm and conifer trees that grew inland from the shore. Carnivorous dinosaurs came to prey on the herbivores. Occasionally, dinosaurs would cross the tidal flats, leaving tracks in the mud. (TPWD 2021c)

In 1909, George Adams discovered the tracks in the limestone bed of the river. The tracks remained unprotected until 1937, when R.T. Bird was collecting fossils for the American Museum of Natural History and travelled to Glen Rose to see the tracks. While exploring, he found multiple tracks including those of both sauropods (believed to be the *Acrocanthosaurus*, a smaller relative of the *Tyrannosaurus rex*) and theropods (believed to be the *Sauroposeidon proteles*). These tracks would be the first distinct sauropod tracks ever discovered. (TPWD 2021c)

Today, the park and surrounding areas host a variety of wildlife species. Mammals seen in the park include white-tailed deer, coyotes, bobcats, raccoons, beavers, skunks, opossums, armadillos, fox squirrels, rabbits, and small rodents. Several kinds of lizards and snakes are also found within the park. The Paluxy River hosts yellow and channel catfish, striped and largemouth bass, alligator gar, freshwater drum, and bluegill. Birds of the park consist of a

variety of resident and migrant species including wild turkeys, golden-cheeked warblers, and black-capped vireos. (TPWD 2021c)

3.7.4.2 Squaw Creek Park

SCP serves as the public entrance to utilize SCR. It is located at CPNPP and provides recreation such as boat fishing, bank fishing, and hiking (Luminant 2021b). Details for SCR, including species stocked for sportfishing, are discussed in Section 3.7.1.1.

3.7.4.3 Wheeler Branch Park

Wheeler Branch Park is located on Wheeler Branch Reservoir, two miles north-northwest of the City of Glen Rose in Somervell County. The reservoir is a 180-acre impoundment operated by the SCWD. The reservoir began filling in 2007 and has a maximum dept of 85 feet. The primary purpose of the reservoir is to provide drinking water to Somervell County residents. Water level is maintained by pumping water from the Paluxy River during periods of high flow. Wheeler Branch Reservoir is an oligotrophic reservoir, with water transparencies typically ranging from 10 to 15 feet. Habitat features consist of flooded cedars around the periphery, flooded standing timber in deeper water, brush piles, rock piles and ledges. Details for Wheeler Branch Reservoir including species composition are discussed in Section 3.7.1.2. (Tibbs and Baird 2018)

3.7.5 Invasive Species

This section contains the occurrences of aquatic and terrestrial invasive species in the CPNPP vicinity, and management activities undertaken by the plant to control such species. The TPWD maintains an inventory of invasive species known to have significant economic impacts on agricultural systems, public infrastructure, or natural resources, or are recognized by ecologists to degrade natural ecosystems, negatively affect native species, or have the potential to have deleterious effects on human health (TPWD 2020d). Vistra OpCo maintains guidance documents with policies and procedures for invasive species management of threadfin and gizzard shad, tilapia, and Harris mud crabs in both SCR and the SSI. In addition, CPNPP completes a tri-annual aquatic life study to monitor for the aforementioned species as well as fish species composition, Asian clams, zebra mussels, and golden algae.

3.7.5.1 Aquatic Plants

3.7.5.1.1 Hydrilla (Hydrilla verticillata)

Hydrilla is an aquatic invasive species that is considered a federal noxious weed and is prohibited without a permit in Texas (TPWD 2020d; USDA 2010). There are two forms, monoecious that likely comes from Korea, and dioecious, which comes from India. The dioecious form was first introduced into Florida when aquarium plants were discarded in public waters. The monoecious form was introduced into Delaware and the Potomac River basin. Although it is on the federal noxious weeds list, it is still sold via the internet for aquariums. It is often spread by fragmented pieces attached to boats when the boats move between waterways. It is an herbaceous perennial that grows submersed underwater and can form dense mats. The plants can grow stems up to 25 feet and form dense mats across the surface of the water. It is

rooted in the soil below the water surface, it has whorls of four to eight leaves around the stem and produces white flowers along the stalks. Part of what makes this species so invasive are its ability to reproduce rapidly from fragments, its ability to grow in a variety of habitats, and the ability to grow up to an inch a day. Besides reproducing from fragments, it can reproduce through tubers and buds on shoots. This species typically grows in freshwater locations such as ponds, reservoirs, and canals. It can also grow in a variety of depths from a few inches to up to 20 feet of water. Additionally, it can grow with very little sunlight, which allows it to out-compete other species. (Jacono et al. 2020; UFCAIP 2020)

The quick rate of growth and the ability to grow at low light before other plants allows hydrilla to outcompete native species for resources or cause native species to die off. Additionally, it can interfere with recreational activities, impact fish species, and alter the water chemistry. This species can cause economic harm by slowing the flow of water in irrigation canals or clog water control pumping stations. The cost to remove hydrilla from water systems can cost thousands to millions of dollars. Management can be through biological, chemical, or mechanical means. Although mechanical means can cause the hydrilla to fragment, which can lead to additional growth since it is often how the plant reproduces. (Jacono et al. 2020; UFCAIP 2020) According to the USGS Nonindigenous Aquatic Species Database, hydrilla specimens have been collected from SCR in Somervell County (USGS 2020a). CPNPP does not currently have a documented control or monitoring program for hydrilla. Both TPWD and CPNPP aim to educate park visitors on reducing the spread of invasive species at SCR (Baird and Tibbs 2019; Luminant 2021b) Invasive species observed at CPNPP with the potential to impact operations are documented through the Vistra OpCo tracking system.

3.7.5.2 Aquatic Animals

3.7.5.2.1 Zebra Mussel (Dreissena polymorpha)

Zebra mussels were first introduced into the United States from the Black Sea to the Great Lakes. They are native to seas and rivers between eastern Europe and western Asia. Zebra mussels are small bivalves that are no larger than 50 mm long and named for the pattern on their shells; however, colors of the shell can vary, having only light or dark shells with no markings. Reproduction usually occurs during the spring or summer. Females produce approximately 40,000 eggs which are released into the water column and fertilized by males. Up to one million eggs can be produced per female during the spawning season. Larvae emerge after three to five days and remain free floating in the water currents until they develop enough to settle to the bottom and begin searching for a substrate to attach to. Adults are sexually mature when they reach 8–9 mm in length. Individuals typically live between three and nine years. Zebra mussels prefer habitat conditions with optimal temperatures between 68–77°F, although they can tolerate a range of conditions and have shown growth in temperatures as low as 43°F. They feed on algae by efficiently filtering as much as 1 liter of water per day per individual. (Benson et al. 2020a)

Zebra mussels have spread to many waterways due to their free-floating larval form. Larval mussels then mature and attach to boats by threads and are easily transported to other

waterways. They cause significant damage and problems because of their biofouling capabilities. They colonize rapidly and have been known to attach to surfaces in high densities, such as in pipes, reducing water flow and intake capabilities in many nuclear and hydroelectric plants. They also disrupt the natural ecosystems they invade. They reduce the amount of food available and therefore outcompete many native mussel species, which also reverberates up the food chain as it removes food sources from other species including fish. Zebra mussels also affect native mussel species by directly attaching to them and restricting their ability to survive. (Benson et al. 2020a) Zebra mussels are an aquatic invasive species that is prohibited in Texas without a permit (TPWD 2020d). Zebra mussels have become a concern at SCR and the SSI because of their spread to the Brazos River basin. However, zebra mussels are intolerant of warm water and would not likely survive in SCR or the SSI. Zebra mussels have not been documented in the SSI within SCR as of 2018. However, CPNPP maintains procedures as well as implements tri-annual aquatic studies to monitor and control for zebra mussels in the SSI Further TPWD has focused management efforts at SCR to educate park visitors on the threats of zebra mussels and how to prevent their spread (Baird and Tibbs 2019).

3.7.5.2.2 Asian Clam (Corbicula fluminea)

Asian clams were first introduced to the United States in 1938 via the Columbia River in Washington State (Foster et al. 2020). Asian clams are small, lightly yellow-green to light-brown bivalves that average 25 mm in length but can be as large as 65 mm long. Its ability to reproduce rapidly, coupled with low tolerance of cold temperatures (2-30°C), can produce wild swings in population sizes from year to year in northern water bodies. Asian clams are asexual and are capable of reproducing by self-fertilization. The average life span of individual clams is between two and four years, but they can live up to seven years. Asian clams can be found in various water sources such as lakes and streams but prefer habitats with high levels of dissolved oxygen and substrate consisting of sand or clay where they can be found on or buried just below the sediment. (USFWS 2015)

The main threat to CPNPP from Asian clams stems from damage to pipes from clogging, where clams accumulate to such an extent that discharge from or intake into pipes is blocked. Asian clams can easily outcompete native species for food resources and habitat, as well as alter substrate. (Foster et al. 2020; USFWS 2015) According to the USGS Nonindigenous Aquatic Species Database, Asian clam specimens have been collected from SCR in Hood County (USGS 2020b). In addition, shells have been found onshore near the CPNPP; however, no documented live Asian clams were observed during studies in 2015 and 2016 nor during fish studies in 2018 in the SSI. Prior to 2008, CPNPP implemented biannual treatment with Bulab to control Asian clams. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Monitoring for Asian clams is completed as part of the tri-annual aquatic life study.

3.7.5.2.3 Tilapia (Oreochromis spp.)

Tilapia are considered an aquatic invasive species and are prohibited without a permit in Texas (TPWD 2020d). Tilapia were introduced into SCR and the SSI sometime after 2010 as surveys prior to this time found no indication of the fish in the reservoirs. Over the past several years, tilapia biomass has rapidly increased. Tilapia is a non-native species from the Middle East and Africa, likely introduced to the United States via aquaculture operations and the aquarium trade. Several species occur in Texas, including (but not limited to) blue tilapia (*Oreochromis aureus*), Mozambique tilapia (*Oreochromis mossambicus*), and red tilapia (*Oreochromis niloticus*). Identification to species is difficult and hybridization is common. The exact taxonomy of tilapia in SCR is unknown, but likely involves hybrids of two or more species.

Tilapias are omnivorous and opportunistic feeders, and therefore will adapt their diet to what is available. Juveniles primarily feed on zooplankton, while adults consume certain types of planktonic and filamentous green algae, plants, macroinvertebrates, and occasionally other fish. They compete for the same food with threadfin shad and when food is limiting, can feed on small shad. They are commonly stocked in private impoundments to control certain green algae and vascular plant species. However, there are certain algal species that tilapia and/or other fish will not eat for various reasons. Tilapias are intolerant to cold temperatures and sensitive to golden algal toxins. Rapid temperature decreases can stress tilapia and mortality generally occurs when water temperature reaches the low 50s (°F). While cold temperatures are typically not an issue in the SSI or SCR, an outage during cold weather or a golden algae bloom under the right conditions could result in a die off. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Monitoring for tilapia is completed as part of the tri-annual aquatic life study. As largemouth bass populations increase, predation may help control tilapia numbers.

3.7.5.2.4 Common Carp (Cyprinus carpio)

The common carp is native to Eurasia and was first introduced in the United States in the 1800s. Adult fish can be as long as 25 inches and weigh between 20–60 pounds. Age of sexual maturity of the individuals depends on water temperature, with most fish becoming mature between two and five years of age. Common carp spawn from April through August, commencing when water temperatures reach 62°F. Females release eggs into shallow areas which are then fertilized by males. The eggs stick to underwater surfaces such as logs or plants and then hatch within 3 to 16 days. Common carp have a wide range of habitat tolerances and can live in waters that have a range of oxygen, salinity, and turbidity level, but preferred habitats include shallow water with lots of vegetation and little current. When carp inhabit lakes, they will use warmer, shallower water with plenty of vegetation near the edges of the lake. However, during the winter can inhabit deeper areas. Common carp are omnivorous and feed on a variety of items including invertebrates, plankton, detritus, and vegetation. (Hammerson 2020; Nico et al. 2020)

Common carp can negatively affect the habitat where they exist by destroying vegetation and increasing the turbidity of the water. This reduces spawning habitat and water clarity, thereby reducing habitat for species that require clean water and aquatic vegetation. They have also been known to feed on the eggs of other fish, reducing populations of native species. (Nico et al. 2020) Common carp have been collected from the SSI. CPNPP does not currently have a documented control or monitoring program for common carp. Both TPWD and CPNPP aim to educate park visitors on reducing the spread of invasive species at SCR (Baird and Tibbs 2019; Luminant 2021b) Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system as well as documents occurrences through the Vistra OpCo tracking system.

3.7.5.2.5 Harris Mud Crab (Rhithropanopeus harrisii)

The Harris mud crab is native to the northwest Atlantic. It can be found from the Gulf of Saint Lawrence through the Gulf of Mexico in brackish waters along the coast. It has been introduced to California and Oregon as well as to other countries. The introductions to California and Oregon were likely through shipping ballasts where the larval stage was transported. It is believed that the introduction to Texas freshwater reservoirs is due to accidental release from boats or as bait. This species generally prefers brackish waters with mild salinity but has established populations in freshwater habitats. (Fofonoff et al. 2018)

Harris mud crabs are brown to olive, usually darker above and paler below. Males are typically 0.17-0.57 inches and females are 0.17-83 inches wide. Their walking legs are thin and can be somewhat hairy. They can typically produce 1,000 to 4,000 eggs, up to 7,500 eggs per clutch. Females are able to release fertilized egg clutches up to four separate times following a single mating. Multiple spawnings may also assure continued reproduction under stressful or hazardous conditions when mating activity may be reduced. (Harriet et al. 2021) After hatching, the larval stage remains in the water column until it goes through several molts and is able to settle along the bottom of the water body 15–32 days after hatching. Once established, the crabs are often associated with some form of shelter such as vegetation or decaying debris in freshwater or reefs in estuarine waters. Food sources include algae, carrion, mollusks, and amphipods. The primary predators of Harris mud crabs are fish, although little is known about the species that prey on the crabs in fresh water. (Fofonoff et al. 2018; Perry 2020)

Because little is known about the crab in places where it has invaded, impacts to ecosystems are difficult to discern. They likely have an impact on the food web, altering the trophic structure, particularly in freshwater ecosystems. This species is a known carrier of white spot baculovirus, which is detrimental to penaeid shrimp. They have also been known to cause biofouling issues with intake pipes, particularly in Texas. (Fofonoff et al. 2018; Perry 2020) Harris mud crabs have been documented in SCR. In 2009, a mesocosm study of chemical control alternatives for Harris mud crabs was completed in SCR. The study showed that Bulab (previously used for Asian clam control in the SSI) is most effective in reducing Harris mud crab populations. Currently, CPNPP maintains a biological monitoring and management procedure to provide

steps for treatment of aquatic life found in the SSI that could compromise the service water system. Monitoring for the Harris mud crab is completed as needed, as part of the tri-annual aquatic life study, as well as routinely done during the cleaning of the travelling intake screens.

3.7.5.3 Phytoplankton and Zooplankton

3.7.5.3.1 Golden Algae (Prymnesium parvum)

Golden algae was first documented in inland waters of the Middle East. It was documented for the first time in the United States in 1985 from a fish kill on the Pecos River in Texas. Four additional Texas river systems have since been affected by golden algae, including the Brazos, Canadian, Colorado, and Red rivers. Golden algae are single-celled phytoplankton which contain chlorophyll and can make their own food. Under certain conditions, they are able to prey on other organisms. Phytoplankton provide the base of the food chain in aquatic systems. These algae are microscopic, ranging in size from 8 to 11µm in length and 4 to 6µm in width. They are oval shaped and have two flagella used for locomotion and an additional organelle called a haptonema which allows them to attach to other organisms. Because of their microscopic nature and because they are light sensitive, samples for golden algae need to be collected from below the surface of the water and 400 to 1,000 magnification is needed to view the algae. This species can form cysts and remain dormant when conditions are not ideal, re-emerging when conditions become more favorable. (NMSU 2018; TPWD 2007; TPWD 2020e)

Golden algae can exist in aquatic systems without causing problems, but when they do cause problems, it can be devastating to the ecosystem. When conditions are favorable, the algae can create toxins. Chemical compounds are released from the algae which combine with minerals in the water to form toxins called prymnesins, which causes icthyotoxicity, therefore affecting gill-breathing species. This includes all fish, crayfish, bivalves, amphibians, and some plankton. Releasing toxins provides benefits to golden algae, such as causing other bacteria and algae to slow and making them easier prey to catch, repel zooplankton that prey on golden algae, and inhibit the growth of other algae species, thus outcompeting other alga species. The release of the prymnesins leading to toxic algal blooms occurs most often during the winter and spring when water temperatures are lower than 86°F, nutrients in the water are limited, and the pH is greater than 7.0, often resulting in fish kills. The toxins attach to exposed cells on the gills of fish and other gill-breathing species. The toxins continue to work inwards from the outer gill cells, damaging the cells through hemorrhaging and allowing water and chemicals into the cells and the circulatory system, eventually harming internal organs. When fish become infected, they can exhibit bleeding from the gills or become covered in mucous. Additionally, the mouth, eyes, and fins may become red. The toxicity can cause behavioral changes, such as causing lethargy, crowding near fresher water, leaping out of the water to avoid the toxins, or swimming slowly. When bivalves die, the soft bodies may be seen floating in the water. Large fish kills are common in water sources when golden algae blooms last for a long period of time. The water often becomes yellow, gold, or rust-colored, and will form foam where it is agitated, such as along shorelines. (NMSU 2018; TPWD 2007; TPWD 2020e)

There are very few treatments available for large water bodies to remove harmful golden algae. Ultraviolet light treatment has been successful in small areas, while copper-based algaecides can also be helpful. However, the algaecides can cause unwanted side effects for beneficial and native species. To reduce the risk of spreading golden algae, any boats and equipment should be cleaned thoroughly with hot water and allowed to dry for several days to prevent contamination of other water bodies. (TPWD 2007) Golden algae has been documented in the SSI in the SCR and has contributed to documented fish kills at CPNPP. The SSI historically has grown filamentous green algae from spring through the fall, causing screen and strainer clogging issues. As a result, dye has been added to the reservoir to reduce light penetration and control algal growth. Algal growth in the SSI appears to have declined over the past few years. While many factors play a role in filamentous green algae growth, the increasing tilapia densities may be suppressing growth.

Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system. Results from the 2018 SSI aquatic life studies indicated that CPNPP can discontinue monitoring for golden algae due to lack of recent documentation, but if a large-scale fish die-off occurs in the SSI or drought conditions exist during seasonal time frame when golden algae could exist then, the environmental team will sample for golden algae on a case-by-case basis.

3.7.5.3.2 Water Flea (Daphnia lumholtzi)

The water flea is native to tropical and subtropical climates. Its native range includes freshwater lakes in east Africa, east Australia, and Asia. The first documented observation of water fleas in Texas was in 1990. It continues to be found throughout the south and midwestern region of the United States. Although it is not known how they were introduced, it was likely though contaminated shipments of fish. It appears that the continued spread of this water flea species is reliant on human dispersal, as it is unlikely to spread between unconnected water bodies without human help. It likely spreads between unconnected water bodies through contaminated surfaces such as boats or other equipment. (USFWS 2018)

The water flea is easily distinguishable from native daphnia species. The helmet is larger than any native species and its tail is longer than the length of the body. The underside of the upper part of the exoskeleton has 10 spines along either side. The folds on the back of the head are formed into sharp points. Males of this species often do not have the helmet on the head and the tail is shorter than that of the females. This species is capable of reproducing without fertilization. They can develop from eggs that are in the females' brood pouch. The eggs can be found in the females' pouch in as little as 5 days after birth. After a female gives birth and the eggs hatch, she will undergo a molt and be ready to develop more eggs. The rapid growth rate of individuals and the rapid rate at which reproduction can occur gives this species an advantage, as the population can grow extremely quickly. (USFWS 2018)

Water fleas are filter feeders that feed on phytoplankton drifting in the water column. This species of water flea has become invasive for several reasons. Among the reasons are rapid reproduction, quick growth, adaptability to warm climates and higher temperatures, spines to

protect itself, and its ability to produce eggs that can remain dormant in the sediment of water bodies until favorable conditions are present. Water fleas can cause problems in water bodies because they outcompete native daphnia species. This can impact the base layers of the food web, thus affecting species dependent on it further up the food chain. The presence of the spiny tail gives it an advantage in that many native fish species are unable to eat water fleas, thus putting additional stress on native daphnia. Water fleas have been documented in the SSI in the SCR. (Benson et al. 2020b; USFWS 2018)

CPNPP does not currently have a documented control or monitoring program for the water flea. Currently, CPNPP maintains a biological monitoring and management procedure to provide steps for treatment of aquatic life found in the SSI that could compromise the service water system as well as documents occurrences through the Vistra OpCo tracking system.

3.7.5.4 Terrestrial Plants

3.7.5.4.1 Giant Reed (Arundo donax)

One of the largest species of grasses, the giant reed is native to east Asia. It was originally introduced into the United States via California during the early 1800s. It continued to spread to other states, as it was often planted as an ornamental or used to control erosion. This species is often found in riparian areas, near or on wetlands, or along lake or reservoir shores. It can also be found where the water table is near the ground surface. Giant reeds are perennial graminoids. They can grow to a height of between 6 and 30 feet. Each individual stem can grow to a diameter between 0.4 and 1.6 inches. Flowers grow at the top of each stem and look like large plumes. Seeds are easily dispersed by wind, but this species reproduces most often by rhizomes (horizontal stems that grow underground, sending out roots and shoots), or through fragments that can establish and grow new plants. The first characteristic that makes this species invasive is that the rhizomes and plant grow rapidly. The rhizomes can grow up to 2.5 inches a day within the first 40 days, and up to an inch a day up to 150 days. The plant can grow from 1.5 to 4 inches daily. The second characteristic that makes this species invasive is its tolerance of a wide range of conditions, including drought, high levels of precipitation, frequent flooding, salinity, and a variety of soil types with pH levels varying from 5 to 8.7. Finally, it can tolerate high levels of disturbance. Once giant reed becomes established in an area, it can form monocultures and create dense stands of nothing but giant reed. This inhibits growth of native species and provides poor wildlife habitat. (McWilliams 2004) Giant reed has not been documented near SCR. CPNPP does not currently have a documented control or monitoring program for giant reed.

3.7.5.4.2 Cattail (Typha spp.)

Cattails are large (1–5 feet tall) plants with brown cylindrical seed heads which mature from August to September at the top of round stalks. They have long, narrow, green leaves with parallel veins that fan out from a central core. There are two different species of cattail in Texas: broadleaf cattail (*Typha latifolia*), considered native to the contiguous U.S., and narrowleaf cattail (*Typha angustifolia*), which is not. They hybridize readily (into *Typha* x *glauca*) and many of the plants with characteristics of broadleaf cattail have been found to have a large percentage

of genetic material matching narrowleaf cattail. Both species have the dense, brown cylindrical seed heads at the top of strong stalks in the fall. These species spread readily by rhizomes and grow in groups. (Landis and Fiedler n.d.)

These species do not tolerate dense shade and become more common in areas cleared of shrubs. The hybrid and narrowleaf cattails are likely to become a dominant plant and push out native species if not managed using herbicide. (Landis and Fiedler n.d.)

The genus *Typha* (cattail family) have been documented near SCR; however, the exact species is not known (BWI 2008). CPNPP does not currently have a documented control or monitoring program for cattails.

3.7.5.5 Terrestrial Animals

3.7.5.5.1 Wild Boar (Sus scrofa)

Wild boars (also known as feral hogs) are native to Eurasia and have been introduced into every continent and many islands, except Antarctica. They were brought to the southeastern United States as early as the 1539 by Spanish explorers on the Gulf Coast and/or settlers. Feral hogs can grow quite large, ranging in size from 100–300 pounds in fully grown adults. Males of this species are larger than females, but both species are covered in dark brown/black coarse hair, although the color can vary significantly. Their canine teeth are large and are often visible. While growth of feral hogs can continue through the first 5 years of life, they reach sexual maturity at a relatively young age, with males become mature between 5 and 7 months and females between 10 and 12 months. Once females become pregnant, they usually have litters of five to six piglets, which remain with the mother until 2 to 3 months. The juveniles' coats are brown with yellowish stripes. They lose this coloring at around 4 months of age. (AISC 2020; McLure et al. 2018)

The diet of feral hogs is omnivorous; they have been known to consume vegetation, roots, nuts, insects, small birds, amphibians, reptiles, small mammals, and eggs. When feeding, hogs are social. Foraging can occur over large areas and usually occurs early in the morning or late in the day. Feral hogs are successful invaders due to their generalist diet, their ability to tolerate a wide range of habitats, and the ability to reproduce often and at a young age. Feral hogs can cause significant biological and economic damage. They root in the soil and can damage crops and irrigation systems. Management and damage control cost Texans millions of dollars each year. Ecologically, they alter soil systems, remove plant cover, destroy the habitats of other species, especially threatened, endangered, and species of conservation concern. Feral hogs are also known carriers of parasites and zoonotic diseases. (AISC 2020; McLure et al. 2018; SI 2007) Feral hogs have been documented in the vicinity of CPNPP. CPNPP does not currently have a documented control or monitoring program for feral hogs.

3.7.6 Procedures and Protocols

Vistra OpCo relies on administrative controls and other regulatory programs to ensure that habitats and wildlife are protected as a result of a change in plant operations (i.e., water withdrawal increase, new TPDES discharge point, wastewater discharge increase, air emissions increase), or prior to ground-disturbing activities. The administrative controls, as presented in Section 9.5, involve reviewing the change, identifying effects, if any, on the environmental resource area (i.e., habitat and wildlife), establishing BMPs, modifying existing permits, or acquiring new permits as needed to minimize impacts. Existing regulatory programs that the site is subject to, as discussed in Chapter 9, also ensure that habitats and wildlife are protected. These are related to programs such as stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; and management of herbicide applications to ensure that the intended use will not adversely affect the environment.

3.7.7 Studies and Monitoring

3.7.7.1 Entrainment and Impingement Monitoring

In accordance with the statutory guidelines set forth in the TPDES permit issued to Vistra OpCo for CPNPP, and to maintain compliance under Section 316(b) of the Clean Water Act (CWA), periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that CPNPP is using the best technology available (BTA) to reduce entrainment and impingement.

The intake structure at CPNPP is located in an excavated recess of the SCR shoreline and consists of eight circulating water system (CWS) pumps and 12 travelling screens. The intake is located approximately 50 feet below the surface of SCR. Noncontact cooling water is discharged from a common outfall located across the peninsula from the intake.

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 2.7 cfs (1,200 gpm) of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens. Each circulating water pump provides a total of 613 cfs (275,000 gpm) to the condensers for the units. The facility's maximum design flow is about 2,200,000 gpm (3,168 mgd). Under normal conditions, four pumps operate per unit; however, with lower winter lake temperatures, three pumps operate per unit. The plant can operate at reduced loads operating two or three pumps per unit.

CPNPP has a screenhouse structure that is recessed from the shoreline, on the north side of the peninsula. The screenhouse contains trash racks installed to prevent large debris from entering the intake bays. In addition, traveling water screens are located behind the trash racks to prevent smaller debris from entering and to help reduce entrainment. Circulating water pumps

are located downstream of the traveling water screens to transport the screened flow to the condensers.

A historical entrainment and impingement study was conducted at CPNPP. For impingement, sampling was conducted weekly from October 18, 1993, through March 1994, semi-monthly from April 1994 through August 1994, and weekly from September through October of 1994. For entrainment, sampling was conducted weekly from April 6 through August 24, 1994 (spawning season in most Texas reservoirs), using a half-meter, 500-micron mesh net towed from a boat in the vicinity of the intake. The results indicated that there was no significant adverse environmental impact to the SCR as a result of CPNPP operations and that the plant was operating using the BTA.

In 2018, a biological information report was written utilizing the 2014 TPWD fisheries survey to describe the potential impacts of impingement and entrainment on species known to occur in SCR. It was determined that the species most susceptible to impingement and entrainment in SCR include threadfin shad, gizzard shad, and sunfish. These species have life histories that may intersect with the operation of the cooling water intake structure (CWIS).

Specific details regarding historical impingement and entrainment studies, as well as BTA and monitoring are discussed below.

3.7.7.1.1 Impingement Monitoring

Impingement sampling was conducted from October 1993 through October 1994. The sampling involved utilizing a basket inserted into the debris sump to collect fish off of the travelling screens. Approximately 262,498 fish, comprising 13 species, were impinged by the CWS during this timeframe. Ninety-six percent of those impinged were threadfin shad. Gamefish including largemouth bass, white bass, channel catfish, and white crappie accounted for less than one percent combined of the total impingement. These results were consistent with those of plants in similar design and location, that forage species are most likely to dominate impingement losses due to their abundance, their pelagic habit, tendency to move in schools, and reduced physiological condition at high temperatures. Given the low number in game fish impinged on an annual basis and the high reproductive capacity of threadfin shad, it was determined that the total impingement numbers were not significant or creating an unacceptable impact on the game fish community at SCR.

Additional sampling was completed from February 2006 through February 2007 by collecting samples impinged from the facilities intake screens. A total of 58,121 aquatic organisms, including 12 fish species, were collected in impingement samples at CPNPP. Threadfin shad accounted for 92 percent of the total impingement, followed by bluegill (4 percent), mud crab (*Rhithropanopeus harrisii*) (2 percent), inland silverside (*Menidia beryllina*) (1 percent), and largemouth bass (1 percent). However, this total included a threadfin shad die-off that occurred in the reservoir on August 22 and 23, 2006. The number (39,071) of threadfin shad collected during this single event made up 69 percent of the total number of fish collected during the study.

Impingement rates (number of fish/million gallons) for each sample event were used to estimate total impingement for the study year. The estimate of the total number of fish impinged during the sample year was approximately 295,000. The estimates included approximately 253,000 threadfin shad and 28,844 bluegills. Approximately 83 percent of threadfin shad and 96 percent of bluegill were believed to be less than 1 year of age. Impingement rates were compared to various facility and environmental variables to identify possible relationships. Again, the increased temperatures are believed to account for the high number of threadfin shad deaths, as this species experiences high impingement rates during periods of increased water temperature.

CPNPP is identified in the 2013 GEIS in Table 3.1-2 as having a once-through cooling system within the context of license renewal. However, in 2015, SCR was designated as a closed-cycle recirculating system (CCRS) by the TCEQ consistent with the definition in 40 CFR 125.92(c)(2). Plants that recirculate cooling water through the condensers after the waste heat is removed by dissipation to the atmosphere are considered closed cycle cooling. The CCRS designation is specific to 316(b) and how CPNPP operates the cooling system. According to the EPA, CCRSs are highly effective in reducing impingement and entrainment by reducing intake flow. These reductions in flow and the concurrent reductions in impingement and entrainment impacts are among the highest reductions in adverse environmental impact possible at an intake structure. The use of SCR as a CCRS is considered the BTA for impingement as determined by the TCEQ.

The 2019 TPDES permit identifies the existing cooling water system as a CCRS as defined as 40 CFR §125.92(c); thus, it is the BTA. Additional impingement studies were not required. (Attachment B) Adherence to the 316b rule (79 FR 48300), and Texas Administrative Code (Chapter 308, §308.91), combined with continued compliance to permit regulation with BTA and ongoing studies to identify any potential concerns, will minimize impacts caused by impingement.

3.7.7.1.2 Entrainment Monitoring

Entrainment sampling of ichthyoplankton was conducted from April through August 1994. Boat-mounted nets were towed in front of the trash racks weekly. The entrainment estimate utilized data on all species and life stages captured in the net. Two juveniles, *Dorosoma* and *Lepomis* were captured and likely represent an overestimate of impact to their populations. Eggs and larvae were also sent to the lab and identified down to the genus. Daily, weekly, monthly, annually, and seasonal estimates were calculated for entrainment characterization based on the actual and maximum operating conditions of the CWS. Taxa identified include sunfish, shad, white bass, inland silverside, crappies, and drums. Assuming 100 percent mortality, 30 million eggs/larvae were estimated to have been entrained in 1994. The results indicated that drums, sunfish, threadfin, and gizzard shad likely accounted for most of the losses (from egg to juvenile), while game fish losses were likely minimal.

In 2018, two fine mesh intake technologies were evaluated to make a BTA determination on entrainment, fine-mesh traveling water screens with fish friendly features, and narrow-slot

cylindrical wedgewire screens. Further, an alternative water source and a mechanical draft CCRS was considered to reach a BTA determination. It was later determined that the CWIS is BTA, and the social costs of the alternatives are not justified by the social benefit. No additional control requirements are necessary beyond what Vistra OpCo is already doing.

The 2019 TPDES permit identifies the existing cooling water system as a CCRS as defined as 40 CFR §125.92(c); thus, it is the BTA (Attachment B). Adherence to the 316b rule (79 FR 48300), and Texas Administrative Code (Chapter 308, §308.91), combined with continued compliance to permit regulation with BTA and ongoing studies to identify any potential concerns, will minimize impacts caused by entrainment.

3.7.7.2 Avian Monitoring

CPNPP does not have natural draft cooling towers and the tallest plant structures are the reactor containment structures and the metrological tower, which is located away from other structures. The aboveground in-scope transmission lines are those from the turbine buildings to the switchyard adjacent to the power block. Given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures pose a minimal bird collision hazard.

CPNPP does not have an avian protection plan. Site condition reports and the corrective action system are used to identify and correct any site conditions including those involving wildlife. CPNPP implements deterrents such as anti-nesting measures and routine housekeeping to keep birds away from some operational areas. Studies and monitoring at CPNPP occur as needed to comply with federal, state, and local regulatory requirements as directed by the agencies and generally prior to new projects. TPWD is aware of the known rookery at the northwest end of SCR. (TPWD 2020c)

3.7.7.3 As-Needed Monitoring

Studies and monitoring at CPNPP occur as needed to comply with federal, state, and local regulatory requirements, as directed by the agencies, generally prior to new projects. Any onsite monitoring is consistent with agency policies and procedures and is performed under the guidance of the agency under which coordination is occurring.

3.7.8 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

The USFWS Southwest Region Ecological Services Office maintains current lists of threatened or endangered species on its website. The USFWS federal endangered and threatened species listings and the TPWD state threatened, and endangered species listings were reviewed (TPWD 2022a; TPWD 2022b; USFWS 2022a). Further, the TXNDD maintains information on over 700 natural resource "Elements" including threatened and endangered species. The record of these elements is known as an elemental occurrence (EO). An EO has a practical conservation value, is based off of one or more (potentially hundreds) observation and can be a native plant community or an animal aggregation, such as a colonial waterbird rookery or a bat roost. Data

were extracted to determine those elemental occurrences within a 6-mile radius of CPNPP. EOs identified include the Comanche peak prairie clover (*Dalea reverchonii*), Brazos water snake, glen rose yucca (*Yucca necopina*), Texas milk vetch (*Astragalus reflexus*), slender glass lizard (*Ophisaurus attenuates*), black-capped vireo (Vireo atricapilla), golden-cheeked warbler (*Setophaga chrysoparia*), Woodhouse's toad (*Anaxyrus woodhousii*), glass mountains coral-root (*Hexalectris nitida*), Strecker's chorus frog (*Pseudacris streckeri*), Cedar-elm sugarberry series, and the ash-juniper-oak series. In addition, a bird rookery was identified on the northern tip of SCR. The species assemblage was not listed. (TPWD 2020c)

Species located onsite or potentially occurring near the CPNPP site, or within either county occurring within a 6-mile radius of the site, that are listed as threatened or endangered by these agencies are described below. Consultation letters with state and federal agencies are provided in Attachment C.

3.7.8.1 Federally Listed Species

A total of five species are federally protected under the Endangered Species Act (ESA) with a probability of occurring within the 6-mile radius (Table 3.7-4) (USFWS 2021a). Golden-cheeked warblers (*Setophaga chrysoparia*), piping plovers, rufa red knots, whooping cranes, and Texas fawnsfoot are known to occur in both Hood and Somervell counties and are listed as endangered, threatened, or candidate species (USFWS 2022a; USFWS 2021b). The ecological requirements for these species are summarized below. No federally listed species are known to exist at the CPNPP site or along the transmission line ROWs.

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to any special status or protected species.

3.7.8.1.1 Golden-Cheeked Warbler (Setophaga chrysoparia)

Golden-cheeked warblers are federally and state-listed as endangered. Golden-cheeked warblers nest only in central Texas in juniper-oak woodlands. They require old growth forest with a dense tree canopy where they forage for a variety of insects, including caterpillars. In early March, golden-cheeked warblers begin arriving in central Texas from their wintering grounds in Mexico, Honduras, Nicaragua, and Guatemala. Their stay in Texas lasts until about the end of July, when they begin departing to take advantage of more abundant winter food supplies south of the border. The males arrive first and can be seen and heard at the tops of the tallest oak and juniper trees. When the females arrive a few days to a week later, they choose males that sing the loudest and defend their territories most vigorously. Normally, pairs remain together throughout the nesting season. If one partner dies, the remaining partner may attempt to find a new mate. There is evidence from banding experiments that some birds return to the same territories year after year and may even choose the same mate. (USFWS 2021a)

Golden-cheeked warblers lay three to four creamy white eggs. For approximately 12 days, the female warbler incubates the eggs. The male is for the most part inattentive at this time, joining the female only when she forages for insects away from the nest. Hatching occurs rapidly, including instances of all the eggs hatching on the same day. To avoid attracting the attention of predators, eggshells and fecal sacs of the young are either carried away or eaten by the adults. The nestlings fledge at nine days, but remain near the adults for approximately four weeks, begging for food. By the third week, the young birds are foraging for themselves and can fly as well as the adults. By mid-July they are ready for the journey south. (USFWS 2021a)

Habitat loss or degradation is the main reason the golden-cheeked warbler is endangered. The clearing of old juniper woodlands for livestock grazing and urban expansion has decreased the area available for nesting. Habitat for the golden-cheeked warbler exists near SCR and individuals have been documented within six miles of CPNPP (eBird 2021; TPWD 2020c). However, informal surveys of the CPNPP site for the golden-cheeked warbler and the black-capped vireo were conducted during April 2007 at various times of day over the course of three days. Recordings of the songs and calls of both species were studied prior to field survey, and survey methods consisted of walking transects on an east/west axis spaced approximately 100 m apart. Neither species was audibly nor visually identified during that survey. (Luminant 2013b)

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.2 Piping Plover (Charadrius melodus)

Piping plovers are federally, and state listed as threatened. Piping plovers are small shorebirds that are approximately 7 inches long. During the breeding season, adult birds are sandy gray above with a white collar and underparts. They have a black band that stretches across the forehead between the eyes and a black band also develops around the neck. Legs are orange and the bill is orange with a black tip. During the non-breeding season, the feathers on the back are paler and the black bands on the forehead and neck are not present. The bill becomes all black. Piping plovers breed from the northern Great Plains through North and South Dakota and southward along major rivers to northern Kansas. They can be found breeding on the beaches of Lake Superior, Lake Michigan, and Lake Huron in Michigan and Wisconsin. The Atlantic population breeds along the coast of New England from Novia Scotia through the mid-Atlantic coast down to North Carolina. Little is known about their overwintering territory. The population of piping plovers that breeds in the Great Plains region spends the winter along the Gulf Coast, while the population that breeds along the Atlantic coast, spends the winters further down the Atlantic coast near Florida. They are also thought to overwinter in Mexico, the Bahamas, and Cuba. Fall migration peaks between August and September but can occur from July through November. Spring migration peaks by mid-April and most birds have left overwintering sites by mid-May. (Elliott-Smith and Haig 2004)

Nests are constructed in sand, shells, or gravel covered ground near patches of grass, away from water, and near a large object such as a log. Nests are simply scrapes 1 to 2 centimeters deep scratched into the ground; they may or may not be lined with pebbles or shells. Females typically lay four eggs, which are incubated for approximately 20–30 days by both the males and females. Both parents also brood the young birds after hatching. Chicks forage near their parents and remain with family groups through fledging, which can occur between 21–35 days after hatching. Piping plovers prefer wide and sparsely vegetated beaches and have been documented breeding on alkali lakes, barrier islands, reservoirs, rivers, and on sand bars. Similar habitat on beaches, mudflats, and sandflats along the Gulf of Mexico and Atlantic coasts are preferred during the winter months. Threats to this species include habitat degradation and loss, particularly from development and beach stabilization projects (Elliott-Smith and Haig 2004).

Piping plovers are only federally considered for wind projects but are also state listed as threatened for both Hood and Somervell counties (TPWD 2022a; TPWD 2022b; USFWS 2021a). Potential habitat for the piping plover likely exists along the Brazos River, which is within the 6-mile vicinity of CPNPP; however, review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c).

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.3 Rufa Red Knot (Calidris canutus rufa)

The rufa red knot is federally listed as threatened. It is a robin-sized shorebird and a master of long-distance aviation. Some rufa red knots fly more than 9,300 miles from south to north every spring and repeat the trip in reverse every autumn, making this bird one of the longest-distance migrants in the animal kingdom. The rufa red knot's unique and impressive life history depends on suitable habitat, food, and weather conditions throughout a network of far-flung sites across the western hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. (USFWS 2021b)

The rufa red knot spends most of the year in flocks, sometimes with other species. As they head north to breed in the tundra of the central Canadian Arctic, their plumage becomes rusty red. The birds return to gray as they head south to wintering grounds at the southern tip of South America (Tierra del Fuego), in northern Brazil, throughout the Caribbean, and along the southeastern and Gulf coasts of the U.S. into Mexico. Rufa red knots feed on invertebrates, especially small clams, mussels, and snails, but also crustaceans, marine worms, and horseshoe crab (Limulus polyphemus) eggs. On the breeding grounds knots mainly eat insects. (USFWS 2021b)

Large flocks of rufa red knots arrive at stopover areas each spring, with many of the birds flying directly from northern Brazil. Spring migration is timed to coincide with the spawning season for the horseshoe crab, whose eggs provide a rich, easily digestible food source. Because it provides abundant horseshoe crab eggs, Delaware Bay is the single most important spring stopover habitat, supporting an estimated 50 to 80 percent of all migrating rufa red knots each year. Mussel beds and small clams on the Atlantic coast are also important food sources for migrating knots, in both spring and fall. Some rufa red knots that winter on the Gulf coast take an overland migration route, stopping along the rivers of the Mississippi drainage and at saline lakes in the northern U.S. and southern Canadian plains. (USFWS 2021b)

Rufa red knots are only federally considered for protection for wind projects; however, potential habitat for the rufa red knot likely exists along the Brazos River, which is within the 6-mile radius of CPNPP (USFWS 2021a). A review of the TXNDD yielded no observations of this species within six miles of the CPNPP site (TPWD 2020c). eBird data was not available for the rufa red knot.

Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Should rufa red knots be observed on or near CPNPP, adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.4 Whooping Crane (Grus americana)

The whooping crane is federally, and state listed as endangered. Once fairly widespread on the northern prairies, it was brought to the brink of extinction in the 1940s, but strict protection has brought the wild population back to well over one hundred. The flock that winters on the central Texas coast flies 2,400 miles north to nest in Wood Buffalo National Park in central Canada; this remote breeding area was not discovered until 1954. (Audubon 2021a)

The tallest bird in North America, the whooping crane breeds in the wetlands of Wood Buffalo National Park in northern Canada and spends the winter on the Texas coast at Aransas National Wildlife Refuge near Rockport. Whooping cranes begin their fall migration south to Texas in mid-September and begin the spring migration north to Canada in late March or early April. Whooping cranes migrate more than 2,400 miles a year. As many as 1,400 whooping cranes migrated across North America in the mid-1800s. By the late 1930s, the Aransas population was down to just 18 birds. Because of well-coordinated efforts to protect habitat and the birds themselves, the population is slowly increasing. In 1993, the population stood at 112. In the spring of 2002, it is estimated that there were 173 whooping cranes—a small, but important, increase. Today, three populations exist: one in the Kissimmee Prairie of Florida, the only migratory population at Aransas National Wildlife Refuge, and a very small captive-bred population in Wisconsin. (TPWD 2021d)

Whooping cranes mate for life but will accept a new mate if one dies. These long-lived cranes can live up to 24 years in the wild. The mated pair shares brooding duties: either the male or the

female is always on the nest. Generally, one chick survives. It can leave the nest while quite young but is still protected and fed by its parents. Chicks are rust-colored when they hatch; at about 4 months, chicks' feathers begin turning white. By the end of their first migration, they are brown and white, and as they enter their first spring, their plumage is white with black wing tips. (TPWD 2021d)

The hatchlings will stay with their parents throughout their first winter, and separate when the spring migration begins. The sub-adults form groups and travel together. Cranes live in family groups made up of the parents and one or two offspring. In the spring, whooping cranes perform courtship displays (loud calling, wing flapping, leaps in the air) as they get ready to migrate to their breeding grounds. Their diet consists of blue crabs, clams, frogs, minnows, rodents, small birds, and berries. Whooping cranes migrate throughout the central portion of the state from the eastern panhandle to the DFW area and south through the Austin area to the central coast during October-November and again in April. Their preferred stopover habitat includes areas along rivers, in grain fields, and in shallow wetlands. (TPWD 2021d)

Suitable stopover habitat exists within the 6-mile radius. A review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Should whooping cranes be observed on or near CPNPP, adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

3.7.8.1.5 Texas Fawnsfoot (Truncilla macrodon)

The Texas fawnsfoot is federally listed as proposed threatened and state listed as threatened. Historically, they are known to be located in the Brazos and Colorado River drainages of central Texas. In the Brazos River basin, historic records of the Texas fawnsfoot have primarily come from the mainstem of the Brazos River, though several observations have been reported from its large tributaries. (TAMU 2017)

Currently, little is known about the life history or reproductive requirements of Texas fawnsfoot. Like other freshwater mussel species, it is likely an obligate ectoparasite on one or more host-fish species, and its congeners appear to be long-term brooders that are host specialists of freshwater drum. Based on recent observations from field surveys throughout Texas fawnsfoot's range, adults appear to occur most often in bank habitats and occasionally in backwater, riffle, and point bar habitats with low to moderate water velocities and fine or coarse sediments. These mesohabitat types appear to serve as flow refuges, where near-bed shear stress remains low during high flow events. (TAMU 2017)

Specimen of Texas fawnsfoot have been documented within 6 miles of CPNPP in the Brazos River (TPWD 2020c). However, it is considered intolerant of reservoirs and therefore is not likely to be found in SCR (TPWD 2022a).

3.7.8.2 State Listed Species

A total of nine state-listed species are listed as potentially occurring in Hood and Somervell counties: black rail, golden-cheeked warbler, interior least tern, piping plover, white-faced ibis, whooping crane, THL, Brazos River water snake (*Nerodia harteri*), and Texas fawnsfoot (TPWD 2022a; TPWD 2022b). Golden-cheeked warblers, piping plovers, whooping cranes, and Texas fawnsfoot are also federally protected and described in Section 3.7.8.1. Ecological descriptions and requirements for the remaining species are summarized below. Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.1 Black Rail (Laterallus jamaicensi)

The black rail is a tiny marsh bird, generally no bigger than a sparrow. They are extremely secretive and walks or runs through the marsh making them rarely seen in flight. In very dense cover, black rails may get around by using the runways made by mice. The distinctive short song of this bird is given mostly late at night, so the bird may go unnoticed in some areas. They are fairly common at a few coastal points, however, its status inland in the east is rather mysterious. (Audubon 2021b)

Black rails prefer tidal marshes on the coast and inhabit grassy marshes inland (Audubon 2021b). They favor very shallow water, or damp soil with scattered puddles. They prefer dense stands of spartina and other grasses, salicornia, rushes, sedges. Black rails build nests a couple of inches above ground in shallow water in a clump of vegetation, often at a spot slightly higher than surrounding marsh. Their nests are well-constructed cups of marsh plant material, usually with a domed top woven over it. A ramp of dead vegetation leads from nest entrance down to ground. Adults may continue to add to the nest, building it up to higher level, in areas where nest might be threatened by high tides. Black rails can have between 3–13 eggs, but usually have 6–8. The eggs are white to pale buff and dotted with brown spots. Incubation is completed by both sexes and lasts from 17–20 days. The young are downy and leave nest within a day after hatching. They feed on wide variety of insects, including aquatic beetles, and also eat spiders, snails, small crustaceans, and seeds of bulrush and other marsh plants, especially in winter. (Eddleman 1994)

A review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c).

3.7.8.2.2 Interior Least Tern (Sternula antillarum athalassos)

Interior least terns are the smallest North American terns. Adults average 8 to 10 inches in length, with a 20-inch wingspan. Their narrow, pointed wings make them streamlined flyers. Males and females are similar in appearance. Breeding adults are gray above and white below, with a black cap, black nape and eye stripe, white forehead, yellow bill with a black or brown tip, and yellow to orange legs. Hatchlings are about the size of ping-pong balls and are yellow and

buff with brown mottling. Fledglings are grayish brown and buff colored, with white heads, dark bills and eye stripes, and stubby tails. Young terns acquire adult plumage after their first molt at about one year, but do not breed until they are two to three years old. The interior least tern's call has been described as a high pitched "kit," "zeep," or "zreep." (TPWD 2021e)

Interior least terns arrive at breeding areas from early April to early June and spend three to five months on the breeding grounds. Upon arrival, adult terns usually spend two to three weeks in noisy courtship. This includes finding a mate, selecting a nest site, and strengthening the pair bond. Courtship often includes the "fish flight," an aerial display involving aerobatics and pursuit, ending in a fish transfer on the ground between two displaying birds. Courtship behaviors also include nest preparation and a variety of postures and vocalizations. (TPWD 2021e)

Interior least terns nest in colonies, where nests can be as close as 10 feet but are often 30 feet or more apart. The nest is a shallow depression in an open, sandy area, gravelly patch, or exposed flat. Small twigs, pieces of wood, small stones or other debris usually occur near the nest. Egg-laying begins in late May, with the female laying two to three eggs over a period of three to five days. The eggs are pale to olive buff and speckled or streaked with dark purplish brown, chocolate, or blue-gray markings. Both parents incubate the eggs, with incubation lasting about 20–22 days. The chicks hatch within one day of each other and remain in the nest for about a week. As they mature, they begin to wander from the nest, seeking shade and shelter in clumped vegetation and debris. Chicks are capable of flight within three weeks, but the parents continue to feed them until fall migration. Interior least terns will renest until late July if clutches or broods are lost. (TPWD 2021e)

The breeding season is usually complete by late August. Prior to migration, the terns gather at staging areas with high fish concentrations. They gather to rest and eat prior to the long flight to southern wintering grounds. Low, wet sand or gravel bars at the mouths of tributary streams and floodplain wetlands are important staging areas. Interior least terns often return to the same breeding site, or one nearby, year after year. (TPWD 2021e)

Nesting habitat of the interior least tern includes bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. The birds prefer open habitat and tend to avoid thick vegetation and narrow beaches. Sand and gravel bars within a wide unobstructed river channel, or open flats along shorelines of lakes and reservoirs, provide favorable nesting habitat. Nesting locations are often at the higher elevations away from the water's edge, since nesting usually starts when river levels are high and relatively small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sandbars and beaches. Highly adapted to nesting in disturbed sites, terns may move colony sites annually, depending on landscape disturbance and vegetation growth at established colonies. For feeding, interior least terns need shallow water with an abundance of small fish. Shallow water areas of lakes, ponds, and rivers located close to nesting areas are preferred. As natural nesting sites have become scarce, the birds have used sand and gravel pits, ash disposal areas of power plants, reservoir shorelines, and other manmade sites. (TPWD 2021e)

Habitat may exist along SCR for the interior least tern. A review of the TXNDD data yielded no observations of this species within six miles of the CPNPP site (TPWD 2020c). eBird data was not available for the interior least tern. Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.3 White-Faced Ibis (Plegadis chihi)

The white-faced ibis is state listed at threatened. The white-faced ibis is a dark, chestnut colored-bird with green or purple on its head and upper parts, and a long, down-curved bill. It is very similar in appearance to the glossy ibis except during the breeding season when the white-faced ibis has a narrow border of white feathers all around its bare facial skin at the base of the bill. This ibis has reddish legs and feet and red bare skin on the face around the eyes. (TPWD 2021f)

The white-faced ibis seems to prefer freshwater marshes, where it can find insects, newts, leeches, earthworms, snails and especially crayfish, frogs, and fish. They roost on low platforms of dead reed stems or on mud banks. During the nesting season, they are colonial and will construct a deep cup of dead reeds among beds of bulrushes, on floating mats of dead plants or they may nest in trees. The areas where these nests are built usually are where water is less than three feet deep. The nests are lined with grasses in preparation for the ibis nestlings. In Texas, between April and June, three to four greenish-blue eggs will hatch after an incubation period of approximately 21–22 days. The male and female both share in the parenting responsibilities of incubation and brooding of the nestlings. Nestlings initially are covered with a dull, blackish down and are noted to be uncommonly timid. (TPWD 2021f)

The white-faced ibis nests in isolated colonies from Oregon to Kansas, but its center of greatest abundance seems to be in Utah, Texas, and Louisiana. In Texas, they breed and winter along the Gulf Coast and may occur as migrants in the panhandle and west Texas. (TPWD 2021f)

Habitat exists for the white-faced ibis along the Brazos River and portions surrounding SCR. A review of the TXNDD and eBird species observation data yielded multiple observations of this species along SCR and the Brazos River (eBird 2021; TPWD 2020c). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.4 Texas Horned Lizard (Phrynosoma cornutum)

The THL is state listed as threatened. The THL is a flat-bodied and fierce-looking lizard. The head has numerous horns, all of which are prominent, with two central head spines being much longer than any of the others. This lizard is brownish with two rows of fringed scales along each

side of the body. On most THLs, a light line can be seen extending from its head down the middle of its back. It is the only species of horned lizard to have dark brown stripes that radiate downward from the eyes and across the top of the head. (TPWD 2021g)

They can be found in arid and semiarid habitats in open areas with sparse plant cover. Because horned lizards dig for hibernation, nesting, and insulation purposes, they commonly are found in loose sand or loamy soils. THLs range from the south-central United States to northern Mexico, throughout much of Texas, Oklahoma, Kansas, and New Mexico. (TPWD 2021g)

A review of the TXNDD species observation data yielded no observations of this species within 6 miles of the CPNPP site (TPWD 2020c). During the site visits for the CPNPP Unit 3 and 4 COLA, harvester ant colonies were found onsite. Harvester ants are the THL's primary source of food and can be indicative of the presence of individuals onsite. Following this observation, the site was surveyed for individuals, and none were found onsite. (Luminant 2013b) There have been no recorded observations of the THL at the CPNPP site since the 2007 survey. The greatest threat to the THL would be during ground disturbing activities, none of which are currently planned in areas the THL would inhabit. Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practice by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations should prevent potentially negative impacts to any special status and protected species.

3.7.8.2.5 Brazos Water Snake (Nerodia harteri)

The Brazos water snake is also known as Harter's water snake. This snake has one of the most restricted ranges of any Texas snake, found only along the upper portions of the Brazos River drainage. The snake is a mix of brown and gray or a green and brown combination. They can be identified by the four rows of dark dorsal spots that run the length of its body, giving it a checkerboard appearance. The snake has a pink or orange-colored belly, and its neck is often a yellow or cream color. (BRA 2021)

The Brazos water snake enjoys residing in water that is fast-flowing, rocky, and free of dense vegetation. This snake takes cover under rocks in water or in vegetation along shore. Juveniles use medium to large flat rocks on unshaded shores for hiding and rocky shallows for feeding, while adults inhabit rocky riffles as well as a wider range of habitats in pools and lakes. A daytime hunter, the Brazos water snake requires rocks within its habitat to provide cover and security. They typically eat small fish but have been recorded eating a variety of salamanders, frogs, and crayfish. (BRA 2021; McBride 2009)

The Brazos water snake has been documented within 6 miles of CPNPP in the Brazos River (TPWD 2020c). Compliance with all regulatory requirements associated with protected species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to this species.

Of importance, CPNPP does not have any current plan or program in place to manage or alter the site's land outside the plant area including tree or habitat removal. Therefore, threatened, and endangered species identified within the 6-mile radius are unlikely to be affected by the continued operation of CPNPP.

3.7.8.2.6 Brazos heelsplitter (Potamilus streckersoni)

The Brazos heelsplitter is state listed as threatened. It is a rare freshwater mussel with a thin, smooth, elliptical shell and a straight hinge line. The beaks are slightly elevated above the hinge line. External shell color is tan to dark brown or black that fades to a lighter color on the beaks. Some specimens have low, poorly developed wing-like structures that extend above the hinge line; however, these are usually absent or lacking. The interior shell surface (nacre) is shiny and purple throughout or white to bluish white, with a pink or purple tint along the hinge line. (USFWS 2022b)

The species is reported to occur in streams, large rivers, and some reservoirs. In riverine systems, the Texas heelsplitter occurs most often in nearshore habitats such as banks and backwater pools but occasionally in main channel habitats such as riffles. They are typically found in standing to slow-flowing water in soft substrates consisting of silt, mud, or sand but occasionally in moderate flows with gravel and cobble substrates (TPWD 2022a). The species historical range included Louisiana and Texas. However, the current known range for the species does not occur within 6 miles of the CPNPP site. (USFWS 2022b)

3.7.8.3 <u>Species Protected Under the Bald and Golden Eagle Protection Act</u>

Bald and Golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA was originally enacted in 1940 (16 U.S.C. 668-668c) and it prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald or golden eagles, including their parts, nests, eggs, or feathers. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export, or import, at any time or any manner, any bald eagle … [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." (USFWS 2020b)

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts resulting from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment. (USFWS 2020b)

Bald eagles are large birds distinguished by a white head and white tail feathers. Bald eagles do not get their characteristic white head and tail until about 5 years of age, remaining mostly brown until then. This can cause identification confusion with golden eagles. However, golden eagles have feathers on the legs all the way down, while bald eagles only have feathers on the tops of the legs. Both males and females are large birds with females weighing up to 14 pounds with an 8-foot wingspan, while males are slightly smaller, averaging 10 pounds with a 6-foot wingspan. Eagles mate for life. (USFWS 2019)

Several compounding factors led to the bald eagle's decline. Decline started in the late 1800s with the demise of many waterfowl and shorebird species that were overhunted for their plumage, leading to a loss of prey. Eagles often succumbed to lead poisoning after consuming carrion that had been killed with lead shot. The biggest threat that led to the most significant decline was the pesticide commonly known as DDT (dichlorodiphenyltrichloroethane) that became popular as a means to kill insects after World War II. DDT residues ended up in waterways, where it was ingested by aquatic organisms and fish. Through a process of biomagnification, eagles were ingesting fish that had high levels of the pesticide in their bodies. DDT caused eggshells to be thin, with most either cracking during incubation or never hatching. By 1963, only 487 nesting pairs of eagles remained. DDT was eventually outlawed, and the bald eagle was placed on the endangered species list. Recovery efforts included protecting nest sites, captive breeding programs, reintroduction efforts, and placing the eagles on the endangered species list. In July of 2007, the bald eagle was removed from the endangered species list, with the ruling becoming effective in August of 2007. (USFWS 2019)

The staple food of bald eagles is fish, but they will feed on waterfowl and small mammals such as rabbits. Eagles are found near rivers, lakes, marshes, estuaries, and seacoasts. They can be found in tall trees that they use for perching, roosting, and nesting. Nests are built in the tops of trees and eagles will re-use and add to the same nest year after year. Nests can be up to 10 feet across and weigh up to a half ton. If trees are NA, eagles will nest on cliffs or on the ground. Eagles typically breed once a year and lay 1 to 3 eggs that hatch after an incubation period of approximately 35 days. Young eagles can fly three months after hatching and will leave the nest about a month after that. Causes of eaglet death include human interference, disease, and lack of food. Research indicates that eaglet mortality can be as high as 50 percent in the first year of life (USFWS 2019).

Golden eagles (*Aquila chrysaetos canadensis*) can be found in a variety of habitats from the tundra, through grasslands, forested habitat and woodland-brushlands, and south to arid deserts including Death Valley, California. They are aerial predators and eat small to mid-sized reptiles, birds, and mammals up to the size of mule deer fawns and coyote pups. They also are known to scavenge and utilize carrion. Golden eagles build nests on cliffs or in the largest trees of forested stands that often afford an unobstructed view of the surrounding habitat. Sticks and soft material are added to existing nests, or new nests are constructed to create strong, flat, or bowl-shaped platforms. They avoid nesting near urban habitat and do not generally nest in densely forested habitat. Individuals will occasionally nest near semi-urban areas where housing density is low and in farmland habitat; however, they have been noted to be sensitive to

human presence. Golden eagles migrate from the Canadian provinces and northern tier and northeastern states to milder areas with less snow cover in the winter. During winter, golden eagles are found throughout the continental United States. (USFWS 2011)

Activities on the CPNPP site are evaluated to ensure compliance under the BGEPA and MBTA. Potential habitat for the bald eagle is located on and within the vicinity of the CPNPP site. No bald eagles have been documented at the operational facilities however, they have been observed at SCR (eBird 2021). Eagles observed at SCR have been seen flying, foraging, and resting (eBird 2021). Potential habitat for the golden eagle also exists within 6 miles of CPNPP, however, no golden eagles have been observed at the operational facilities nor near SCR. One golden eagle was observed along the Brazos River in 1979, but none have been observed since (eBird 2021). In addition, no bald or golden eagle nests have been documented onsite. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. There are currently no MBTA permitting requirements associated with the CPNPP site operations or in-scope transmission lines that are under the scope of the CPNPP LRA. A review of the TXNDD data and eBird species observation data yielded several observations of both bald and golden eagles within 6 miles of the CPNPP site (eBird 2021; TPWD 2020c). Compliance with all regulatory requirements associated with this species will continue to be an administrative control practiced by Vistra OpCo for the licensed life of the CPNPP facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to bald eagles.

3.7.8.4 Species Protected Under the Migratory Bird Treaty Act

In addition to species protected under federal and state endangered species acts (ESAs), there are numerous bird species protected under the Migratory Bird Treaty Act (MBTA) that may visit CPNPP. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter or offer for sale, or purchase or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations (USFWS 2020b). Birds of conservation concern in particular conservation regions in the continental United States that may occur in Hood and Somervell counties include the following species: Harris's sparrow (*Zonotrichia querula*), lesser yellowlegs (*Tringa flavipes*), red-headed woodpecker (*Melanerpes erythrocephalus*), and semipalmated sandpiper (*Calidris pusilla*).

The Harris's sparrow breeds exclusively in northern Canada in areas of open tundra mixed with white pine, black spruce, larch, alder, and willow. In winter they use hedgerows, agricultural fields, shrubby pastures, backyards, and shrubby areas near streams of the southern Great Plains. Like other sparrows, Harris's sparrows hop along the ground scratching at the surface or jump to pick food off a low branch. Although they spend a lot of time foraging on the ground, they hop into small shrubs and trees to rest or to sing. If they feel threatened, they also tend to fly into a tree or shrub rather than run along the ground to seek cover. (AAB 2021a)

No Harris's sparrows have been documented within the operational facilities of CPNPP, however, there are many documented occurrences within 6-miles of the site (eBird 2021). Exact

site usage is not fully documented; however, photos from some observations show the Harris's sparrow foraging on the ground (eBird 2021).

The lesser yellowlegs prefers shallow, weedy wetlands, and flooded fields across North America during migration. It's smaller with a shorter, more needlelike bill than the greater yellowlegs, but otherwise looks very similar. It breeds in the meadows and open woodlands of boreal Canada. Lesser yellowlegs walk in a deliberate, high-stepping manner, occasionally darting forward in pursuit of prey. They often travel in loose flocks of half a dozen or more, and sometimes numbering into the thousands at migratory stopover sites. They are fairly tolerant of other shorebird species during migration and in the winter, but birds on breeding territories are aggressive defenders of the nest site, flying at intruders and persistently attempting to chase them from the area. During migration and throughout the winter, Lesser yellowlegs use a wide variety of fresh and brackish wetlands, including mudflats, marshes, lake and pond edges, wet meadows, sewage ponds, and flooded agricultural fields such as rice paddies. They tend to be found in vegetated wetlands rather than in bare habitats, contributing to their "marshpiper" nickname. (AAB 2021b)

No lesser yellowlegs have been documented within the operational facilities of CPNPP, however, there are many documented occurrences within six miles of the site (eBird 2021). Exact site usage is not fully documented, however, photos from some observations show the lesser yellowlegs resting in wetland areas (eBird 2021).

The semipalmated sandpiper is a small sandpiper with a short neck and a moderately long bill that may droop slightly at tip. They have moderately long legs and have a black center of rump and tail. Their legs are black, and their back is gray-brown. They breed on open tundra, generally near water, and winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows. (AAB 2021c)

No semipalmated sandpipers have been documented within the operational facilities of CPNPP; however, there are two documented occurrences within six miles of the site along SCR (eBird 2021). Exact site usage is not fully documented, and no photos were available from observation areas (eBird 2021).

Red-headed woodpeckers are medium-sized woodpeckers with fairly large, rounded heads, short, stiff tails, and powerful, spike-like bills. They inhabit scattered open woodlots in agricultural areas, dead timber in swamps, or pine savannas. Red-headed woodpeckers breed in deciduous woodlands with oak or beech, groves of dead or dying trees, river bottoms, burned areas, recent clearings, beaver swamps, orchards, parks, farmland, grasslands with scattered trees, forest edges, and roadsides. In the northern part of their winter range, they live in mature stands of forest, especially oak, oak-hickory, maple, ash, and beech. In the southern part, they live in pine and pine-oak. They are somewhat nomadic; in a given location, they can be common one year and absent the next. Red-headed woodpeckers are known to breed and overwinter in Texas. (AAB 2021d)

No red-headed woodpeckers have been documented within the operational facilities of CPNPP; however, there are several documented occurrences within six miles of the site (eBird 2021). Exact site usage is not fully documented in the observations, but photos attached to observations near the site showed them feeding and nesting (eBird 2021).

No planned refurbishment activities, construction activities outside of previously disturbed areas, or land alterations are planned. Further, CPNPP does not have natural draft cooling towers and the tallest plant structures are the reactor containment structures and the metrological tower which is located away from structures. The aboveground in-scope transmission lines are those from the turbine buildings to the switchyard adjacent to the power block. Given the lower profile of the structures and the short distance of the in-scope transmission lines, these structures would not pose a bird collision hazard beyond that considered in the 2013 GEIS.

3.7.8.5 Essential Fish Habitat

A review of the NOAA Essential Fish Habitat (EFH) was conducted to determine the location of EFH within 6 miles of CPNPP. NOAA only provides EFH for federally managed fish and invertebrates. EFH does not apply to enclosed freshwater habitats; subsequently, no EFH is located within the vicinity of CPNPP, nor were any EFH areas protected from fishing. As habitat areas of particular concern (HAPC) are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of CPNPP (NOAA 2020).

Table 3.7-1 Phytoplankton and Zooplankton Taxa in the Vicinity of CPNPP

Phytoplankton	Zooplankton
Prymnesium parvum	*Cyclopoida* spp.
Leptosira terrestris	*Calanoida* spp.
	Nauplii spp.
	Rotifera spp.
	Bosminidae spp.
	Daphniidae spp.
	Conchostraca spp.

(BWI 2008)

Table 3.7-2 Common Fish Species in the Vicinity of CPNPP

Common Name	Scientific Name
Black bullhead	*Ameiurus melas*
Bluegill sunfish	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Flathead catfish	*Pylodictis olivaris*
Freshwater drum	*Aplodinotus grunniens*
Gambusia	*Gambusia spp.*
Gizzard shad	*Dorosoma cepedianum*
Green sunfish	*Lepomis cyanellus*
Inland silverside	*Menidia beryllina*
Largemouth bass	*Micropterus salmoides*
Longear sunfish	*Lepomis megalotis*
Palmetto bass	*Morone chrysops x M. saxatilis*
Redear sunfish	*Lepomis microlophus*
Threadfin shad	*Dorosoma petenense*
Tilapia	*Oreochromis spp.*
Warmouth	*Lepomis gulosus*
Western mosquitofish	*Gambusia affinis*
Yellow bullhead	*Ameiurus natalis*

(BWI 2008)

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 1 of 9)

Common Name	Scientific Name
Amphibians	
Blanchard's cricket frog	*Acris blanchardi*
Cope's gray tree frog	*Dryophytes chrysoscelis*
Gulf coast toad	*Incilius nebulifer*
Plains leopard frog	*Gastrophryne olivacea*
Strecker's chorus frog	*Pseudacris streckeri*
Western narrow-mouthed toad	*Gastrophryne olivacea*
Woodhouse's toad	*Anaxyrus woodhousii*
Birds	
American barn owl	*Tyto furcata*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Spinus tristis*
American kestrel	*Falco sparverius*
American pipit	*Anthus rubescens*
American robin	*Turdus migratorius*
Bald eagle	*Haliaeetus leucocephalus*
Barn swallow	*Hirundo rustica*
Belted kingfisher	*Megaceryle alcyon*
Bewick's wren	*Thryomanes bewickii*
Black-and-white warbler	*Mniotilta varia*
Black-chinned hummingbird	*Archilochus alexandri*
Black-crested titmouse	*Baeolophus atricristatus*
Black-throated green warbler	*Setophaga virens*
Black vulture	*Coragyps atratus*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue grosbeak	*Passerina caerulea*
Blue-headed vireo	*Vireo solitarius*
Blue jay	*Cyanocitta cristata*
Blue-winged teal	*Anas discors*
Brewer's blackbird	*Euphagus cyanocephalus*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 2 of 9)

Common Name	Scientific Name
Broad-winged hawk	*Buteo platypterus*
Brown creeper	*Certhia americana*
Brown-headed cowbird	*Molothrus ater*
Brown thrasher	*Toxostoma rufum*
Bufflehead	*Bucephala albeola*
Canada goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Canyon wren	*Catherpes mexicanus*
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thryothorus ludovicianus*
Cassin's sparrow	*Peucaea cassinii*
Cattle egret	*Bubulcus ibis*
Cave swallow	*Petrochelidon fulva*
Cedar waxwing	*Bombycilla cedrorum*
Chimney swift	*Chaetura pelagica*
Chipping sparrow	*Spizella passerina*
Chuck-Wills-widow	*Antrostomus carolinensis*
Clay-colored sparrow	*Spizella pallida*
Cliff swallow	*Petrochelidon pyrrhonota*
Common grackle	*Quiscalus quiscula*
Common nighthawk	*Chordeiles minor*
Common poorwill	*Phalaenoptilus nuttallii*
Common yellowthroat	*Geothlypis trichas*
Crested caracara	*Caracara cheriway*
Dark-eyed junco	*Junco hyemalis*
Dickcissel	*Spiza americana*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker	*Picoides pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe	*Sayornis phoebe*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 3 of 9)

Common Name	Scientific Name
Eastern screech owl	*Megascops asio*
Eastern towhee	*Pipilo erythrophthalmus*
Eastern wood-pewee	*Contopus virens*
Eurasian collared dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Field sparrow	*Spizella pusilla*
Fox sparrow	*Passerella iliaca*
Franklin's gull	*Leucophaeus pipixcan*
Gadwall	*Anas strepera*
Golden-cheeked warbler	*Setophaga chrysoparia*
Golden-crowned kinglet	*Regulus satrapa*
Grasshopper sparrow	*Ammodramus savannarum*
Gray catbird	*Dumetella carolinensis*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Great-tailed grackle	*Quiscalus mexicanus*
Greater roadrunner	*Geococcyx californianus*
Greater white-fronted goose	*Anser albifrons*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Harris's sparrow	*Zonotrichia querula*
Hermit thrush	*Catharus guttatus*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Inca dove	*Columbina inca*
Indigo bunting	*Passerina cyanea*
Killdeer	*Charadrius vociferus*
Ladder-backed woodpecker	*Picoides scalaris*
Lark sparrow	*Chondestes grammacus*
Least flycatcher	*Empidonax minimus*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 4 of 9)

Common Name	Scientific Name
Le Conte's sparrow	*mmodramus leconteii*
Lesser goldfinch	*Spinus psaltria*
Lesser scaup	*Aythya affinis*
Lincoln's sparrow	*Melospiza lincolnii*
Little blue heron	*Egretta caerulea*
Loggerhead shrike	*Lanius ludovicianus*
Louisiana waterthrush	*Parkesia motacilla*
Magnolia warbler	*Setophaga magnolia*
Mallard	*Anas platyrhynchos*
Mississippi kite	*Ictinia mississippiensis*
Mourning dove	*Zenaida macroura*
Nashville warbler	*Leiothlypis ruficapilla*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis*
Northern flicker	*Colaptes auratus*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Olive-sided flycatcher	*Contopus cooperi*
Orange-crowned warbler	*Leiothlypis celata*
Orchard oriole	*Icterus spurius*
Painted bunting	*Passerina ciris*
Peregrine falcon	*Falco peregrinus*
Pied-billed grebe	*Podilymbus podiceps*
Pine siskin	*Spinus pinus*
Pine warbler	*Setophaga pinus*
Prairie falcon	*Falco mexicanus*
Purple finch	*Haemorhous purpureus*
Purple martin	*Progne subis*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-breasted merganser	*Mergus serrator*
Red-breasted nuthatch	*Sitta canadensis*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 5 of 9)

Common Name	Scientific Name
Red-eyed vireo	*Vireo olivaceus*
Redhead	*Aythya americana*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Rock pigeon	*Columba livia*
Ruby-crowned kinglet	*Regulus calendula*
Ruby-throated hummingbird	*Archilochus colubris*
Ruddy duck	*Oxyura jamaicensis*
Rufous-crowned sparrow	*Aimophila ruficeps*
Sandhill crane	*Grus canadensis*
Savannah sparrow	*Passerculus sandwichensis*
Scissor-tailed flycatcher	*Tyrannus forficatus*
Sharp-shinned hawk	*Accipiter striatus*
Snow goose	*Chen caerulescens*
Snowy egret	*Egretta thula*
Solitary sandpiper	*Tringa solitaria*
Song sparrow	*Melospiza melodia*
Spotted sandpiper	*Actitis macularius*
Spotted towhee	*Pipilo maculatus*
Summer tanager	*Piranga rubra*
Swainson's hawk	*Buteo swainsoni*
Swainson's thrush	*Catharus ustulatus*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
White-crowned sparrow	*Zonotrichia leucophrys*
White-eyed vireo	*Vireo griseus*
White-throated sparrow	*Zonotrichia albicollis*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 6 of 9)

Common Name	Scientific Name
White-winged dove	*Zenaida asiatica*
Wild turkey	*Meleagris gallopavo*
Willet	*Tringa semipalmata*
Willow flycatcher	*Empidonax traillii*
Wilson's warbler	*Cardellina pusilla*
Wood duck	*Aix sponsa*
Upland sandpiper	*Bartramia Lesson*
Vesper sparrow	*Pooecetes gramineus*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Yellow-billed cuckoo	*Coccyzus americanus*
Yellow-breasted chat	*Icteria virens*
Yellow-rumped warbler	*Setophaga coronata*
Yellow warbler	*Setophaga petechia*
Crustaceans	
Harris mud crab	*Rhithropanopeus harrisii*
Invertebrates	
American painted lady	*Vanessa virginiensis*
Arogos skipper	*Atrytone arogos*
Black swallowtail	*Papilio polyxenes*
Black witch	*Ascalapha odorata*
Bordered patch	*Chlosyne lacinia*
Checkered white	*Pontia protodice*
Common buckeye	*Junonia coenia*
Common checkered skipper	*Pyrgus communis*
Common streaky-skipper	*Celotes nessus*
Dainty sulphur	*Nathalis iole*
Dun skipper	*Euphyes vestris*
Dusky-blue groundstreak	*Calycopis isobeon*
Goatweed leafwing	*Anaea andria*
Gray hairstreak	*Strymon melinus*
Great purple hairstreak	*Atlides halesus*
Hackberry emperor	*Asterocampa celtis*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 7 of 9)

Common Name	Scientific Name
Juniper hairstreak	*Callophrys gryneus*
Juvenal's duskywing	*Erynnis juvenalis*
Monarch	*Danaus plexippus*
Northern cloudywing	*Thorybes pylades*
Orange sulphur	*Colias eurytheme*
Painted lady	*Vanessa cardui*
Pearl crescent	*Phyciodes tharos*
Phaon crescent	*Phyciodes phaon*
Queen	*Danaus gilippus*
Question mark	*Polygonia interrogationis*
Reakirt's blue	*Echinargus isola*
Red admiral	*Vanessa atalanta*
Rustic sphinx	*Manduca rustica*
Sleepy orange	*Abaeis nicippe*
Southern broken-dash	*Wallengrenia otho*
Southern dogface	*Zerene cesonia*
Southern skipperling	*Copaeodes minima*
Variegated fritillary	*Euptoieta claudia*
Mammals	
American beaver	*Castor canadensis*
Black-tailed jackrabbit	*Lepus californicus*
Coyote	*Canis latrans*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Fox squirrel	*Sciurus niger*
Gray fox	*Urocyon cinereoargenteus*
Mexican free-tailed bat	*Tadarida brasiliensis*
Nine-banded armadillo	*Dasypus novemcinctus*
Northern raccoon	*Procyon lotor*
Striped skunk	*Mephitis mephitis*
White tailed deer	*Odocoileus virginianus*
Wild boar	*Sus scrofa*
Virginia opossum	*Didelphis virginiana*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 8 of 9)

Common Name	Scientific Name
Reptiles	
American alligator	*Alligator mississippiensis*
Brazos river water snake	*Nerodia harteri*
Broad-banded copperhead	*Agkistrodon contortrix laticinctus*
Coachwhip	*Coluber flagellum*
Common slider	*Trachemys scripta*
Dekay's brown snake	*Storeria dekayi*
Diamondback water snake	*Nerodia rhombifer*
Eastern hognose snake	*Heterodon platirhinos*
Eastern patch-nosed snake	*Salvadora grahamiae*
Eastern racer	*Coluber constrictor*
Gopher snake	*Pituophis catenifer*
Great plains rat snake	*Pantherophis emoryi*
Greater earless lizard	*Cophosaurus texanus*
Green anole	*Anolis carolinensis*
Lined snake	*Tropidoclonion lineatum*
Little brown skink	*Scincella lateralis*
Mediterranean house gecko	*Hemidactylus turcicus*
Ornate box turtle	*Terrapene ornata*
Plain-bellied water snake	*Nerodia erythrogaster*
Ring-necked snake	*Diadophis punctatus*
Rough earth snake	*Haldea striatula*
Rough green snake	*Opheodrys aestivus*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Slender glass lizard	*Ophisaurus attenuatus*
Smooth softshell turtle	*Apalone mutica*
Snapping turtle	*Chelydra serpentina*
Speckled kingsnake	*Lampropeltis holbrooki*
Spiny softshell turtle	*Apalone spinifera*
Texas blind snake	*Rena dulcis*
Texas cooter	*Pseudemys texana*
Texas spiny lizard	*Sceloporus olivaceus*

Table 3.7-3 Terrestrial Species Likely to be Observed in Hood and Somervell Counties (Sheet 9 of 9)

Common Name	Scientific Name
Texas spotted whiptail	*Cnemidophorus gularis*
Western diamondback rattlesnake	*Crotalus atrox*
Western rat snake	*Pantherophis obsoletus*
Western ribbon snake	*Thamnophis proximus*

(BMNA 2020; eBird 2021; Haynie 2017; iNaturalist 2020a; iNaturalist 2020b; iNaturalist 2020c)

Table 3.7-4 Federal and State Listed Threatened and Endangered Species Occurring in Hood and Somervell Counties[a]

Common Name	Scientific Name	Federal Status	State Status	Habitat Present within 6 miles of CPNPP
Birds				
Black rail	*Laterallus jamaicensis*	—	T	Y
Golden-cheeked warbler	*Setophaga chrysoparia*	E	E	Y
Piping plover	*Charadrius melodus*	T[b]	T	Y
Rufa red knot	*Calidris canutus rufa*	T[b]	—	Y
White-faced ibis	*Plegadis chihi*	—	T	Y
Whooping crane	*Grus americana*	E	E	Y
Mollusks				
Texas fawnsfoot	*Truncilla macrodon*	C	T	Y
Brazos heelsplitter	*Potamilus streckersoni*	—	T	N
Reptiles				
Brazos water snake	*Nerodia harteri*	—	T	Y
THL	*Phrynosoma cornutum*	—	T	Y

(TPWD 2022a; TPWD 2022b; USFWS 2022a)

a. All species are listed for both counties.

b. Only federally considered for wind projects.

T = Threatened;E = Endangered; DL = Delisted; PT = Proposed Threatened; C = Candidate; — = Not listed

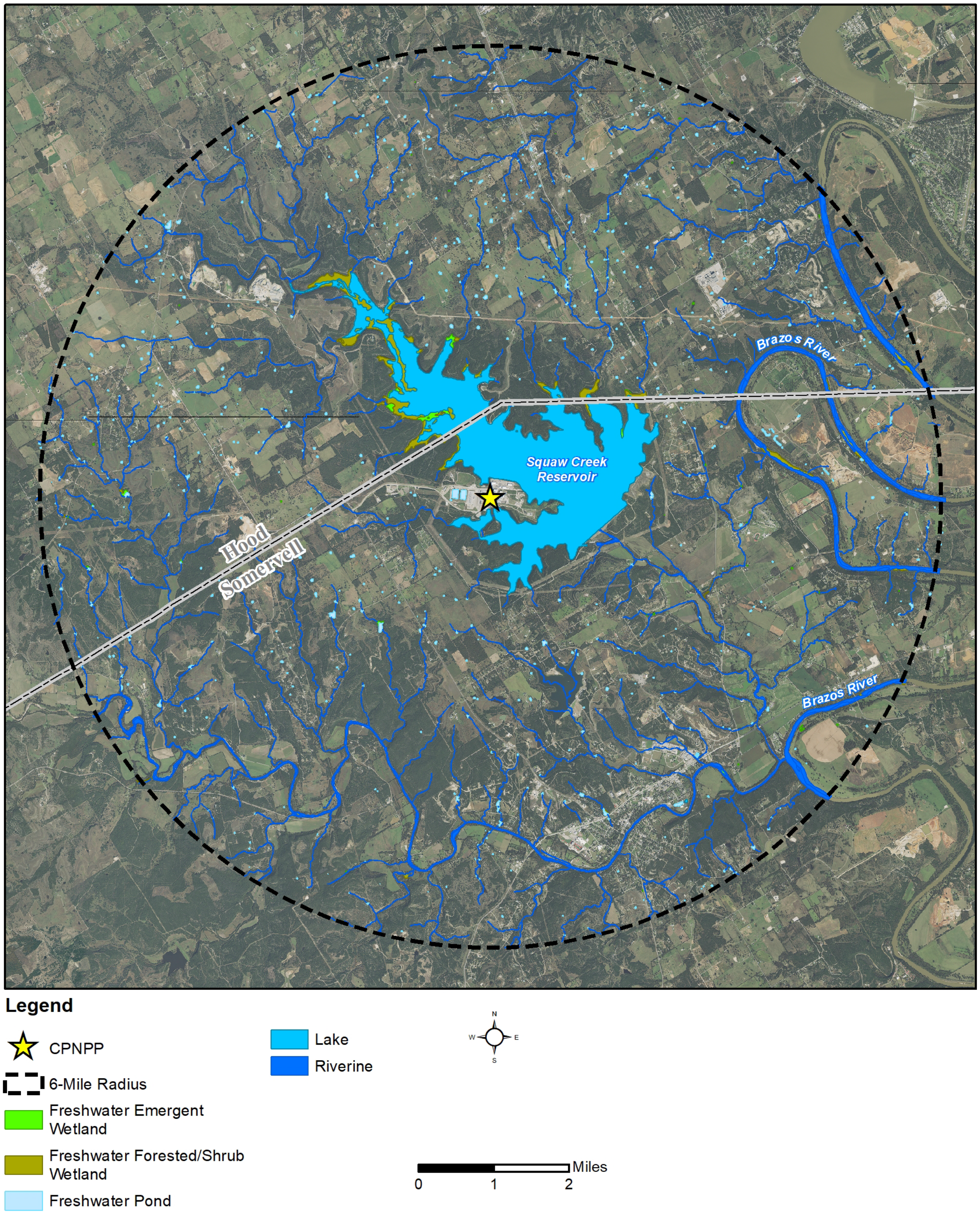


Figure 3.7-1 NWI Wetlands within a 6-mile Radius of CPNPP

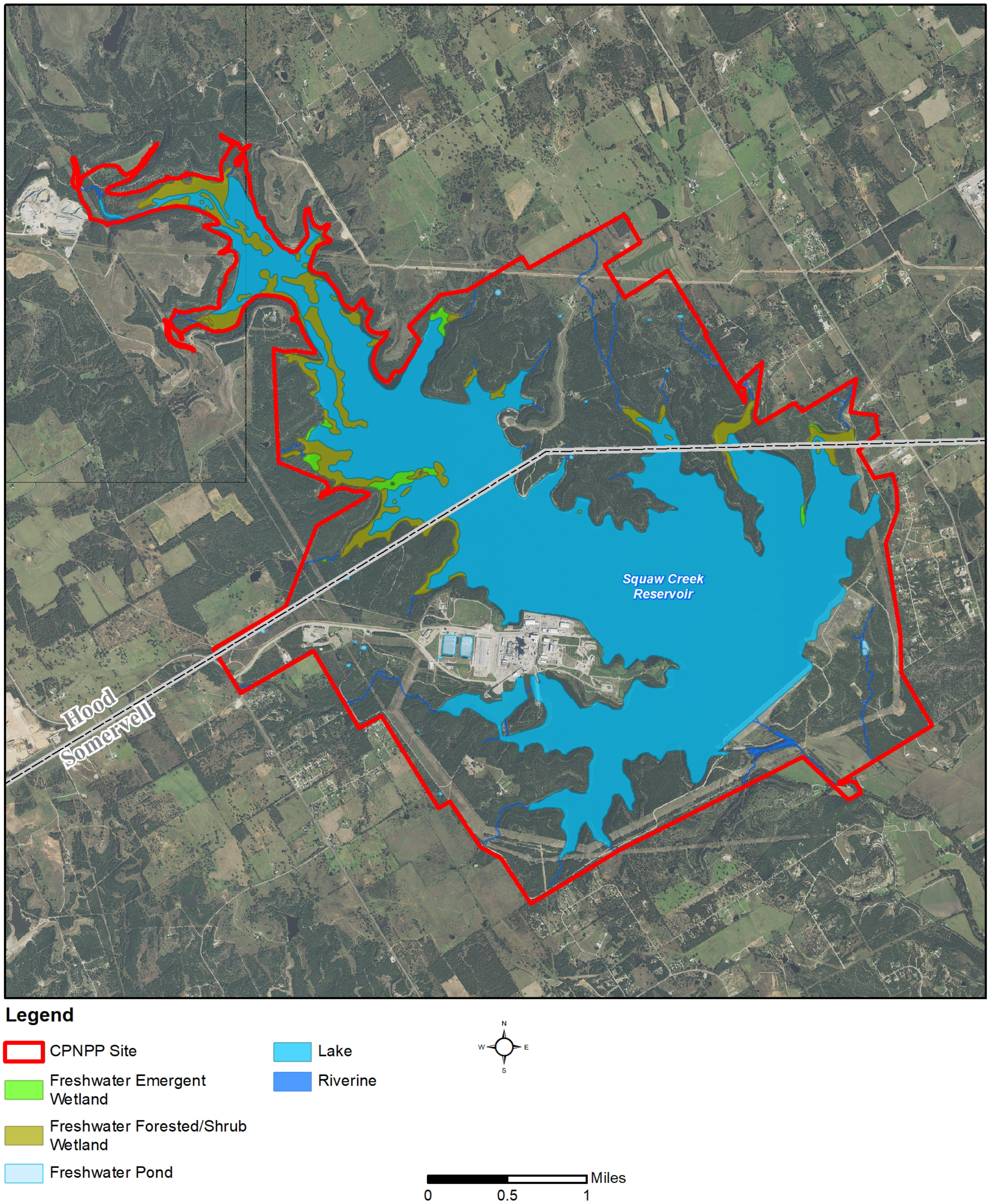


Figure 3.7-2 NWI Wetlands on the CPNPP Site

3.8 Historic and Cultural Resources

Cultural resources include prehistoric era and historical era archaeological sites and objects, architectural properties and districts, and traditional cultural properties, which are defined as significant objects or places important to Native American tribes for maintaining their culture (USDOI 1998). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act of 1966 (NHPA) [Public Law 89-675].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.
- Afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertaking.

To provide early consultation for the Section 106 process, Vistra OpCo contacted the Texas Historical Commission (THC) for informal consultation concerning the CPNPP LRA and potential effects on cultural resources within the approximately 7,700-acre site and on historic properties within a 6-mile radius of CPNPP. Native American groups recognized as potential stakeholders were also contacted by Vistra OpCo and provided the opportunity for comment. Vistra OpCo correspondence is included in Attachment D.

This ER identifies all known archaeological sites and properties listed on the NRHP within a 6-mile radius of CPNPP. For the purpose of the LRA, the aboveground area of potential effect (APE) is defined as the entire CPNPP property and everything within a 6-mile radius of CPNPP. The aboveground APE considers the visual integrity of historical properties in relation to continued CPNPP operation. The archaeological APE is considered bounded by the approximately 7,700 acres, where ground disturbance, though unanticipated during the proposed license renewal term, might compromise the physical integrity of archaeological data.

No ground disturbance associated with CPNPP is considered within the scope of the 10 CFR Part 51 evaluation. As such, the LRA consists of an administrative action relative to historic and cultural resources. Although construction of the existing CPNPP facility and SCR would have impacted any archaeological resources that may have been located within their respective footprints, much of the surrounding area remains largely undisturbed. There have been five previous cultural resources surveys within the 7,700-acre CPNPP property and extending out from the property (Table 3.8-1).

The literature review of previously recorded cultural sites included the area within a 6-mile radius of CPNPP. A record review was conducted at the THC online Texas Archaeological Sites

Atlas. The purpose of the literature review was to develop an understanding of the local context by conducting an inventory of all previously and newly recorded archaeological sites on the 7,700-acre CPNPP property and within a 6-mile radius of CPNPP, regardless of NRHP status.

The results of the literature review showed that there are 141 cultural resources previously recorded within 6 miles of CPNPP (THC 2021). Of these, 15 are cemeteries or individual burials protected by state burial law, four are NRHP-listed, and five have been determined eligible for the NRHP. There are an additional seven resources with undetermined NRHP status within the 6-mile radius, the remaining 110 cultural resources are unevaluated, or do not have a defined NRHP evaluation listed (Tables 3.8-1 and 3.8-2).

3.8.1 Land Use History

The land use history for CPNPP and the surrounding region was developed as part of a Phase 2A literature review and archaeological sensitivity assessment of the CPNPP property and is summarized here. The approximately 7,700-acre CPNPP property consists of 11 categories of land use/cover as defined in Section 3.2.1. In the order of descending acreage totals, the primary land use/cover consists of the open water of SCR at 41.9 percent, evergreen forest at 26.7 percent, grassland/herbaceous cover at 17.8 percent, developed areas at 8.2 percent, deciduous forest at 4 percent, and woody wetlands at 1 percent, with seven much smaller categories making up less than 1 percent each (Table 3.2-1). Section 3.8.2 provides a more detailed discussion of historical land use as part of the cultural history. Early maps provide information on how the area was used in the past. The USGS Granbury 1889 map shows the project APE with a road connecting the communities of Granbury and Glen Rose passing through the east portion of the APE (Figure 3.8-1). The composite USGS Hill City and Nemo 1961 quad maps show a mosaic of grasslands with some upland and riparian woodlands, crossed by a pipeline, with only a few scattered houses, barns, a windmill, and a gravel pit. There are more unpaved jeep trails than paved roads (Figure 3.8-2). A composite 2016 USGS edition depicts the property with SCR filled. The jeep trails are gone, and numerous paved roads and the railway spur to the CPNPP site are depicted (Figure 3.8-3). Figure 3.8-4 shows the 2 NRHP properties, 2 NRHP districts, and the 15 recorded cemeteries within the 6-mile radius along with the modern infrastructure of the vicinity in 2020.

Photographs taken prior to, during, and after the construction of the CPNPP facility are useful in showing the environmental context during that time period. As shown in the earlier USGS maps discussed above, at the time of construction, the CPNPP facility and reservoir area consisted of undeveloped forest and rangeland, remnants of small communities, and agricultural fields. At the construction site, the trees and brush were removed, and the area was mechanically leveled (Figures 3.8-5 and 3.8-6). Construction included excavation for the CPNPP facility components (Figures 3.8-5, 3.8-6, and 3.8-7). Final construction of the CPNPP facility included multiple buildings, structures, and parking lots on a peninsula surrounded primarily by SCR and forest (Figures 3.8-8, 3.8-9, and 3.8-10).

The CPNPP property and the surrounding region hold evidence of both prehistoric and historic occupation by Native Americans and Euro-Americans. Archaeological records suggest that the CPNPP property and the surrounding area were potentially occupied by Native American populations during the Paleoindian Period (prior to 8,800 before present (BP)), the Archaic Period (circa (ca.) 8,800 to 1,200 to 1,300 BP), the Late Prehistoric Period (ca. 1,300 to 450 BP), and the Historic Period (ca. 1670 AD to present).

3.8.2 Cultural History

3.8.2.1 Paleoindian Period (Prior to 8,800 BP)

The Paleoindian period is the earliest substantiated cultural adaptation in the Americas and Texas. Paleoindian peoples have been defined as nomadic big game hunters who lived in small bands which traveled seasonally within set territories for food sources that included hunting megafauna. However, this definition is not adequate in light of the diverse material culture, projectile point styles, and subsistence practices which have been documented in the last 50 years. Paleoindian sites are primarily located in positions where large streams enter major rivers. Clovis (11,200 to 10,900 BP) is the earliest documented cultural horizon in Texas and is widespread throughout the state in many different environmental settings. The Clovis lifeway seems to have been that of generalized hunter-gatherers with the technology to hunt big game but not the need to rely exclusively on it. The following Folsom culture appears to be oriented towards a subsistence based on bison hunting and is identified by a tool complex including Folsom points, endscapers, and large thin bifaces. The Folsom sites or single artifacts are most often found in grassland settings. The Dalton and San Patrice tool complexes are associated with the transition to latter part of the Early Paleoindian Period and represent hunter gatherer Archaic-like subsistence. The Wilson, St. Mary's Hall and Golondrina-Barber point styles represent the Late Paleoindian Period (10,000 to 8,000 BP) in central Texas. These later Archaic-like manifestations include rock ovens and other typical Archaic features but are smaller in scale than the later Archaic features. Researchers believe this represents the transition from the Late Paleoindian to the Archaic Period. (Collins 1998)

3.8.2.2 Archaic (8,800 to 1,200 BP)

The Archaic Period is marked by changes in subsistence and settlement patterns likely associated with changes in climate and the resulting environmental changes. This period is divided into the Early, Middle, and Late Archaic and is characterized by the exploitation of a larger variety of plant and animal resources with an overall greater diversity in material culture. The transition to the Early Archaic Period is inferred to include a less mobile and more localized lifestyle than the preceding Paleoindian Period. Projectile points no longer exemplified the intricate work characteristic of Paleoindian tools. Early Archaic tools such as spear points, knives, drills, scrappers, and gravers were still used, but varied in size and shape and were often fashioned with side or corner notches for hafting. The overall characteristic of the Archaic period is the large quantity of heated rock which is found as hearths, middens, ovens, scatters, and other features. (Collins 1998)

The early Archaic (8,800 to 6,000 BP) evidence in central Texas indicates a pattern of resource exploitation which favored the live oak savanna of the Edwards Plateau and the nut mast, fruits, berries, and geophites of the region, along with a greater diversity of animals for subsistence. Typical projectile points associated with this period include Angostura, early split stem, and Martindale-Uvalde styles. By the Middle Archaic (6,000 to 4,000 BP) the more mesic climate shifted to a more xeric one. The Bell-Andice-Calf Creek points seem to reflect a concentration on bison hunting in the more mesic interval, while the Taylor and later Nolan-Travis point style are associated with the later more arid climate and the appearance of burned rock middens. The Late Archaic Period (4,000 to 1,200 BP) subsistence practice continues with the Middle Archaic technology with an increase in burned rock middens and increase bison hunting again. The "tool kit" includes six prominent point styles of notched and stemmed points as well as mortars and pestles for food processing. (Collins 1998)

3.8.2.3 Late Prehistoric (800 to 1670 AD)

The Late Prehistoric is often referred to as the Neo-Indian Period in Texas and is characterized by a shift to bow and arrow technology from the preceding atlatl and dart point technology and the period has both early and late subperiods typified by the earlier Austin and later Toyah material culture manifestations. The early Late Prehistoric Period subsistence is a continuation of the preceding Late Archaic Woodland hunting and gathering practices with burned rock middens. By the later Late Prehistoric Toyah interval, pottery is added to the material culture typified by Toyah and Perdiz points, end scrapers, long thin bifacial knives, and prismatic blades. (Collins 1998)

3.8.2.4 Historic Period (1670 AD to present)

The Historic Period begins with arrival of Europeans in late 1600s. The indigenous populations of Texas were impacted by the Spanish and French contact in the region. The primary early Historic Period impact was from diseases introduced by the Europeans, for which the indigenous populations had no immunity. The introduction of the horse to the region and the incursions of mounted Apaches from the north added to regional conflict and the shifting of material culture and subsistence practices of the central Texas population. (Collins 1998) The middle Historic Period (1730 to 1800 AD) began with an increase in the Spanish mission system followed by the subsequent failure of that Spanish effort. The Wichita and Comanche occupied the fortified villages on the Red River in modern Oklahoma and northern Texas. The conflict between these Red River groups and the Apache caused the latter to seek protection from the Spanish resulting in formation of two Spanish missions near Menard, Texas. (NRC 2013d) A group of allied Wichita, Comanche, and Tawakonis attacked the mission in 1758, specifically targeting the Apache, which only resulted in retaliation by the Spanish for the attack (NRC 2019) The later Historic Period began about 1800. At this time other northern groups entered the Southern Plains. The Kiowa were present in the Southern Plains around 1800 and the Cheyenne and Arapaho were present in the early 1840s. (NRC 2013d) The first permanent Anglo settlers in the valleys of the Paluxy River and Squaw Creek arrived prior to 1855. At this time, the Brazos River was the general boundary of settlement by Anglo populations who feared raids and predation from the Comanche and other Plains indigenous groups. (NRC 2013d)

3.8.2.5 Hood County

Hood County embraces 425 square miles of the north-central plains of Texas. Granbury, the county seat, is 41 miles southwest of Fort Worth. Before settlers from the east ventured onto the plains, the area was the home of the Comanche and, to a lesser extent, the Lipan Apaches and Kiowas. In the 19th century, a band of Comanches known as the Penatekas, or Honeyeaters, roamed the area west of the cross timbers, generally between the headwaters of the Colorado and Brazos rivers. Comanche Peak, the highest point in Hood County, was a Comanche meeting place. The Lipan Apaches also roamed the area, and the town of Lipan in extreme northwestern Hood County was named after a group that once lived in the Kickapoo Valley. (Callaway 2006)

Settlers from the east began to arrive in the area 10 or 15 years before the Civil War. One of the first, Charles E. Barnard, set up a trading post and Barnard's Mill at a site now in Somervell County. George B. Erath, for whom an adjacent county is named, was one of the first to survey on the Brazos River (1846–1850). Other settlers, mostly ranchers and farmers, began to settle in the Brazos and Paluxy river valleys in 1854. The main concern facing these early settlers was the frequent raids by the Comanches. Native American horse-stealing raids into the Paluxy and Squaw Creek country occurred all during the Civil War and until 1872, when a party of Native Americans stole horses from a section of land close to Cresson in northeast Hood County. (Callaway 2006)

Hood County was formed in November 1866 by an act of the eleventh Texas legislature. The area was within the municipality of San Felipe de Austin as early as 1823 and the municipality of Viesca in 1834. After Texas became a republic, the area now known as Hood County had, at one time or another, been part of Robertson, Navarro, McLennan, Johnson, and Erath counties.

Location of the new county seat was a controversial issue. Residents in the southern section of the county favored the center of the county, as stated in the law. The other choice was a parcel of land donated by influential county leaders Thomas Lambert and J. F. and J. Nutt. The commission established to designate the county seat, citing a poor water supply at the center of the county, voted in favor of the donated land. The controversy surrounding the site of Granbury eventually caused the residents of the southern section of the county to petition for a new county.

As a result, in 1875, Somervell County was established by an act of the Texas legislature. In that same year, a fire destroyed the courthouse in Granbury. In 1870 whites made up 96 percent of the population. The highest total of blacks in Hood County was 241 in 1900, or only 3 percent of the population. The last three decades of the 19th century saw a steady increase in population; in 1910, the total was just over 10,000. Residents were able to send their produce and livestock to market on the Fort Worth and Rio Grande Railway, which was completed in 1887. (Callaway 2006)

By the turn of the century, Hood County had several towns: Granbury, Acton, Tolar, Lipan, and Cresson. After 1910, Hood County's population fell to 8,759 in 1920, to 6,779 in 1930, and to its

20th-century low of 5,287 in 1950. The number of farms fell by almost a third between 1910 and 1920 to 1,234, then dropped more gradually to 830 in 1950. From 1960 to 1980, the population increased from 5,443 to 17,714. Between 1970 and 1980, Hood County ranked sixth among all U.S. counties in the category of highest growth rate. One of the main reasons for the sudden increase was the completion in 1969 of Lake Granbury, which turned the county into a popular recreation and resort center, as well as a retirement community. The influx of people into Hood County between 1970 and 1980 had a tremendous impact on the area, and by 1990 the county’s population had grown to 28,981. The census counted 41,100 people living in Hood County in 2000. (Callaway 2006)

3.8.2.6 Somervell County

Somervell County is in north-central Texas and comprises 188 square miles, the second-smallest area among Texas counties. Glen Rose, the principal town, and county seat is 55 miles southwest of Fort Worth. Prior to European settlement of North America, the area was inhabited by Native Americans, particularly members of the Caddo groups and Tonkawas. The southern edge of the Wichita Confederacy of Caddos extended into this area, although the Tonkawas were the major tribal group. Apaches and Comanches came into the area periodically. (Elam 2006)

Most of the early history of Somervell County was as part of either Johnson or Hood counties. Somervell County was established in 1875, when residents in southern Hood and northern Bosque counties petitioned for a new county because of their separation from markets and seats of government. The county, taken completely from Hood County, was named for Alexander Somervell, who led an expedition to Mexico under the Republic of Texas. The first and only county seat is Glen Rose, named in 1872. Other early communities included Wilcox, Rainbow, Nemo, and Glass. The census of 1880 indicated a population of 2,649, with only 132 people in Glen Rose. (Elam 2006)

Glen Rose was the center of activity for the county during the last two decades of the 19th century. Four periodicals were published in Glen Rose during these decades: *The Glen Rose Citizen*, *The Glen Rose Falcon*, and *The Glen Rose Herald* were local newspapers, while T*he Monthly Baptist Standard* had a wider circulation. The county entered the 20th century with a population of 3,498. The population peaked at 3,931 in 1910 and then declined to a low of 2,542 by 1950. (Elam 2006)

Although agricultural production during the Great Depression remained fairly constant, unemployment increased dramatically. New Deal programs provided some assistance. Glen Rose borrowed $80,000 under the Public Works Administration to construct a new water and sewage system. Three low-water dams on the Paluxy River, several local school buildings, and a canning plant were built with Work Projects Administration money. (Elam 2006)

In the years after World War II, the county’s proximity to Dallas-Fort Worth led to a rapid increase in industry that transformed it. Dramatic changes came with the construction of a nuclear power plant by the Texas Utilities Electric Company along Squaw Creek north of Glen

Rose. The construction of this plant, begun in the mid-1970s, resulted in some important financial advantages for the county. Between 1960 and 1970, the county grew by 8 percent, but the next census reflected a 49 percent growth rate; half the population of 4,154 lived in Glen Rose. In 1990 the population of the county was 5,360, with Glen Rose (1,949) the most populous community. (Elam 2006)

3.8.3 Onsite Cultural Resources

Onsite cultural resources are those located within the 7,700-acre CPNPP property. That property includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE. There are 33 cultural resources listed within the 7,700-acre CPNPP property. These 33 resources were recorded during five cultural resources surveys of the property, or associated ROW for waterline and transmission lines. (NRC 2013d) The cultural resources investigations are listed in Table 3.8-1. Prior to the construction of CPNPP and SCR, an archaeological survey of the vicinity was conducted by Alan Skinner and Gerald Humphreys under the auspices of Southern Methodist University anthropology (SMU) department. The SMU survey resulted in the recording of 25 archaeological sites and the Hopewell Cemetery within the CPNPP property. Of note is that three resources: —41HD55, 41HD56, and 41HD57, —recorded in the text have been subsequently redesignated as sites 41HD64, 41HD65, and 41HD66, respectively. The 1985 Espey, Houston, and Associates survey filled out a site update form for 41SV52 noting that the site had been destroyed but did not record any additional sites within the CPNPP property. In 2007 and 2008, James Briscoe recorded seven sites within the CPNPP property while conducting surveys for water and transmission lines: 41HD87, 41HD88, 41HD89, 41SV160, 41SV161, 41SV169, and 41SV170 (NRC 2013d). Briscoe recommended that six of the sites were not eligible for the NRHP, while 41SV88 is listed as undetermined.

No NRHP-eligible cultural resources have been confirmed within the 7,700-acre CPNPP property (Figure 3.8-5). No structures within the CPNPP property have been documented through the Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER) programs.

3.8.4 Offsite Cultural Resources

Offsite cultural resources are those outside the 7,700-acre CPNPP property boundary. There are 108 offsite resources within 6 miles of CPNPP. Lists of known archaeological sites and historic properties within a 6-mile radius of CPNPP are presented in Tables 3.8-3 and 3.8-4. There are two NRHP-listed properties and two NRHP districts with 6 miles of CPNPP (Table 3.8-4 and Figure 3.8-4). The Somervell County Courthouse and Barnards Mill are dually listed as State Antiquities Landmarks (SAL) and on the NRHP. The Glen Rose Downtown Historic District and Oakdale Park Historic District are listed on the NRHP. Additionally, there are 14 cemeteries within 6 miles of CPNPP which are protected by state burial laws (Figure 3.8-4). There is no planned offsite disturbance during the proposed LR operating term, and as such no offsite impacts to the archaeological resources would be anticipated. The two NRHP properties and two NRHP districts are located in the community of Glen Rose over 4.5 miles from the

CPNPP. Therefore, any visual or noise impacts to these four NRHP properties would be minimal due to distance, topographic variability, and vegetation.

3.8.5 Cultural Resource Surveys

There have been five previous cultural resources surveys within the 7,700-acre CPNPP property (Table 3.8-1). In 1972 a survey of the property and SCR was conducted by SMU prior to the construction of the plant and the reservoir. The survey resulted in the recording of 27 archeological sites and the Hopewell Cemetery. A subsequent survey of CPNPP water lines and a transmission line by SMU in 1974 resulted in the recording of three archaeological sites and a 20th-century structure outside of the CPNPP property within the 6-mile APE. (NRC 2013d) A survey of a transmission line in 1985 by Espey, Houston, and Associates resulted in the updating of site 41SV52 and the recording of an additional two sites outside the CPNPP 6-mile APE. (NRC 2013d) Briscoe Consulting conducted a survey in 2007 and 2008 under the auspices of Enercon Services, Inc., for several water and transmission lines. The two surveys resulted in the re-examination of several site areas and the recording of seven archaeological sites within the CPNPP property and two new sites outside the CPNPP 6-mile APE. (NRC 2013d)

3.8.6 Procedures and Integrated Cultural Resources Management Plan

Cultural resources on the CPNPP site are protected by Vistra OpCo's procedures related to all ground disturbance and excavation at the plant site. The Excavation Permit Pre-Job Brief Card specifies that, "If human remains or cultural resources over 50 years of age are uncovered during excavation, stop work and notify the Site Facility Engineer." The Control of Site Excavation procedure clearly defines all cultural resources. These two procedures serve to make Vistra OpCo personnel and contractors aware of the need to identify, protect, and minimize impact to all cultural resources over 50 years of age at the CPNPP site during the planning, scoping, and implementation of all potential ground disturbing activities.

Table 3.8-1 Previous Cultural Resources Surveys within the CPNPP Property

THC Atlas Abstract Number	Survey Company and Author	Report Date	Description	Findings
8100000119	Southern Methodist University S. Alan Skinner and Gerald Humphreys	1973	The Historic and Prehistoric Archaeological Resources of the SCR	27 archaeological sites (19 prehistoric and 8 historic sites)
8100000161	Southern Methodist University Joseph Gallagher	1974	Results of Small-Scale Survey of Comanche Peak Transmission Lines and Pipeline R-O-Ws.	No sites on property, three prehistoric sites and one historic site within the CPNPP 6-mile APE
8100003639	Espey, Huston and Associates Mindy Bonine	1985	Summary Report: A Cultural Resources Investigation of the Proposed Comanche Peak-Walnut Springs 345 kV Transmission Line, Erath, Hood, and Somervell Counties, Texas	One prehistoric site on property, two sites outside of CPNPP 6-mile APE
8100015956 and 8100015957	Briscoe Consulting James Briscoe and Robert Walker	2008 2009	Archaeological Survey Report on the Luminant Proposed New Water Exchange Line Project Comanche Peak Nuclear Power Plant Hood and Somervell Counties, Texas	No sites reported in abstract, seven sites within CPNPP property on Atlas, four sites outside 6-mile APE

Table 3.8-2 Archaeological Sites and Historic Properties within the CPNPP Property (Sheet 1 of 2)

Site ID#	Quadrangle	Site Type	NRHP Status
41HD57	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41HD64	Hill City	Paleo-Archaic lithic scatter	Not evaluated
41HD65	Hill City	Early 20th century farmstead complex	Not evaluated
41HD66	Hill City	Small, thin unassigned lithic scatter	Not evaluated
41HD87	Hill City	Unassigned prehistoric lithic scatter	Recommended not eligible
41HD88	Hill City	Unassigned prehistoric lithic scatter	Undetermined
41HD89	Hill City	Early 20th century debris scatter/standing water tower, corral	Recommended not eligible
SV-C004 Hopewell Cemetery	Hill City/Nemo	Cemetery	Protected by state burial law
41SV29	Hill City	Early to mid-20th century debris and windmill	Not evaluated
41SV30	Hill City	Multi-component site, with a prehistoric scatter/late 19th to early 20th century Hopewell Community School	Not evaluated
41SV31	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV32	Hill City	Small unassigned prehistoric lithic scatter	Not evaluated
41SV33	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV34	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV35	Hill City	Early 20th century cattle camp or farmstead	Not evaluated
41SV36	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV37	Hill City	Unassigned prehistoric knapping station	Not evaluated

Table 3.8-2 Archaeological Sites and Historic Properties within the CPNPP Property (Sheet 2 of 2)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV38	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV39	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV40	Hill City	Late prehistoric lithic scatter/camp	Not evaluated
41SV41	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
41SV42	Hill City	Early to mid-20th century farmstead	Not evaluated
41SV43	Hill City	Early to mid-20th century farmstead	Not evaluated
41SV44	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
41SV45	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
41SV48	Hill City	Unassigned lithic scatter	Testing recommended
41SV52	Hill City	Unassigned lithic scatter	Destroyed by construction
41SV53	Hill City	Early 20th century concrete wall features	Not evaluated
41SV54	Hill City	Small unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV160	Hill City	A possible Middle Archaic lithic scatter	No further work was recommended
41SV161	Hill City	Early 20th century farmstead remains	No further work was recommended
41SV162	Nemo	An unassigned prehistoric lithic scatter	No further work recommended
41SV169	Hill City	An early to mid-20th century dry laid stone skirt on an earthen dam	No further work recommended
41SV170	Hill City	A late 19th century ford	No further work recommended

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 1 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
HD-C005 Nubbin Ridge-Cedar Grove Cemetery	Nemo	Cemetery	Protected by state burial law
HD-C037 Mitchell Bend Cemetery	Nemo	Cemetery	Protected by state burial law
41HD76	Hill City	Multi-component Early Archaic lithic scatter and 20th century debris scatter	Determined ineligible in ROW
41HD85	Nemo	Unassigned prehistoric lithic scatter	Recommended not eligible
41HD97	Nemo	20th century?? stone field fence	Recommended not eligible in ROW
79003008 Somervell County Courthouse	Glen Rose West	Historic county courthouse	NRHP Listed
82004523 Barnard's Mill	Glen Rose West	Historic mill and hospital complex	NRHP Listed
12000352 Oakdale Park District	Glen Rose East	Historic district with 29 contributing elements and 14 noncontributing elements	NRHP Listed
14000820 Glen Rose Downtown Historic District	Glen Rose West	Historic district with 35 contributing elements and 12 noncontributing elements	NRHP Listed
SV-C001 Post Oak Cemetery	Hill City	Cemetery	Protected by state burial law
SV-C002 Milam Chapel Cemetery	Hill City	Cemetery	Protected by state burial law
SV-C003/41SV64 Unknown Grave(s)	Glen Rose West	Cemetery	Protected by state burial law
SV-C005/41SV2 Cox Bend/Connally Cemetery	Nemo	Cemetery	Protected by state burial law

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 2 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
SV-C007 Squaw Creek Cemetery	Nemo	Cemetery	Protected by state burial law
SV-C008 Herndon Valley (Oldham) Cemetery	Nemo	Cemetery	Protected by state burial law
SV-C010 Kimmel Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C011 Lanham Mill Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C012 Glen Rose Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C024 McCamant Cemetery	Glen Rose West	Cemetery	Protected by state burial law
SV-C026 Unknown Cemetery	Hill City	Cemetery	Protected by state burial law
SV-C029 Booker Cemetery	Glen Rose West	Cemetery	Protected by state burial law
41SV1	Nemo	Reported late Paleo to early ceramic camp	Site reported destroyed by plowing and borrow pit
41SV3	Nemo	Unassigned prehistoric camp	No further work recommended
41SV4	Nemo	Archaic camp	1991 No further work recommended 2004 Ineligible in ROW
41SV5	Nemo	Unassigned prehistoric camp with burned rock	No further work recommended
41SV6	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
41SV7	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
41SV8	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
41SV9	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 3 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV10	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
41SV11	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
41SV12	Glen Rose East	Small unassigned prehistoric midden	No further work recommended
41SV13	Glen Rose East	Two areas of unassigned prehistoric middens	No further work recommended
41SV14	Glen Rose East	Reported site, observed as a thin lithic scatter	No further work recommended
41SV15	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
41SV16	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
41SV18	Glen Rose East	Archaic camp	Not evaluated
41SV19	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
41SV20	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
41SV21	Glen Rose East	Small unassigned lithic scatter with mussel shell	Not evaluated
41SV22	Glen Rose East	Small unassigned lithic scatter with little mussel shell	Not evaluated
41SV25	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
41SV26	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
41SV27	Glen Rose East	Thin unassigned prehistoric lithic scatter	Not evaluated
41SV28	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
41SV46	Hill City	Late 19^{th} to early 20^{th} century farmstead	Not evaluated
41SV47	Nemo	Late Prehistoric Period camp site	Avoid or testing recommended
41SV49	Nemo	Archaic lithic scatter/camp	No further work recommended
41SV50	Nemo	Archaic to Late Prehistoric lithic scatter/camp	No further work recommended
41SV51	Nemo	Petroglyph, a lithic scatter with diagnostic points reported from the Paleo to Late Prehistoric Periods	Protection of petroglyph recommended Determined ineligible in ROW

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 4 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV55	Nemo	Archaic camp with manos and metates	Not Evaluated
41SV56	Hill City	Late Prehistoric camp with hearths	Determined eligible
41SV57	Hill City/Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
41SV58	Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
41SV59	Hill City	Unassigned prehistoric camp	Determined eligible
41SV61	Hill City	A possible hearth eroding from riverbank, no cultural material observed	Not evaluated as cultural material was not observed, monitoring for cultural material recommended
41SV62	Hill City	Unassigned lithic scatter with shell midden	Monitoring recommended
41SV63	Glen Rose West	1930s to 1950s trash midden and concrete slab	Undetermined
41SV65	Glen Rose West	Late 19^{th} to mid-20^{th} century farmstead	Not evaluated
41SV103	Glen Rose East	Unassigned prehistoric camp with PPK fragments, manos, metates and flakes exposed by plowing	Not evaluated
41SV109	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV110	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV111	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV112	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Not evaluated
41SV113	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Further survey recommended
41SV111	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
41SV114	Glen Rose West	Unassigned prehistoric lithic scatter with mano and metate fragments	Site reported destroyed

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 5 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV115	Hill City	Archaic to Late Prehistoric Period lithic scatter	Site reported destroyed
41SV117	Glen Rose West	1903 to 1943 Lanham Mill School site	Undetermined
41SV118	Not stated	Unassigned prehistoric site No site form	Determined ineligible
41SV119	Hill City	Unassigned prehistoric site No site form	Undetermined
41SV120	Glen Rose West	Unassigned prehistoric site No site form	Undetermined
41SV121	Glen Rose East	Late Prehistoric Period open camp with pottery, arrow points, and faunal fragments	Site reported destroyed?
41SV122	Glen Rose East	Archaic to Late Prehistoric open camp based on PPK	Site reported destroyed?
41SV123	Glen Rose West	Unassigned prehistoric site exposed by bulldozing	Site reported destroyed
41SV127	Nemo	Archaic to Late Prehistoric open camp	Not evaluated
41HD128	Hill City	Small Archaic activity site	No further work recommended
41SV129	Hill City	Unassigned lithic scatter	No further work recommended
41SV130	Hill City	Unassigned lithic scatter with two hearths	Testing recommended
41SV131	Hill City	Early 20th century moonshine still	No further work recommended
41SV132	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter	No further work recommended
41SV133	Hill City	Thin unassigned prehistoric lithic scatter	No further work recommended
41SV134	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter on bedrock	Not eligible
41SV135	Hill City	Thin unassigned prehistoric lithic scatter on exposed bedrock no soils	Not eligible
41SV136	Hill City	Thin unassigned camp with minor burned rock cultural deposit present	Testing for eligibility was recommended
41SV137	Hill City	Early to mid-20th century farmstead	No further work recommended

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 6 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV138	Glen Rose West	Thin unassigned prehistoric lithic scatter	No further work recommended
41SV139	Glen Rose West	Mid-20th century trash dump	No further work recommended
41SV140	Glen Rose West	Thin unassigned prehistoric lithic scatter, no deposits	No further work recommended
41SV141	Glen Rose West	Small thin unassigned prehistoric lithic scatter with burned rock, no deposits	No further work recommended
41SV142	Glen Rose West	Small unassigned prehistoric camp with burned rock, debitage, an unidentified dart point and mussel shell	Preservation recommended
41SV143	Glen Rose West	Small unassigned prehistoric camp with a hearth and charcoal	Unclear recommendation
41SV144	Glen Rose West	Small Archaic camp site, with debitage, burned rock and Granbury point	No further work recommended
41SV145	Glen Rose West	Small unassigned prehistoric lithic scatter with no diagnostics or cultural deposits	No further work recommended
41SV146	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	No further work recommended
41SV147	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	A possible cistern was recommended for further study if destruction of the site was imminent
41SV148	Glen Rose West	Mid-20th century artesian wells utilized by the	No further work recommended
41SV149	Glen Rose West	A single hearth exposed in the riverbank three meters below the surface	Further investigations of the hearth and surrounding soils was recommended
41SV150	Nemo	A probable Archaic camp site.	Unknown as the site form missing/report redacted

Table 3.8-3 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP (Sheet 7 of 7)

Site ID#	Quadrangle	Site Type	NRHP Status
41SV151	Nemo	A single buried hearth exposed in backhoe trenching; no additional artifacts were observed	Determined eligible
41SV153	Nemo	An extensive lens of burned rock observed in several backhoe trenches	Ineligible in ROW; undetermined
41SV154	Hill City	An early to mid-20th century house, well and cellar depression in poor condition	Not fully evaluated
41SV155	Hill City	An early to mid-20th century stone barn	Evaluation by architectural historian recommended
41SV156	Glen Rose East	A WPA dam on the Paluxy River that was blown up with dynamite in the mid-20th century	Evaluation by architectural historian recommended
41SV157	Glen Rose West	Burned rock and a few flakes recovered from three backhoe test trenches, no features observed	Determined ineligible
41SV172	Glen Rose East	Buried burned rock, mussel shell and lithic debitage observed in backhoe tests	Undetermined
41SV174	Nemo	Site type not listed on Atlas	Determined ineligible
41SV175	Nemo	Site type not listed on Atlas	Undetermined

(THC 2021a)

Table 3.8-4 NRHP-Listed Sites within a 6-Mile Radius of CPNPP

Resource Name NRHP Listing	County	Quadrangle	NRHP Listed	Distance from CPNPP[a]
Somervell County Courthouse 79003008	Somervell	Glen Rose West	1979	2.18 mi
Barnards Mill 82004523	Somervell	Glen Rose West	1982	4.87 mi
Oakdale Park Historic District 12000352	Somervell	Glen Rose West	2012	4.59 mi
Glen Rose Downtown Historic District 14000820	Somervell	Glen Rose West	2014	4.63 mi

(THC 2021)

a. Distances are approximate and based on the CPNPP center point and NRHP location data.

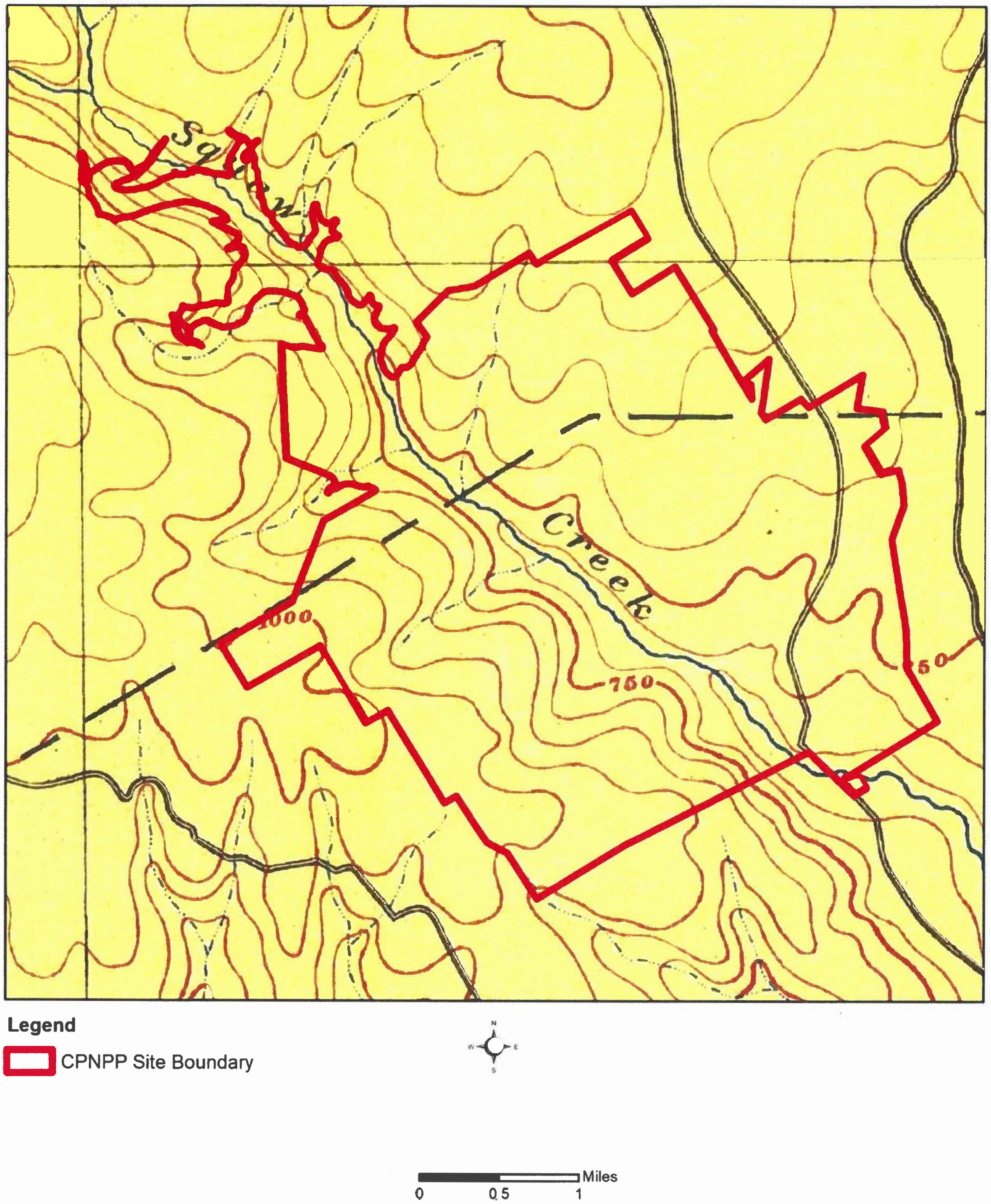


Figure 3.8-1 USGS 1889 Granbury, Texas, Map

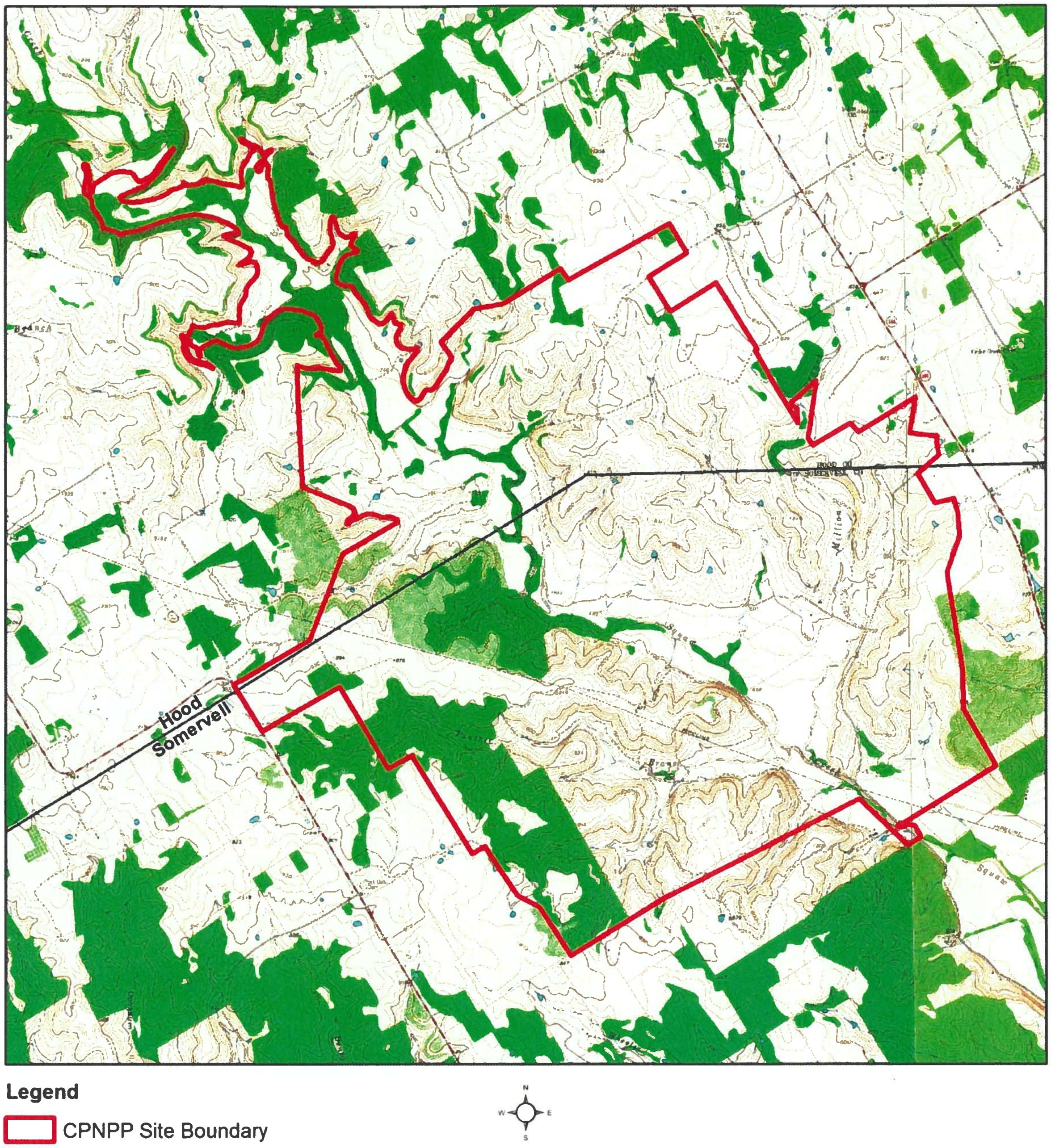


Figure 3.8-2 CPNPP Property, 1961

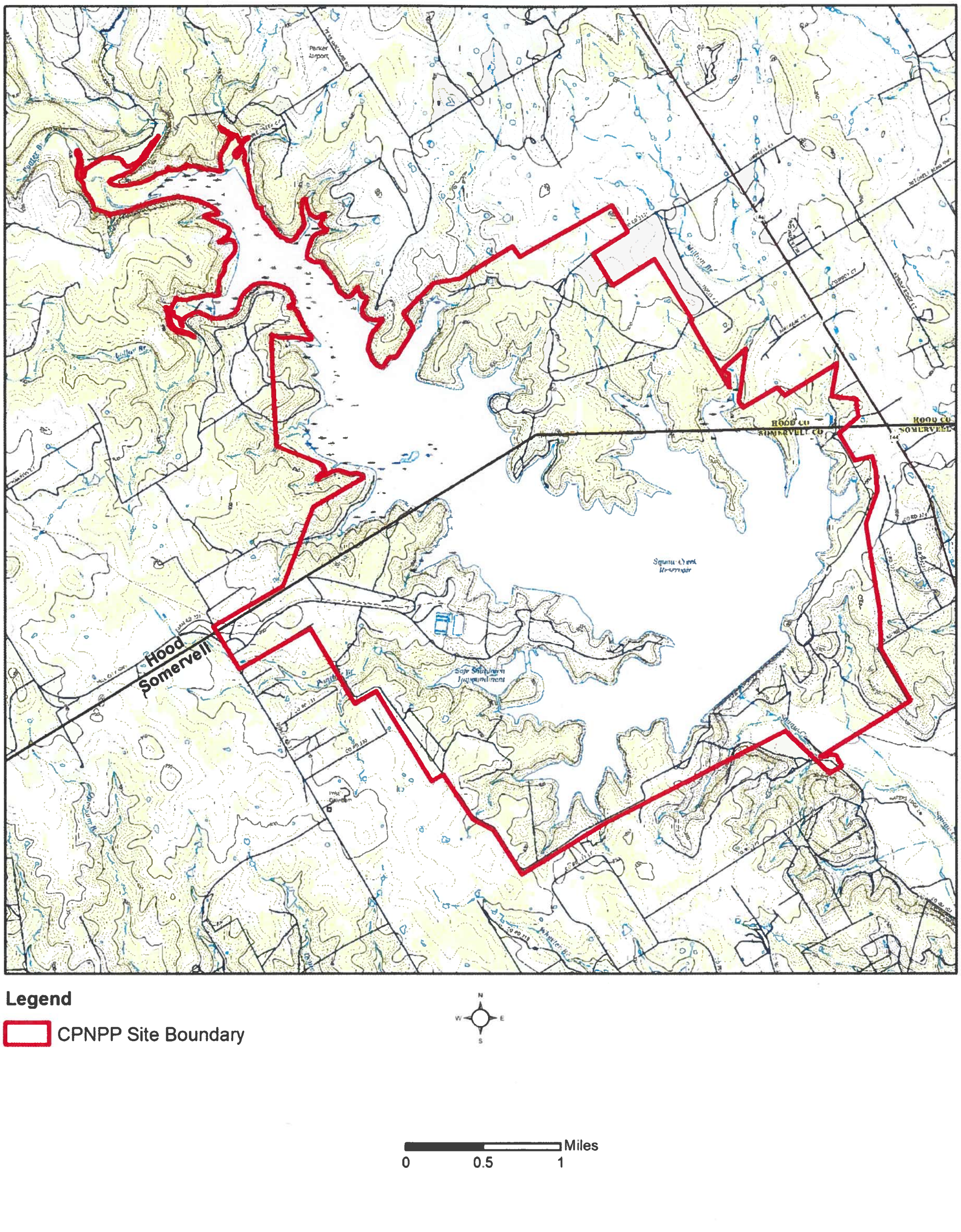


Figure 3.8-3 Vistra OpCo Property, 2016

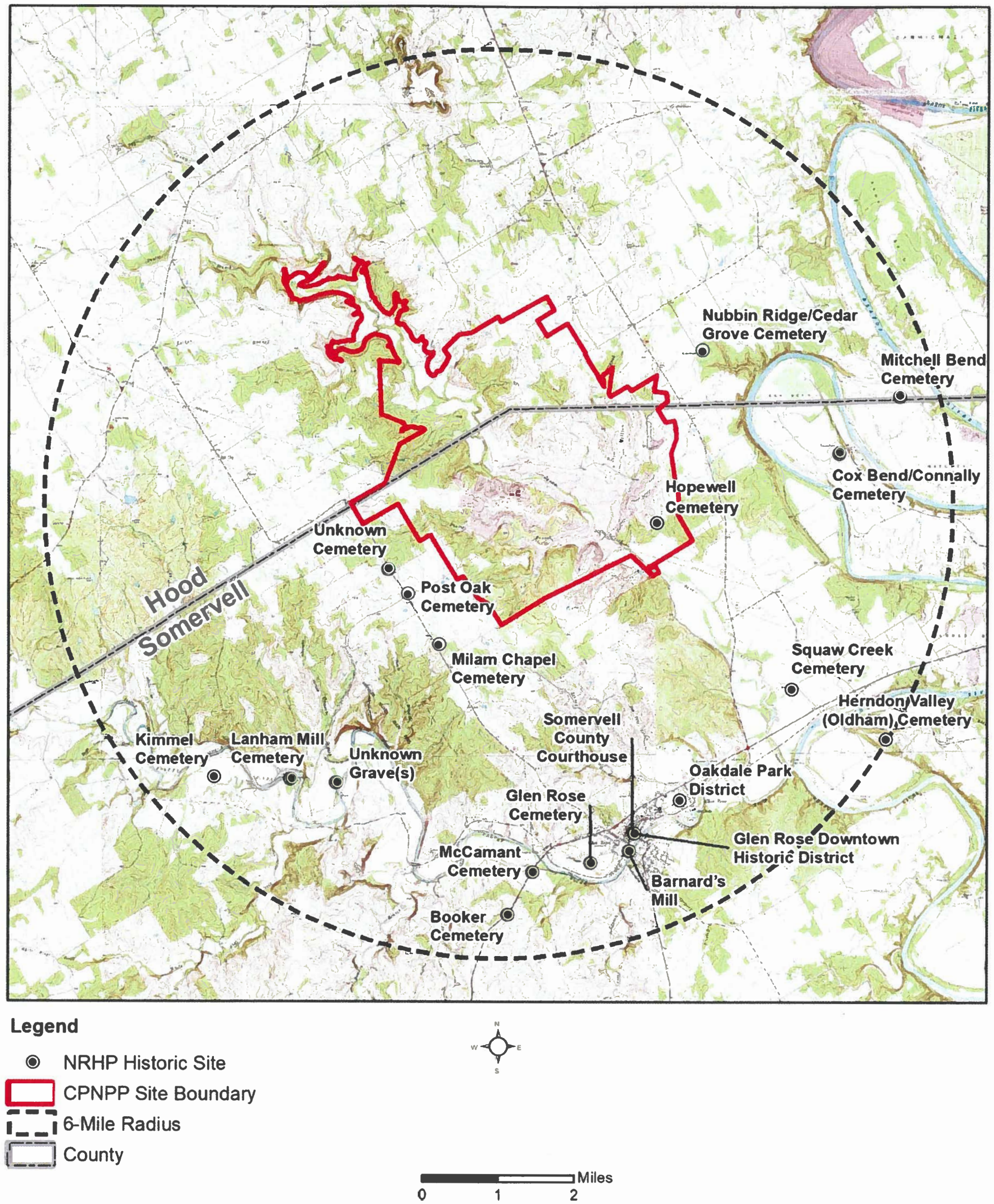
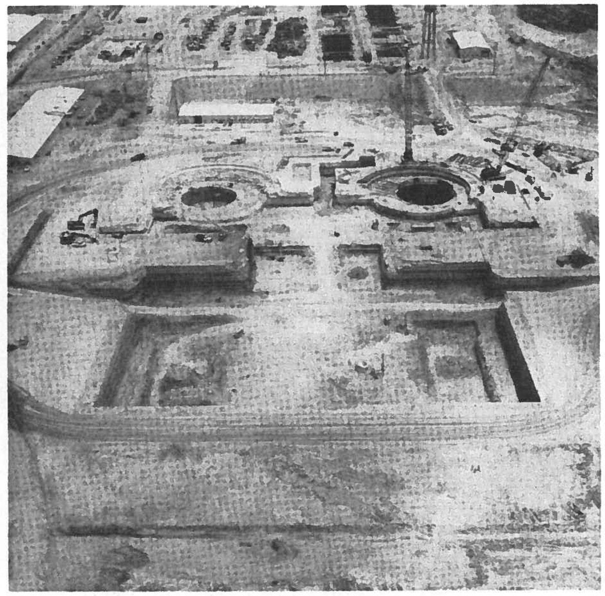


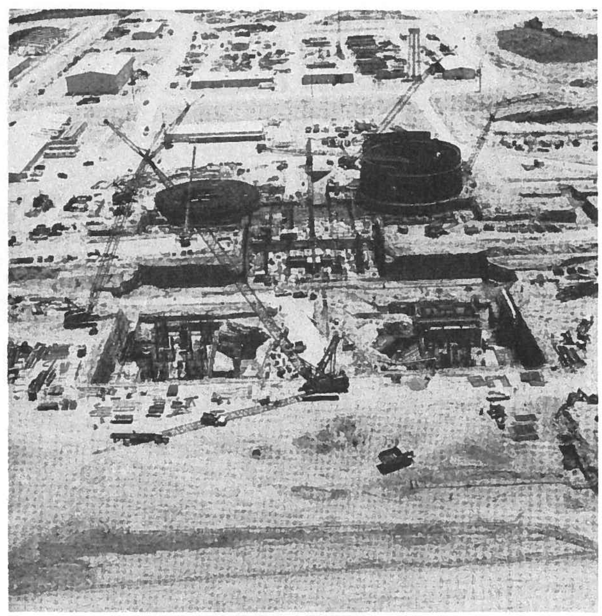
Figure 3.8-4 NRHP-Listed Resources and Cemeteries within 6 Miles of CPNPP

DECEMBER 1974



JUNE 1975

DECEMBER 1975



JUNE 1976

Figure 3.8-5 Construction Photographs of the CPNPP Site Over an 18-Month Period

Figure 3.8-6 Construction Photograph of the CPNPP Site After Tree Removal, Mechanical Leveling, and Initial Excavation

Figure 3.8-7 Construction Photograph of CPNPP Showing Areas Excavated for Structures, Facing South

Figure 3.8-8 Late-Construction Photograph of CPNPP Showing Structures, Buildings, and SCR, Facing North

Figure 3.8-9 Late-Construction Photograph of CPNPP Showing Structures, Buildings, and SCR, Facing Northeast

Figure 3.8-10 Late-Construction Photograph of CPNPP Showing Structures, Buildings, SCR, Dam and Spillway, Facing West-Northwest

3.9 Socioeconomics

Socioeconomic descriptions focus on Hood, Somervell, and Tarrant counties, because approximately 64 percent of the CPNPP workforce are located in these three Texas counties, while the remaining workforce is dispersed throughout the state of Texas and across the United States (see Table 2.5-1).

As presented in Section 2.5, during refueling outages, which usually last approximately 28 days per unit, there are typically an additional 800 to 1,200 contract employees onsite. Refueling and maintenance outages at CPNPP are on an 18-month staggered cycle. As seen in Figure 3.1-4, within the 50-mile radius of CPNPP there are several nearby Texas cities, including Glen Rose, Granbury, Stephenville, Cleburne, and the Dallas-Fort Worth metroplex. These communities offer numerous motels, campgrounds, and food service conveniences for contract workers who provide temporary staffing support to CPNPP during site outages. Regional transportation corridors such as US 67 and US 377, and local SH 144 provide commuter access to CPNPP.

3.9.1 Employment and Income

The three geographic areas most influenced by CPNPP operations are Hood, Somervell, and Tarrant counties in Texas. Additionally, CPNPP is a CP PowerCo asset with assessed property taxes distributed to various taxing jurisdictions within Somervell County. As presented in Section 3.11.1, the populations of these counties are expected to increase during the LR operating term. Low-income populations and poverty thresholds for the counties are described in Section 3.11.2.

Because of population size and interaction with nearby urban areas, Hood County has been designated the Granbury micropolitan statistical area within the Dallas-Fort Worth-Arlington combined statistical area (CSA) (USCB 2020b). The reported employed population in Hood County in 2020 was 28,849 persons. The leading reported occupational sector was retail trade, with approximately 12.1 percent, or 3,497 persons employed. This was followed by construction with 9.7 percent, or 2,810 persons employed; and health care and social assistance with 9.4 percent, or 2,706 persons employed. The annual personal income in Hood County was approximately $3.5 billion in 2020, and the average wage per job was $44,162. In 2020, per capita personal income was $55,132. (BEA 2022). The annual average unemployment rate in Hood County has dropped steadily over the years from a reported recent high in 2010 (8.6 percent) to 3.4 percent in 2019. In 2020, during the Covid-19 pandemic, the annual average unemployment rate jumped to 6.6 percent. In 2021, the preliminary average unemployment rate for Hood County was 5.4 percent. (BLS 2022) The top employers for Hood County in 2018 include the Granbury Independent School District (ISD), City of Granbury, and Luminant (GCOC 2020).

Because of its smaller population and distance from urban areas, Somervell County is not included with any metropolitan or micropolitan statistical areas (USCB 2020b). The reported employed population in Somervell County in 2020 was 5,270 persons. The leading reported

occupational sector was government and government enterprises with 17.0 percent, or 897 persons employed. This was followed by accommodation and food services with 8.1 percent, or 427 persons employed; and construction with 7.6 percent, or 398 persons employed. The annual personal income in Somervell County was $458 million in 2020, and the average wage per job was $66,429. In 2020, per capita personal income was $50,164. (BEA 2022) The annual average unemployment rate in Somervell County has dropped steadily over the years from a reported recent high of 8.1 percent in 2011 to 3.6 percent in 2019. In 2020, during the Covid-19 pandemic, the annual average unemployment rate jumped to 6.5 percent. In 2021, the preliminary average unemployment rate for Somervell County was 5.3 percent. (BLS 2022) A list of Somervell County top employers was not available.

Tarrant County is located in the Dallas-Fort Worth Metropolitan Statistical Areas, and within the Dallas-Fort Worth-Arlington CSA (USCB 2020b). In 2020, Tarrant County reported a total employment of 1,272,899 persons. The leading occupational sector was retail trade with 127,785 persons employed (10.07 percent); followed by health care and social services with 124,267 persons employed (9.8 percent), and government and government enterprises with 115,726 employed (9.1 percent). The annual personal income in Tarrant County was $118 billion in 2020, and the average wage per job was $61,533. In 2020, the per capita personal income was $55,615. (BEA 2022) The annual average unemployment rate in Tarrant County has steadily dropped from 8.2 percent in 2010 to 3.3 percent in 2019. During the Covid-19 pandemic in 2020, the annual average unemployment rate jumped to 7.3 percent. The preliminary average annual unemployment rate in 2021 for Tarrant County was 5.5 percent. The principal employers in Tarrant County are AMR Corp/American Airlines, Texas Health Resources, and Lockheed Martin Aeronautics Company (TC 2021a).

3.9.2 Housing

Between 2010 and 2020, the Texas counties where the majority of CPNPP workforce reside all had an increase in population: Hood County (20.4 percent); Somervell County (8.4 percent); and Tarrant County (16.7 percent) (see Table 3.11-2).

As presented in Table 3.9-1 the availability of vacant housing in the three counties has been consistent since 2000. The 2020 percentage of available housing indicates that with the growth in population in the three counties, there were sufficient vacant homes available to keep up with the population increase. In 2020, availability of housing in Hood County was 12.9 percent, 18.3 percent in Somervell County, and 7.4 percent in Tarrant County. (USCB 2020c; USCB 2021d; USCB 2022c)

Table 3.9-1 also details the rise in median housing values that has taken place over the years. Between 2000 and 2010, the median house value rose by 35.8 percent in Hood County, 58.1 percent in Somervell County, and 49.4 percent in Tarrant County. Between 2010 and 2020, the median housing values in Hood County rose by 37.1 percent; 42.6 percent in Somervell County, and 55.4 percent in Tarrant County. Of the three counties, as of 2020, Tarrant County median

house values are the highest ($209,600) and Somervell County median house values are the lowest ($205,800). (USCB 2020c; USCB 2021d; USCB 2022c)

Between 2000 and 2010, median monthly rents increased along with median housing values in the three counties. In Hood County, between 2000 and 2010 median monthly rents rose by 53.8 percent; and rose again by 21.3 percent between 2010 and 2020. Somervell County median monthly rents rose by 44.3 percent between 2000 and 2010 and by 23.3 percent between 2010 and 2020. In Tarrant County, between 2000 and 2010, median monthly rents rose by 36.1 percent and by 37.1percent between 2010 and 2020. Of the three counties, Tarrant County has the highest median monthly rents ($1,142) and Somervell County has the lowest monthly rents ($715). (USCB 2020c; USCB 2021d, USCB 2022c)

3.9.3 Water Supply and Wastewater

The following community water supply and wastewater discussion focuses primarily on Hood and Somervell counties where CPNPP is located. In both Somervell and Hood counties, there are various ways for residents to obtain water and wastewater services. Depending on the geographic location, residents of the two counties can get water from a municipality or from private wells. (NRC 2011)

As of 2013, in Hood County there were 16 individual water service providers for communities and subdivisions and two sanitary wastewater disposal providers. Septic systems are utilized in the majority of Hood County subdivisions for wastewater disposal. (AMUD 2021a)

The largest city in Hood County and one of the larger water service providers is the City of Granbury, where water customers consist of a mixture of residential, commercial, institutional, and wholesale users. At present, Granbury provides water service to approximately 14,000 retail water users through 5,500 retail service connections, and 1,670 wholesale water users through three wholesale metered connections. The City of Granbury holds water rights from the Brazos Water Management Area. (Granbury 2021c)

In 2017, the City of Granbury built a new water treatment plant. The plant expanded the city's surface water treated capacity by more than 500 percent and replaced the old water treatment plant. The new plant allowed the city of Granbury to eliminate purchasing water from the Acton Municipal Utility District (AMUD). The surface water treatment plant can produce up to 2.5 million gallons per day (MGD). This meets the city of Granbury's current daily water requirements (approximately 1.5–2 MGD). On peak demand days (3–3.5 MGD), water supply from Granbury's 34 groundwater wells supplement user demand. Currently, the City of Granbury is in Phase II of adding additional equipment to the water plant that will increase its capacity to 5 MGD, and also has plans for a future Phase III increase in water treatment plant capacity to 7.5 MGD, to be implemented in the next 20–30 years, depending on population growth. (Granbury 2021d)

The City of Granbury wastewater collection system consists of a network of sewer lines, lift stations, and manholes. Sewage flows by gravity, aided, when necessary, by lift stations, through the collection system into the wastewater treatment plant (WWTP). No wholesale customers are served by the city of Granbury sewage collection and treatment system. The current WWTP has a permitted capacity of 2 MGD. All treated wastewater is disposed of via permitted outfall into Lake Granbury. (Granbury 2021c)

Currently 100 percent of the Granbury WWTP capacity is already accounted for by existing and upcoming developments. In 2018, city government approved a master plan to meet short-term needs for increasing wastewater capacity with immediate construction of a new 1 MGD east Granbury WWTP. As part of the initial project, Granbury would also rehabilitate the existing 2-MGD south WWTP and introduce other waste collection improvements. In 2018, as part of the phased wastewater expansion plan, the city also intended to continue to improve on the collection system and in 5-10 years build a north Granbury WWTP, and in 10–20 years add additional lines and a west Granbury WWTP. Currently the Granbury WWTP expansion project has stalled due to ongoing public opposition to construction of the proposed 1 MGD east WWTP. As of 2021, the City of Granbury has established an ongoing 180-day moratorium on new development in the eastern portion of the city, which could eventually envelop the entire municipality if the state does not issue a permit for the east WWTP facility. (Granbury 2021d; HCN 2021)

AMUD is another large water and wastewater provider in Hood County and serves both municipal and wholesale customers. The district is composed of a number of residential subdivisions in the Acton area, scattered individual residences, and undeveloped agricultural lands surrounding the southern portion of Lake Granbury and the portion of the Brazos River which flows from Lake Granbury. The district's current customer base is 8,200 households. AMUD water comes from 24 wells located throughout the district and is supplemented with surface water from Lake Granbury via water treated at the Brazos Regional Public Utility Agency Surface Water and Treatment System plant located in Acton. As of 2014, the AMUD wells had a capacity of 3.1 MGD, and the Brazos Regional Public Utility Agency contract supplies 5.81 MGD to the district via the surface water and treatment system plant. (AMUD 2021b; AMUD 2021c)

Approximately 20 percent of the water distributed to AMUD retail users is returned to the district's two wastewater treatment facilities. No wholesale customers are served by the district's sewage collection and treatment system. The AMUD WWTP No. 1 has a rated treatment capacity of 0.6 MGD, and AMUD WWTP No. 2 is rated for 0.487 MGD. It was announced in 2020 that because of the age of some of the waste treatment components and to accommodate additional population growth in the Acton area, WWTP No. 1 would expand its treatment capacity to over 0.9 MGD. (AMUD 2021b; AMUD 2021c)

The SCWD serves as the main water supplier for Somervell County and has completed facilities for raw water supply, recreational use, water treatment, and transmission facilities. The SCWD operates the only water treatment plant in Somervell County and has a capacity of 2.5 MGD,

with build out capacity to 3.75 MGD. (SCWD 2021b) As discussed in Section 3.1.4, the SCWD is continuing to add new waterlines to the county distribution system.

The SCWD provides treated water to the city of Glen Rose on a wholesale basis and serves Somervell County as a retail supplier. Until recent years, the municipal water needs of Somervell County were being met by groundwater, but groundwater levels have been rapidly declining. In 2008, the Wheeler Branch Reservoir was constructed northwest of Glen Rose. The Wheeler Branch storage capacity is 4,118 acre-feet, and the current yield available for municipal use is 2,000 acre-feet per year. The population of Somervell County was a reported 8,490 in 2010, and the amount of water used for municipal purposes was estimated to be 1,541 acre-feet. This is approximately 162 gallons per person per day. Based on a projected 2070 population, the dry year municipal water use in Glen Rose and Somervell County would be approximately 1,819 acre-feet per year, indicating enough SCWD capacity to meet potential population growth. (SCWD 2021b; SCWD 2021a)

The SCWD also provides commercial potable water supplies to CPNPP. The industrial demand by CPNPP is a reported 10,750,000 gallons per year. The SCWD does not provide CPNPP power plant cooling water nor any make-up water (see Section 3.6 discussion). (SCWD 2021b)

The City of Glen Rose owns and operates the only public wastewater treatment facility in Somervell County. Over the past several years, Glen Rose's WWTP has consistently discharged an average of 0.30 MGD. Since the remainder of the county is served by individual septic systems, there is no return wastewater flow in the rural portions of Somervell County. (SCWD 2021b)

3.9.4 Community Services and Education

As of the 2018–2019 school year, Hood County had three public ISDs and one charter school, with 8,656 total students and 16 schools. Within the county, Granbury ISD is the largest district with 10 schools and 7,346 students (grades pre-kindergarten to 12). The Granbury ISD student/teacher ratio was 15.72. Hood County has one private school with 52 total students (2017-2018 school year). (NCES 2021) In Hood County, Weatherford College has opened an education center in the city of Granbury. Along with library collections, smart classroom technology, and academic/career assessments, the center offers credit and workforce continuing education courses. (WC 2021)

For Hood County emergency services, county-wide law enforcement is provided through various agencies including the county sheriff's office, local county constables, the county fire marshal, the Lipan City Marshal office, and the cities of Granbury and Tolar both have police departments (USACOPS 2021). Hood County is served by nine community fire departments, with 22 stations and 498 active volunteer firefighters (USFA 2021). There is one full-service hospital in Hood County. Located in the city of Granbury, the Lake Granbury Medical Center is a 73-bed (acute care) facility. (TDSHS 2021)

For the 2018–2019 school year, Somervell County had one ISD and one charter school, with a reported 2,095 students and five schools. The Glen Rose ISD is the largest district in the county with four schools and 1,857 students serving grades pre-kindergarten to 12. The Glen Rose ISD student/teacher ratio was 13.55. Somervell County has one private school serving 193 students in the 2017–2018 school year. There are no colleges or universities reported to be located in the county. Within the CPNPP 50-mile region, there are 20 two-year and four-year higher educational facilities (both public and private). Approximately 27 miles from Glen Rose, the nearest four-year schools are Tarleton State University in Stephenville, TX, and Southwestern Adventist University in Keene, TX. (NCES 2021)

Somervell County public safety is provided through the County Sheriff's office and the city of Glen Rose police department (GR 2021). The Somervell County Fire Department has one station in the city of Glen Rose. (FireDepartment.net 2021; USFA 2021) There is one full-service hospital in Somervell County. The Glen Rose Medical Center has a 16 bed (acute care) capacity and is located in the city of Glen Rose. (TDHS 2021)

With 41 incorporated cities, towns, and municipalities (TC 2021b), Tarrant County has a large public school student population, and in the 2018–2019 school year reported 27 school districts and 359,281 total students (528 schools). Fort Worth ISD is the largest school district in the county with 84,510 students and 145 schools serving grades pre-kindergarten to 12. The Fort Worth ISD student/teacher ratio was 14.63. There are also 86 private schools in Tarrant County serving a reported 19,772 students (2017–2018 school year). Fourteen of the four-year and two-year higher educational facilities are located within the cities of Fort Worth and Arlington in Tarrant County. (NCES 2021)

There are 38 law enforcement agencies in Tarrant County providing public safety, including the county sheriff's office, community marshals, airport and transit police, and municipal police departments (USACOPS 2021). Tarrant County has 36 fire departments, with 124 stations and over 2,400 firefighters (active and volunteer) providing support (USFA 2021). There are 44 hospitals located in Tarrant County, with 6,221 acute care beds available and 312 psychiatric care beds (TDHS 2021).

3.9.5 Local Government Revenues

For Somervell County, TX, where CPNPP is located, the Somervell County Appraisal District (Somervell CAD) is responsible for annual fair market appraisal of all real and business property within the jurisdiction. The Somervell CAD appraises property according to the Texas property tax code and is a political subdivision of the state of Texas. Using the taxable values for the county as certified by the chief appraiser and following requirements of the truth in taxation laws, tax rates are established for the individual Somervell County taxing jurisdictions. Within Somervell County, the Somervell CAD assesses CPNPP property and collects property tax payments for the following individual taxing jurisdictions: Somervell County, City of Glen Rose, SCWD, Glen Rose Medical (Somervell County Hospital District), and Glen Rose ISD. (SCAD 2020).

Based on annual property appraisals, Table 3.9-2a presents CPNPP's total annual property tax payment to Somervell CAD for 2015 through 2021, along with the Somervell CAD total annual tax revenues. Table 3.9-2b provides a breakdown of CPNPP's annual tax payment as allocated by the Somervell CAD to each of the individual taxing jurisdictions, along with each of the taxing jurisdictions annual tax revenue totals for 2015 through 2021. As presented in Table 3.9-2a, the Somervell CAD total annual revenues attributable to the annual CPNPP tax payment between 2015 and 2021 ranged from 58 percent to 75 percent. In 2021 (latest year of complete financial reporting) the payment attributable to CPNPP represented approximately 68 percent of Somervell CAD revenues. Annually, the Glen Rose ISD is the Somervell CAD taxing jurisdiction that receives the largest percentage of CPNPP's tax payment, representing approximately 69 percent of total school district revenues in 2021 (Table 3.9-2b).

As noted in Table 3.9-2a, CPNPP property taxes for 2015–2017 were challenged by the taxpayer under the Texas tax code. The parties reached a settlement in a confidential settlement agreement that established the values and corresponding tax payments for those three years. At this time, CPNPP does not anticipate any material future changes in tax laws, although it should be noted that the value of CPNPP for Texas property tax purposes moves up and down with power price forecasts, costs incurred to produce electricity at CPNPP, and output, among other valuation variables applicable to an income-producing power plant. In addition to changes in valuation associated with operation of CPNPP in the Electric Reliability Council of Texas (ERCOT) competitive market, the Texas legislature and courts actively consider school finance reforms that could also alter the Texas property tax system in the future.

In appreciation for emergency planning support, CPNPP contributes a total of $220,000 annually to Hood County, Somervell County, Glen Rose ISD, Bosque County, and the city of Benbrook. CP PowerCo also allocates $25,000 each year to support a variety of local community organizations and programs, such as the Somervell County Food Bank, Glen Rose American Legion, Lake Granbury Beautification, and Granbury ISD Science Fair. CP PowerCo actively encourages CPNPP employee participation in charitable fundraising, and annually sponsors a United Way corporate match for staff contributions. With United Way and additional contributions to community special events, approximately $100,000 in total contributions were raised by CP PowerCo and CPNPP staff in 2021.

3.9.6 Transportation

As discussed in Section 3.1, transportation in the CPNPP region includes a rural and urbanized road network, plus rail and air travel (see Figures 3.1-3 and 3.1-4). East of CPNPP, Interstate 35 (I-35) is a major north-south interstate that traverses the 50-mile region, running through the Dallas-Fort Worth metropolitan area. Located north of CPNPP, the I-20 transportation corridor is a major east-west interstate that crosses north Texas. Within Hood and Somervell counties, US 67, US 377, and SH 144 provide commuter access from the communities in the region to CPNPP.

In Hood and Somervell counties, FM 56, located just west of the CPNPP site, is a two-lane, north-south paved highway connecting US 377 at the city of Tolar to US 67 at the city of Glen Rose. FM 56 provides the only direct road access to CPNPP's main plant facilities. For plant workers arriving via Somervell County, FM 56 north from Glen Rose intersects with the plant access road entrance. For CPNPP workers arriving via Hood County north of the plant entrance, FM 56 south from Tolar, and the FM 56 intersection with FM 51 (a two-lane, northeast-southwest highway from the city of Granbury) provide direct commuter access to the CPNPP site. At the FM 56 and CPNPP plant access road intersection, vehicle access to the plant includes dedicated turn lanes and traffic signals. (NRC 2011, Section 2.5.2.3)

The TxDOT average annual daily traffic (AADT) volumes for FM 56 are listed in Table 3.9-3. Over the years, the traffic volume counts on FM 56 have been consistent and reveal little fluctuation of commuter plant access. On FM 56 south of the plant, the most recent 2019 AADT count was 3,308. On FM 56 north of the plant, the 2019 AADT count was 2,988. (TXDOT 2021b)

The U.S. Transportation Research Board developed a commonly used indicator called level of service (LOS) to measure how well a highway accommodates traffic flow. LOS is a qualitative assessment of traffic flow and how much delay the average vehicle might encounter during peak hours. LOS categories are listed and defined in Table 3.9-4.

No recent TxDOT traffic studies specific to FM 56 in the area of CPNPP were available. To provide a current evaluation of LOS for FM 56, the known AADT traffic volumes were compared to the estimated capacity of a two-lane highway, as presented in the U.S. Transportation Research Board highway capacity manual. The manual notes that the capacity of a two-lane highway under base conditions is 1,700 passenger cars per hour (pc/h) in one direction, with a limit of 3,200 pc/h for the total of the two directions. Because of the interactions between directional flows, when a capacity of 1,700 pc/h is reached in one direction, the maximum opposing flow would be limited to 1,500 pc/h. Based on 2019 AADT recorded volumes, FM 56 south of the plant access road would have a reported flow rate of 138 pc/h on average. The 2019 AADT recorded volumes would indicate FM 56 north of the plant access road would have a reported flow rate of 125 pc/h on average. Because traffic flow has stayed consistent over the years, and the base condition capacities for a two-lane road are not exceeded by the current average traffic conditions, there should be ample traffic capacity on FM 56 in the road areas associated with plant access. Applying the LOS traffic conditions defined in Table 3.9-4, FM 56 should fall within the LOS "A" to "C" range of conditions.

In both Somervell and Hood counties, the TxDOT transportation improvement program has identified additional potential local road improvement projects for 2021–2024 planning purposes. These potential transportation improvement program projects should have no impact on plant accessibility. (TXDOT 2021c; TXDOT 2021d).

3.9.7 Recreational Facilities

While there are a number of popular regional and local county parks with playgrounds, visitor attractions, private and public overnight accommodations and camping, marina services, and recreational access to local lakes and rivers, no data on present and projected percentage of visitor use were available. See Figure 3.1-5 for locations of attractions that can be found within the vicinity of CPNPP.

As discussed in Section 3.1, the SCP public use area is located approximately 1 mile north of CPNPP on the SCR shoreline. SCR and park visitor access are controlled by CPNPP. SCP public recreational opportunities include SCR access for boat fishing, bank fishing, and shoreline picnicking. Between 2015 and 2019, in peak years as many as approximately 20,000 annual visitors have accessed SCP, with boat and bank fisherman the primary users. The highest visitor park use traditionally takes place during the cooler months of October through March, with fewer visitors the remaining 6 months of the year. While the SCR and SCP are currently closed to the public, recreational use is expected to reopen to visitors on a seasonal basis in the future. (Luminant 2021b)

Table 3.9-1 Housing Statistics, 2000–2020

Name	2000	2010	2000 to 2010 Change (%)	2020 Estimate	2010 to 2020 Change (%)
Hood County					
Total Housing Units	19,105	23,888	25.0	26,651	11.6
Occupied Units	16,176	20,240	25.1	23,215	14.7
Vacancy Units	2,929	3,648	24.5	3,436	5.8
Vacancy (percent)	15.3	15.3	0.0	12.9	2.4
Median House Value ($)	112,100	152,200	35.8	208,700	37.1
Median Rent ($/month)	541	832	53.8	1,009	21.3
Somervell County					
Total Housing Units	2,750	3,502	27.3	3,851	10.0
Occupied Units	2,438	2,923	19.9	3,145	7.6
Vacancy Units	312	579	85.6	706	21.9
Vacancy (percent)	11.3	16.5	5.2	18.3	1.8
Median House Value ($)	91,300	144,300	58.1	205,800	42.6
Median Rent ($/month)	402	580	44.3	715	23.3
Tarrant County					
Total Housing Units	565,830	696,556	23.1	780,381	12.0
Occupied Units	533,864	632,518	18.5	722,446	14.2
Vacancy Units	31,966	64,038	100.3	57,935	-9.5
Vacancy (percent)	5.6	9.2	3.6	7.4	-1.8
Median House Value ($)	90,300	134,900	49.4	209,600	55.4
Median Rent ($/month)	612	833	36.1	1,142	37.1

(USCB 2020c; USCB 2021d; USCB 2022c)

Table 3.9-2a CPNPP Total Property Tax Payments, 2015–2021

Year	Somervell CAD Total Tax District Revenue (USD)	CPNPP Total Property Tax Paid (USD)	% of Total Annual Revenue
2015[(a)]	39,924,784	29,819,198	75
2016[(a)]	46,575,615	26,783,926	58
2017[(a)]	39,653,991	27,726,896	70
2018	40,088,012	27,004,042	67
2019	41,613,724	27,131,834	65
2020	43,988,727	29,866,917	68
2021	42,425,538	28,900,690	68

a. CPNPP property taxes for 2015–2017 were challenged by the taxpayer under the Texas tax code. The parties reached settlement for the three years in a confidential settlement agreement that established the values and payments for those three years.

Table 3.9-2b CPNPP Total Property Tax Payment (USD) by Somervell County Tax Jurisdictions, 2015–2020

Jurisdiction	2015	2016	2017	2018	2019	2020	2021
Somervell County Water District							
Total Tax Jurisdiction Revenue	2,946,663	3,332,094	2,855,614	2,906,962	2,854,875	3,207,275	2,971,801
CPNPP Total Property Tax Paid	2,217,053	1,955,064	2,065,752	1,974,670	1,877,518	2,194,612	2,040,555
% of Total Annual District Revenue	75	59	72	68	66	68	69
Somervell County Hospital District							
Total Tax Jurisdiction Revenue	3,084,468	4,622,068	3,343,788	3,309,278	3,510,609	3,778,504	3,816,128
CPNPP Total Property Tax Paid	2,320,390	2,194,399	2,351,909	2,248,209	2,309,275	2,585,899	2,620,303
% of Total Annual District Revenue	75	47	70	68	66	68	69
Somervell County District							
Total Tax Jurisdiction Revenue	10,278,112	12,384,528	10,510,640	11,023,500	11,894,304	12,420,744	11,752,390
CPNPP Total Property Tax Paid	7,733,193	7,277,726	7,391,710	7,488,928	7,822,992	8,499,203	8,195,128
% of Total Annual District Revenue	75	59	70	68	66	68	70
Glen Rose ISD							
Total Tax Jurisdiction Revenue	22,978,613	25,581,028	22,244,937	22,114,893	22,578,637	23,845,010	23,235,273
CPNPP Total Property Tax Paid	17,548,537	15,356,713	15,917,502	15,292,212	15,122,026	16,587,181	16,044,684
% of Total Annual District Revenue	76	60	72	69	67	70	69
Glen Rose, City							
Total Tax Jurisdiction Revenue	636,928	655,897	699,011	733,380	775,300	737,194	649,947
CPNPP Total Property Tax Paid	25	24	23	23	23	22	21
% of Total Annual District Revenue	0	0	0	0	0	0	0

Table 3.9-3 Total Average Annual Daily Traffic Counts on FM 56

Route	Location	2005	2010	2015	2017	2019
FM 56	South of CPNPP Plant Access Road	2,900	2,300	2,695	2,526	3,308
FM 56	North of CPNPP Plant Access Road	NC	NC	2,539	2,530	2,988

(TXDOT 2021b)

NC = no count

Table 3.9-4 Level of Service Definitions

Level of Service	Conditions
A	Free flow of the traffic stream; users are mostly unaffected by the presence of other vehicles.
B	Free flow of the traffic stream, although the presence of other vehicles becomes noticeable. Drivers have slightly less freedom to maneuver.
C	The influence of the traffic density on operations becomes marked and queues may be expected to form. The ability to maneuver with the traffic stream is clearly affected by other vehicles.
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	Operations at or near capacity, an unstable level. The densities vary, depending on the free-flow speed. Vehicles are operating with the minimum spacing (or gaps) for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F.
F	Forced or breakdown of flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity. Queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

3.10 Human Health

This section describes site conditions likely to contribute to the occurrence of pathogenic thermophilic microbiological organisms; methodology and procedures designed to meet the regulatory requirements and standards for limiting potential induced current hazards arising from energized in-scope transmission lines; and a description of the plant's radiological health environment and preventative measures necessary to reduce potential exposure levels to plant workers and visitors during plant operations.

3.10.1 Microbiological Hazards

In the GEIS, the NRC considered health impacts from thermophilic microorganisms posed to both the public and plant workers because ideal conditions for thermophilic microorganisms can result from nuclear facility operations and discharges. Microorganisms of particular concern include several types of bacteria (*Legionella* species, *Salmonella* species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*. The public can be exposed to the thermophilic microorganisms *Salmonella, Shigella, P. aeruginosa*, and *N. fowleri* during swimming, boating, or other recreational uses of freshwater. If a nuclear plant's thermal effluent enhances the growth of thermophilic microorganisms in waters open for recreational use, recreational users could experience an elevated risk of exposure when using waters near the plant's discharge. (NRC 2013c; NRC 2020a)

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95 to 113°F, although the bacteria can persist in waters from 68 to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs. As such, human infection is often associated with complex water systems housed within buildings or structures, such as cooling towers. (NRC 2020a)

N. fowleri is ubiquitous in nature and thrives in water bodies at temperatures ranging from 95-106°F or higher and is rarely found in water cooler than 95°F. Infection rarely occurs in water temperatures of 95°F or less (NRC 2013c, Section 3.9.3). Infections occur when *N. fowleri* penetrates the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrates to the brain tissues (CDC 2020). There have been 37 cases of primary amebic meningoencephalitis in Texas through 2020 (CDC 2020).

The other human pathogens mentioned above have infection routes of contact with infected persons or contaminated water, food, soil, or other contaminated material. The pathogens can grow at a range of temperatures, but as human pathogens, have an optimal growth temperature around the human body temperature. The U.S. Centers for Disease Control and Prevention reports three outbreaks of waterborne *Shigella* infection from untreated recreational waters in the Texas 2009–2017 (CDC 2017). There were no reported cases of waterborne infection in

Texas from untreated recreational waters from *Salmonella* spp., *Pseudomonas* spp., *Acanthamoeba*, or *Legionella* ssp. in Texas in 2009–2017 (CDC 2017).

Activities at SCR are seasonal recreational boating and fishing. Access for the public to SCR is at SCR Park located on the northern arm of SCR. Swimming and wading are not allowed in SCR. Fishing is allowed from a boat or the bank. In-water barriers restrict boaters' approach to the discharge point by more than 1,800 feet. (Luminant 2021b; Attachment E)

CPNPP utilizes a cooling system in which cooling water is withdrawn from SCR from its intake on the north side of the plant, increases in temperature as it passes through the plant condensers, and returned to SCR through the discharge point on the southeast side of the plant. The discharge is pumped into a submerged outlet into a deep arm of the SCR. The outlet is a 101.5-foot-long channel that terminates at a lake depth of 35-40 feet (TUGC 1978).

CPNPP's TPDES Permit No. WQ0001854000 included in Attachment B was renewed in October 2019 and governs discharges of cooling water, stormwater, and low-volume wastewater to SCR. The SCR is classified as an industrial cooling reservoir and not subject to ambient water quality temperature limits; however, the permit identifies temperature limits that were proposed and accepted by TCEQ in earlier permit editions. Daily maximum and daily average discharge temperatures based on a flow-weighted average temperature (FWAT) are computed on a daily basis. The daily maximum discharge temperature limit is 116°F for the highest FWAT during the calendar month. The daily average discharge temperature limit is 113°F based on the arithmetic mean of the FWATs for the calendar month. The permit allows discharge of treated domestic wastewater through Outfall 003. Prior to discharge the treated domestic wastewater effluent is routed through a UV light disinfection.

CPNPP's procedures govern chemical additions. Sodium bromide and sodium hypochlorite are added to circulating water to control biological fouling of the system. Anti-scalant is added to circulating water to control scale development in the system. Sodium bromide and sodium hypochlorite are added to station service water to control biological fouling of the system. A corrosion inhibitor and dispersant chemical blend is added to station service water to control corrosion and fouling in the system. Clamicide is added to station service water biannually to control clam growth in the system. Each treatment period lasts several days. Aquashade can be used in the SSI for algae and aquatic plant control as needed.

CPNPP does not have cooling towers which carry a risk of promoting *Legionella*. Condenser tubing also has the potential of promoting *Legionella*. At CPNPP, condenser tubing cleaning is accomplished during outages and staff involved in the cleaning use respiratory protection equipment. The condenser tubes are cleaned during outages by using air to push brushes through the tubes. When the circulating water system (e.g., condenser water boxes) are entered by personnel, to protect against microorganisms (e.g., *Legionella*), safety instructions include ensuring that the circulating water system has been disinfected prior to entry, use of approved air purifying or supplied air respiratory protection equipment and performing personal hygiene practices after exiting the system.

3.10.2 Electric Shock Hazards

The electric field created by high-voltage lines can extend from the energized conductors on the lines to other conducting objects, such as the ground, vegetation, buildings, vehicles, and persons if appropriate clearances are not maintained, posing a shock hazard for the public and workers. To minimize the shock that could be experienced by someone touching an object that is capacitively charged, the clearance between the power lines and the object must limit the induced current to a low enough electrical charge. The National Electrical Safety Code (NESC) contains the basic provisions considered necessary for the safety of workers and the public.

The in-scope transmission lines (Figure 2.2-2) span between the switchyards and the power block. The switchyards are within a fenced, restricted access area and the power block is within the protected area fence. The span between these fenced areas crosses one of the plant's private roads. The entirety of the in-scope transmission lines is within the owner-controlled area (OCA). Thus, risk to the public is minimized due to restricted site access.

The in-scope transmission lines have been evaluated for compliance with NESC clearance standards. The existing switchyard to plant tie lines conductors and clearances were evaluated in 2008 by a licensed engineer as part of the CPNPP uprate project. The clearance study used computer-based modelling of the existing line structures and conductor sag. The evaluation concluded that the clearances at the maximum operating temperature met the 2007 NESC minimum requirements, except for clearance from the Unit 1 main transformers tie line to a light pole. This light pole clearance anomaly was subsequently corrected. Per Section 0.13.B.2 of the current Code, 2017 NESC, existing installations, including maintenance and replacement that currently comply with prior editions of the code, need not be modified to comply with these rules except as may be required for safety reasons by administrative authority. As stated above, the in-scope transmission lines are wholly within areas of restricted access and under the control of Vistra OpCo. Therefore, the in-scope transmission lines comply with current NESC clearance standards.

Compliance with NESC clearance standards is maintained by CPNPP's procedure-driven design review and control process. This process documents evaluations of changes that would potentially affect the electrical shock hazard of the in-scope transmission lines. Maintenance activities are also controlled by procedures. The use of man lifts and cranes near transmission lines is controlled by procedure.

Work on the CPNPP site is governed by a comprehensive industrial safety program with programmatic and tiered specific activity procedures. The program lists as references Occupational Safety and Health Administration (OSHA) regulations at CFR, Title 29, Parts 1904, 1910, and 1926. The program addresses electrical safety, clearance, and safety tagging, use of ladders and portable equipment, etc. Additional instructions are provided for using cranes and man lifts to ensure these are placed and operated safely.

3.10.3 Radiological Hazards

As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," Vistra OpCo designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at CPNPP. NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants must meet radiation dose-based limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and the ALARA criteria in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." Through these release limits, the NRC places regulatory limits on the radiation dose that members of the public can receive from a nuclear power plant's radioactive effluent.

CPNPP's ODCM contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents (Luminant 2020b). These methods ensure that radioactive material discharges from CPNPP meet NRC and EPA regulatory dose standards. CPNPP's annual radioactive effluent release reports contain a detailed presentation of the radioactive liquid and gaseous effluents released from CPNPP and the resultant calculated doses.

Radioactive effluent release data from 2013 through 2019 is trended in the 2019 report, showed no trends for increasing effluent radioactivity but show variability from year to year. Variability is a result of several factors including fuel type in the core, core cycles, and if the year was an outage year for either or both units. The 2020 report also showed no trends for increasing effluent radioactivity. Also, there was no unplanned gaseous or liquid radioactive releases in 2019 or 2020. Radiation doses to members of the public were controlled within the NRC's and EPA's radiation protection standards contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and 40 CFR Part 190. Dose to a member of the public from activities inside the site boundary was evaluated. The highest dose resulted from recreational fishing on SCR. A dose of 2.86E-03 and 2.86E-03 milli roentgen equivalent man/year (mrem/year) was calculated for 2019 and 2020 respectively based on an individual fishing twice a week, five hours each day, six months per year. Pathways included in the calculation were gaseous inhalation and submersion. Liquid pathways are not considered since all doses are calculated at the point of circulation water discharge into the reservoir. (Luminant 2020b; Luminant 2021a)

CPNPP also monitors radioactivity onsite and in the surrounding area through its REMP to identify any undue accumulation of radioactivity in any sector of the environment. Annual reports on the results are sent to the NRC. There were no values reported during the year 2019 or 2020 that exceeded any NRC reportable limit. Based on the 2019 results and from comparisons with the pre-operational and operational program results from previous years, Vistra OpCo concluded that the impact of CPNPP operations on the environment is minimal. The only REMP result directly attributable to Comanche Peak is the tritium detected in SCR. The tritium in SCR is expected to remain well below the reportable level. Gross beta trend indications concerning

SCR are consistent with previous values and do not indicate any increase due to influence from CPNPP. (Luminant 2020c; Attachment E)

Occupational exposure at nuclear power plants is reported by licensees to NRC and then summarized by the NRC. CPNPP's average annual individual occupational dose was well under the NRC exposure limit and the collective worker dose was also below average. The 3-year (2016 to 2018) average annual occupational dose per individual [total effective dose equivalent (TEDE)] was 0.089 roentgen equivalent man (rem) for CPNPP. The annual TEDE limit is 5 rems [10 CFR 20.1201(a)(1)]. The NRC also trended CPNPP's collective dose for workers. From 2016 to 2018, the collective worker dose per reactor at CPNPP was below the average collective dose for pressurized water reactors. (NRC 2020b) Occupational exposure levels are expected to be similar during the license renewal term as there are no planned changes in plant operation that would materially affect occupational doses.

3.11 Environmental Justice

This section characterizes the population and demographic makeup, including the identification of minority and low-income individuals, within a 50-mile radius of CPNPP.

3.11.1 Regional Population

The GEIS presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC 1996b, Section C.1.4). Sparseness measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles.
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles.
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles.

(NRC 1996b, Section C.1.4)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows.

Demographic Categories Based on Proximity

		Category
Not close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles.
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles.
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.
Close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles.

(NRC 1996b, Section C.1.4)

The GEIS then uses the following matrix to rank the population in the region of the plant as low, medium, or high.

GEIS Sparseness and Proximity Matrix

		Proximity			
		1	**2**	**3**	**4**
Sparseness	**1**	1.1	1.2	1.3	1.4
	2	2.1	2.2	2.3	2.4
	3	3.1	3.2	3.3	3.4
	4	4.1	4.2	4.3	4.4

Low Population Area	Medium Population Area	High Population Area

(NRC 1996b, Figure C.1)

The 2020 census population and TIGER/Line data from the USCB were used to determine demographic characteristics in the vicinity of the site (USCB 2020b). The data were processed at the state, county, and census block levels using ESRI ArcGIS 10.4 software (USCB 2022a; USCB 2022d). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers); nursing homes; mental (psychiatric) hospitals; hospitals or wards for the chronically ill; and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes; college dormitories; military quarters; soup kitchens; shelters for abused women (shelters against domestic violence or family crisis centers); and shelters for children who are runaways, neglected, or without conventional housing. (USCB 2020d)

The 2020 census data indicate that approximately 82,833 people live within a 20-mile radius of the CPNPP site, which equates to a population density of 66 persons per square mile (USCB 2022d). The boundary of the city of Cleburne, TX, falls within the 20-mile radius of the CPNPP site. As listed in Table 3.11-1, Cleburne's 2020 population was estimated to be 31,352.

Based on the GEIS sparseness index, the site is classified as Category 3 with 60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.

The 2020 census data indicate that approximately 2,056,308 people live within a 50-mile radius of the site, which equates to a population density of 262 persons per square mile (USCB 2022d). There are three cities within a 50-mile radius that have a population greater than 100,000 residents (Table 3.11-1). Based on the GEIS proximity index, the site is classified as Category 4, greater than or equal to 190 persons per square mile within 50 miles.

As illustrated in the GEIS sparseness and proximity matrix, the combination of "sparseness" Category 3 and "proximity" Category 4 results in the conclusion that CPNPP is located in a "high" population area.

The latest permanent population projections for Texas were obtained from the Texas Demographic Center (TDC). County-level permanent population values for the counties within a 50-mile radius are shown in Table 3.11-2. Transient data for the state of Texas were obtained from Travel Texas Industry Research (TTIR) and included in projected total population within a 50-mile radius of CPNPP.

The area within a 50-mile radius of the CPNPP site totally or partially includes 19 counties, all within the state of Texas (Table 3.11-2). According to the 2020 census, the permanent population (not including transient populations) of the entire 19 counties was approximately 5,910,067 (Table 3.11-2). By 2053, the end of the proposed CPNPP operating term for Unit 2, the permanent population (not including transient populations) of the entire 19 counties is projected to be approximately 8,767,344. Based on 2010–2053 population projections, an annual growth rate of approximately 1.2 percent is anticipated for the permanent population in the 19 counties wholly or partially within a 50-mile radius (TDC 2021).

As shown in Table 3.11-2, the total population (including transient populations) of the 19 counties, which are totally or partially included within a 50-mile radius, is projected to be approximately 9,465,735 in 2053. The total population (including transient populations) within the 50-mile radius is projected to be 3,317,301 in 2053. (TDC 2021; TTIR 2021; USCB 2022a; USCB 2022d)

CPNPP is located in Somervell County. As shown in Table 3.11-2, the population of Somervell County, TX, as reported in the 2020 census was 9,205. Based on Texas's population projection data, Somervell County's projected permanent population for 2053 is expected to be 10,791. (TDC 2021; USCB 2022a). Estimated projected populations and average annual growth rates for Somervell County are shown in Table 3.11-3.

Cities, towns, villages, and some census designated places (CDPs) with centers falling within a 50-mile radius of CPNPP are listed in Table 3.11-1. As seen in Figure 3.1-3, the city of Glen Rose (Somervell County) falls within the 6-mile vicinity of CPNPP. Glen Rose's 2020 population was reported at 2,659 persons. (USCB 2022b)

As listed in Table 3.11-1, there are three cities with populations greater than 100,000 located in the CPNPP region. The largest of these is the city of Fort Worth (40 miles northeast) with a 2020 population of 918,915. The city of Arlington (50 miles northeast) has a population of 394,266 in 2020. The city of Grand Prairie (55 miles northeast) has an estimated 2020 population of 196,100. Ten additional communities, within a 50-mile radius of CPNPP, have a population greater than 25,000 as of 2020 (Table 3.11-1).

3.11.2 Minority and Low-Income Populations

3.11.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the potential environmental "impact area." LIC-203 Revision 4 (NRC 2020c) defines a geographic area for comparison as a 50-mile radius (also referred to as "the region" in this discussion) centered on the nuclear plant. An alternative approach is also addressed that uses an individual state that encompasses the 50-mile radius individually for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for CPNPP.

LIC-203 guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in 5-year averages. The 2020 low-income and minority census population data and TIGER/line data for Texas were obtained from the USCB and processed using ArcGIS software (USCB 2022e). Census population data were used to identify the minority and low-income populations within a 50-mile radius of CPNPP. Environmental justice evaluations for minority and low-income populations are based on the use of USCB block groups for minority and low-income populations.

3.11.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as Black or African American, American Indian, or Alaska Native, Asian, Native Hawaiian/other Pacific Islander, some other race, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC 2020c). The guidance indicates that a minority population is considered present if either of the following two conditions exists:

1. The minority population in the census block group exceeds 50 percent; or
2. The minority population percentage is more than 20 percentage points greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for the state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20 percentage points were added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50 percent, or minority population is more than 20 percentage points greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for Texas and a 50-mile radius, and the corresponding criteria, are shown in Table 3.11-4.

A minority category of "Aggregate of All Races" is created when the populations of all the 2020 USCB minority categories are summed. As shown in Table 3.11-4, the 2020 "Aggregate of All Races" category, when compared to the total population, indicates 49.9 percent of Texas's population are minorities. The 2020 "Aggregate of All Races" category, when compared to the total population, indicates 44.7 percent of the population in a 50-mile radius (region) are minorities. The "Aggregate of All Races and Hispanic" population percentages for Texas and the region are 60.3 and 51.4 percent, respectively. Because 80.3 and 71.4 percent exceeds the 50 percent noted for Condition 1, defined above, the lower criterion (50 percent) would be used for the threshold.

Because Hispanic is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. However, because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the "Aggregate and Hispanic" category.

The number of census block groups contributing to the minority population count were evaluated using the criteria shown in Table 3.11-4 and summarized in Table 3.11-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures 3.11-1, 3.11-2, 3.11-3, 3.11-4, 3.11-5, 3.11-6, 3.11-7, 3.11-8, 3.11-9, 3.11-10, 3.11-11, 3.11-12, 3.11-13, and 3.11-14) depict the locations of minority population census block groups flagged accordingly for each race or aggregate category. Because no block group met the criteria for the "American Indian or Alaskan Native" and "Native Hawaiian/Other Pacific Islander" race categories, no figures illustrating those race categories were produced.

The percentage of census block groups exceeding the "Aggregate of All Races" minority population criterion was 37.8 percent when a 50-mile radius (region) was used and 37.8 percent when the individual state was used as the geographic area (Table 3.11-5). For the "Aggregate and Hispanic" category, 44.9 percent of the census block groups contained a minority population when the region or the individual state was used (Table 3.11-5). The minority population values of the block groups were significantly reduced when races were analyzed individually.

The identified minority population closest to the CPNPP center point is located approximately 23 miles east-northeast of the site: Block Group 482511307002. This census block group contained a total of 1,942 people, with 1,005 Aggregate and Hispanic. Using the regional criteria or the individual state criteria, the block group contains an Aggregate and Hispanic population. (USCB 2022a; USCB 2022e)

There are no block groups within a 6-mile radius that meet the criteria for a minority population. All of the identified minority block groups fall within or are immediately adjacent to cities, municipalities, or USCB-defined urban areas. (USCB 2022e; USCB 2020b)

As presented in Section 3.1.3, the state of Texas has three federally recognized American Indian nations and tribal communities. No tribal lands are located within the 50-mile region of CPNPP.

3.11.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds for individuals or families (NRC 2020c). As addressed above with minority populations, two alternative geographic areas (state of Texas and CPNPP 50-mile region) were used as the geographic areas for comparison in this analysis. The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1. The low-income population in the census block group exceeds 50 percent; or
2. The percentage of individual or family below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., individual state and region's combined average).

To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for the state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for the state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in Condition 2, above, 20 percentage points were added to the low-income values for individuals and families and each geographic area. None of the geographic areas described in the first condition exceeded 50 percent.

As shown in Table 3.11-6, when the 2020 census data category "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 12.2 percent of the population in the region has an individual income below poverty level. In the state of Texas, the percentages of individuals with an income below poverty level is 14.2 percent.

As shown in Table 3.11-6, the state of Texas has an estimated 1,326,621 families living below poverty level. For the low-income family analysis, the USCB 2020 household category "income in the past 12 months below poverty level" is utilized. In the state of Texas, the percentage of the family population with an income below poverty level is 13.4 percent. In the region, when the 2020 census data family category "income in the past 12 months below poverty level" is compared to the total family count, 11.3 percent of the families had an income below poverty level.

When the region is used as the geographic area, any census block group within a 50-mile radius with populations of low-income individuals equal to or greater than 32.2 percent of the total block group population would be considered a "low-income population." Using this criterion,

97 of the 1,258 census block groups (7.7 percent) were identified as low-income populations within a 50-mile radius of the CPNPP site, as shown in Figure 3.11-15. (USCB 2022e)

When the state of Texas is used as the geographic area, any census block group within the region with a low-income population equal to or greater than 34.2 percent of the total block group, the population would be considered a "low-income population" (individual) (Table 3.11-6). Using the appropriate criteria for the individual state criteria, 80 of the total 1,258 census block groups (6.4 percent) have low-income individual population percentages that meet or exceed the threshold criteria noted in Table 3.11-5. There are no identified low-income populations (individual) within the vicinity of CPNPP. The low-income (individual) census block groups are illustrated in Figure 3.11-15 and Figure 3.11-16.

Similarly, both regional and state geographies along with family census data are used to identify low-income family block groups (Table 3.11-5). Using the family individual state criteria, 62 census block groups were identified as having low-income families. Using the regional criteria, 75 census block groups were identified as having low-income families. These census block groups are illustrated in Figures 3.11-17 and 3.11-18. (USCB 2022e; USCB 2022f) The closest low-income block group that meets the guidance criteria for families is located 4.6 miles southeast of the CPNPP center point (Block Group 484250002002). (USCB 2022e)

3.11.3 Subsistence Populations and Migrant Workers

3.11.3.1 Subsistence Populations

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence use include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level are aggregated and not usually structured to identify such uses on or near the site. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population, which is most likely to know of such activity. This may include county officials, community leaders, and landowners in the vicinity who would have knowledge of subsistence activity.

As described in Section 3.1, the CPNPP vicinity falls within rural areas of Hood and Somervell counties. The area consists of farmland and rural residential properties. As illustrated in Figure 3.1-4, within the 50-mile region large metropolitan populated areas (Dallas-Fort Worth-Arlington CSA) are located northeast of CPNPP, while the remainder of the region consists of scattered communities and counties with smaller populations. The NRC staff's scoping and outreach did not identify any special socioeconomic or health circumstances or potential pathways that could lead to disproportionately high and adverse health and environmental impacts. The NRC staff

did not identify any unique resource dependencies or practices or other circumstances that could result in disproportionately high and adverse impacts to minority or low-income populations. (NRC 2011)

As discussed in Section 3.11.2, there are no low-income individual populations in the vicinity of the CPNPP and one low-income family population located in Glen Rose. Potential power plant related impacts would be expected to be most significant closer to the plant. The identified regional low-income populations are found within urban areas where subsistence-type dependence on natural resources (e.g., fish, game, agricultural products, and natural water sources) is less likely.

3.11.3.2 Migrant Workers

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the worker from returning to his/her permanent place of residence the same day." In 2017, Hood County reported that 194 out of 1,176 total farms employed farm labor. Somervell County reported that 69 out of 352 total farms employed farm labor. Tarrant County reported 248 out of 1,173 total farms employed farm labor. The 2017 Census of Agriculture reported that six of the Hood County farms hired migrant labor. None of the Somervell County farms employed migrant farm workers. Five farms in Tarrant County reported employing migrant workers. For Hood County, an estimated total of 420 farm laborers were hired, of which 223 were estimated to work fewer than 150 days per year. For Somervell County, an estimated total of 162 farm laborers were hired, of which 123 were estimated to work fewer than 150 days per year. For Tarrant County, an estimated total of 845 farm laborers were hired, of which 474 were estimated to work fewer than 150 days per year. (USDA 2021)

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 1 of 5)

City/Town/Village/CDP	County	2000 Census Population[a]	2010 Census Population[a]	2020 Census Population[a][b]	Distance to CPNPP (miles)[c][d]	Direction [c][d]
Texas						
Abbott	Hill	300	356	352	51	ESE
Aledo	Parker	1,726	2,716	4,858	29	NNE
Alvarado	Johnson	3,288	3,785	4,739	34	ENE
Annetta	Parker	1,108	1,288	3,041	29	NNE
Annetta North	Parker	467	518	554	30	NNE
Annetta South	Parker	555	526	621	26	NNE
Aquilla	Hill	136	109	101	45	SE
Arlington	Tarrant	332,969	365,438	394,266	50	NE
Azle	Tarrant	9,600	10,947	13,369	43	NNE
Benbrook	Tarrant	20,208	21,234	24,520	32	NE
Blue Mound	Tarrant	2,388	2,394	2,393	46	NNE
Blum	Hill	399	444	383	25	ESE
Brazos Bend	Hood	NA	305	NA	12	N
Briaroaks	Johnson	493	492	507	31	ENE
Burleson	Johnson	20,976	36,690	47,641	32	ENE
Canyon Creek	Hood	NA	916	1,249	7	NNE
Carl's Corner	Hill	134	173	201	45	ESE
Cedar Hill	Dallas	32,093	45,028	49,148	52	ENE
Cleburne	Johnson	26,005	29,337	31,352	24	E
Clifton	Bosque	3,542	3,442	3,465	38	SSE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 2 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Cool	Parker	162	157	211	37	NNW
Covington	Hill	282	269	261	32	ESE
Coyote Flats	Johnson	NA	312	345	29	E
Cranfills Gap	Bosque	335	281	277	36	S
Cresson	Hood	NA	741	1,349	19	NNE
Cross Timber	Johnson	277	268	362	29	ENE
Crowley	Tarrant	7,467	12,838	18,070	31	NE
Dalworthington Gardens	Tarrant	2,186	2,259	2,293	46	NE
De Leon	Comanche	2,433	2,246	2,258	46	WSW
DeCordova	Hood	NA	2,683	3,007	10	NNE
Dublin	Erath	3,754	3,654	3,359	36	WSW
Edgecliff Village	Tarrant	2,550	2,776	3,788	36	NE
Everman	Tarrant	5,836	6,108	6,154	37	NE
Forest Hill	Tarrant	12,949	12,355	13,955	40	NE
Fort Worth	Tarrant	534,694	741,206	918,915	40	NE
Gholson	McLennan	922	1,061	1,250	53	SE
Glen Rose	Somervell	2,122	2,444	2,659	5	SSE
Godley	Johnson	879	1,009	1,450	18	NE
Gordon	Palo Pinto	451	478	470	38	WNW
Granbury	Hood	5,718	7,978	10,958	10	N
Grand Prairie	Dallas	127,427	175,396	196,100	55	NE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 3 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Grandview	Johnson	1,358	1,561	1,879	36	E
Gustine	Comanche	457	476	392	48	SW
Haltom City	Tarrant	39,018	42,409	46,073	46	NE
Hamilton	Hamilton	2,977	3,095	2,895	46	SSW
Hico	Hamilton	1,341	1,379	1,335	26	SSW
Hillsboro	Hill	8,232	8,456	8,221	43	ESE
Hudson Oaks	Parker	1,637	1,662	2,174	32	N
Hurst	Tarrant	36,273	37,337	40,413	51	NE
Iredell	Bosque	360	339	305	22	SSW
Itasca	Hill	1,503	1,644	1,562	38	ESE
Joshua	Johnson	4,528	5,910	7,891	26	ENE
Keene	Johnson	5,003	6,106	6,387	28	ENE
Kennedale	Tarrant	5,850	6,763	8,517	41	NE
Lake Worth	Tarrant	4,618	4,584	4,711	40	NNE
Lakeside	Tarrant	1,040	1,307	1,649	40	NNE
Lipan	Hood	425	430	505	21	NW
Mansfield	Tarrant	28,031	56,368	72,602	42	ENE
Maypearl	Ellis	746	934	939	45	E
Meridian	Bosque	1,491	1,493	1,396	27	SSE
Midlothian	Ellis	7,480	18,037	35,125	48	ENE
Milford	Ellis	685	728	722	51	ESE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 4 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Millsap	Parker	353	403	370	34	NNW
Mineral Wells	Palo Pinto	16,946	16,788	14,820	40	NNW
Mingus	Palo Pinto	246	235	223	41	WNW
Morgan	Bosque	485	490	454	22	SSE
North Richland Hills	Tarrant	55,635	63,343	69,917	49	NE
Pantego	Tarrant	2,318	2,394	2,568	47	NE
Pecan Plantation	Hood	3,544	5,294	6,236	8	NE
Pelican Bay	Tarrant	1,505	1,547	2,049	46	NNE
Reno	Parker	2,441	2,494	2,878	46	NNE
Richland Hills	Tarrant	8,132	7,801	8,621	48	NE
Rio Vista	Johnson	656	873	1,008	24	E
River Oaks	Tarrant	6,985	7,427	7,646	40	NE
Saginaw	Tarrant	12,374	19,806	23,890	46	NNE
Sanctuary	Parker	256	329	337	44	NNE
Sansom Park	Tarrant	4,181	4,686	5,454	41	NNE
Springtown	Parker	2,062	2,658	3,064	46	N
Stephenville	Erath	14,921	17,123	20,897	25	WSW
Strawn	Palo Pinto	739	653	540	45	WNW
Tolar	Hood	504	681	941	10	NW
Valley Mills	Bosque	1,123	1,203	1,229	48	SSE
Venus	Johnson	910	2,960	4,361	41	ENE

Table 3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of CPNPP (Sheet 5 of 5)

City/Town/Village/CDP	County	2000 Census Population[(a)]	2010 Census Population[(a)]	2020 Census Population[(a)(b)]	Distance to CPNPP (miles)[(c)(d)]	Direction [(c)(d)]
Walnut Springs	Bosque	755	827	795	17	S
Watauga	Tarrant	21,908	23,497	23,650	49	NE
Waxahachie	Ellis	21,426	29,621	41,140	55	E
Weatherford	Parker	19,000	25,250	30,854	32	N
Westover Hills	Tarrant	658	682	641	38	NE
Westworth Village	Tarrant	2,124	2,472	2,585	38	NNE
White Settlement	Tarrant	14,831	16,116	18,269	37	NNE
Whitney	Hill	1,833	2,087	1,992	36	SE
Willow Park	Parker	2,849	3,982	4,936	33	NNE

a. (USCB 2021b)

b. (USCB 2022d)

c. (USDOT 2021)

d. Reported distances and directions were calculated from the CPNPP center point to the city center.

NA = not available

Table 3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of CPNPP

State and County	2000 Population[a]	2010 Population[a]	2020 Population[b]	2053 Projected Permanent Population[b][c]	2053 Projected Total Population[b][c][d]
Texas (19 Counties)	4,545,522	5,202,787	5,910,067	8,767,344	9,465,735
Bosque	17,204	18,212	18,235	18,235	19,688
Comanche	14,026	13,974	13,594	13,594	14,677
Coryell	74,978	75,388	83,093	88,770	95,841
Dallas	2,218,899	2,368,139	2,613,539	3,975,327	4,291,994
Eastland	18,297	18,583	17,725	17,725	19,137
Ellis	111,360	149,610	192,455	278,843	301,055
Erath	33,001	37,890	42,545	52,773	56,977
Hamilton	8,229	8,517	8,222	8,222	8,877
Hill	32,321	35,089	35,874	35,874	38,732
Hood	41,100	51,182	61,598	83,903	90,587
Jack	8,763	9,044	8,472	8,472	9,147
Johnson	126,811	150,934	179,927	244,228	263,683
McLennan	213,517	234,906	260,579	296,083	319,668
Palo Pinto	27,026	28,111	28,409	28,409	30,672
Parker	88,495	116,927	148,222	202,101	218,200
Somervell	6,809	8,490	9,205	10,791	11,651
Stephens	9,674	9,630	9,101	9,101	9,826
Tarrant	1,446,219	1,809,034	2,110,640	3,315,223	3,579,307
Wise	48,793	59,127	68,632	79,670	86,016

a. (USCB 2021a)

b. (USCB 2022a)

c. (TDC 2021)

d. (TTIR 2021)

Table 3.11-3 County Population Growth, 2010–2053

County	Measure	2010	2020	2025	2030	2035	2040	2045	2053
Hood County	Population	51,182	61,598	62,404	66,206	69,917	73,586	77,646	83,903
	Average Annual Growth %		1.87	0.26	1.19	1.10	1.03	1.08	0.97
Somervell County	Population	8,490	9,205	9,802	10,253	10,468	10,519	10,428	10,791
	Average Annual Growth %		0.81	1.26	0.90	0.42	0.10	-0.17	0.43
Tarrant County	Population	1,809,034	2,110,640	2,322,418	2,507,170	2,689,000	2,862,672	3,030,318	3,315,223
	Average Annual Growth %		1.55	1.93	1.54	1.41	1.26	1.14	1.13

a. County projection data indicate Somervell County's population may begin to decline after 2040. For a more conservative population value a linear trend was applied to the county projection data to derive the 2053 population.

Note: Projected population values are based on the population projection growth trend for the years reported by the Texas Demographic Center (TDC 2021; USCB 2021a, USCB 2022a).

Table 3.11-4 Minority Populations Evaluated Against Criterion

Geographic Area	Texas[a]			50-Mile Radius (Region)[b]		
Total Population	29,145,505			2,147,297		
Census Categories	**State Population by Census Category[a]**	**Percent[c]**	**Criteria**	**Regional Population by Census Category[b]**	**Percent[c]**	**Criteria**
Black or African American	3,552,997	12.2	32.2	309,807	14.4	34.4
American Indian or Alaska Native	278,948	1.0	21.0	19,718	0.9	20.9
Asian	1,585,480	5.4	25.4	89,101	4.1	24.1
Native Hawaiian/Other Pacific Islander	33,611	0.1	20.1	3,256	0.2	20.2
Some Other Race	3,951,366	13.6	33.6	250,183	11.7	31.7
Two or More Races	5,133,738	17.6	37.6	287,963	13.4	33.4
Aggregate of All Races	14,536,140	49.9	50.0	960,028	44.7	50.0
Hispanic or Latino	11,441,717	39.3	50.0	616,263	28.7	48.7
Aggregate and Hispanic[d]	17,560,908	60.3	50.0	1,104,001	51.4	50.0

a. (USCB 2022a)

b. (USCB 2022d)

c. Percent values were calculated by dividing each census category's population by the state or region total population values.

d. Includes everyone except persons who identified themselves as "White," "Not Hispanic," or "Latino" (NRC 2020c).

Table 3.11-5 Minority and Low-Income Census Block Group Counts, 50-Mile Radius of CPNPP

Total Number of Block Groups with Population within 50-mi radius	Individual State Method		50-Mile Radius (Region)	
	1,258		1,258	
Census Categories	**Number of Block Groups**	**Percent of Block Groups within Region**	**Number of Block Groups**	**Percent of Block Groups within Region**
Black or African American	178	14.1	157	12.5
American Indian or Alaska Native	0	0	0	0
Asian	11	0.9	15	1.2
Native Hawaiian/Other Pacific Islander	0	0	0	0
Some Other Race	66	5.2	81	6.4
Two or More Races	2	0.2	6	0.5
Aggregate of All Races	476	37.8	476	37.8
Hispanic or Latino	160	12.7	168	13.4
Aggregate and Hispanic	565	44.9	565	44.9
Low Income Individuals	80	6.4	97	7.7
Low Income Families (Households)	62	4.9	75	6.0

(USCB 2020b; USCB 2022d; USCB 2022e)

Table 3.11-6 Low-Income Population Criteria Using Two Geographic Areas

Geographic Area	Texas[a]			50-Mile Radius (Region)[b]		
(Income) Total Population	28,013,446			2,061,236		
(Income) Total Families	9,906,070			715,993		
Census Category	**State Population**	**Percent[c]**	**Criteria**	**Region Population**	**Percent[c]**	**Criteria**
Low Income – Number of Persons Below Poverty Level (Individuals)	3,984,260	14.2	34.2	251,029	12.2	32.2
Low Income – Number of Families Below Poverty Level (Households)	1,326,621	13.4	33.4	81,034	11.3	31.3

a. (USCB 2022f)

b. (USCB 2022e)

c. Percent values were calculated by dividing each census category's population by the state and regional total population values.

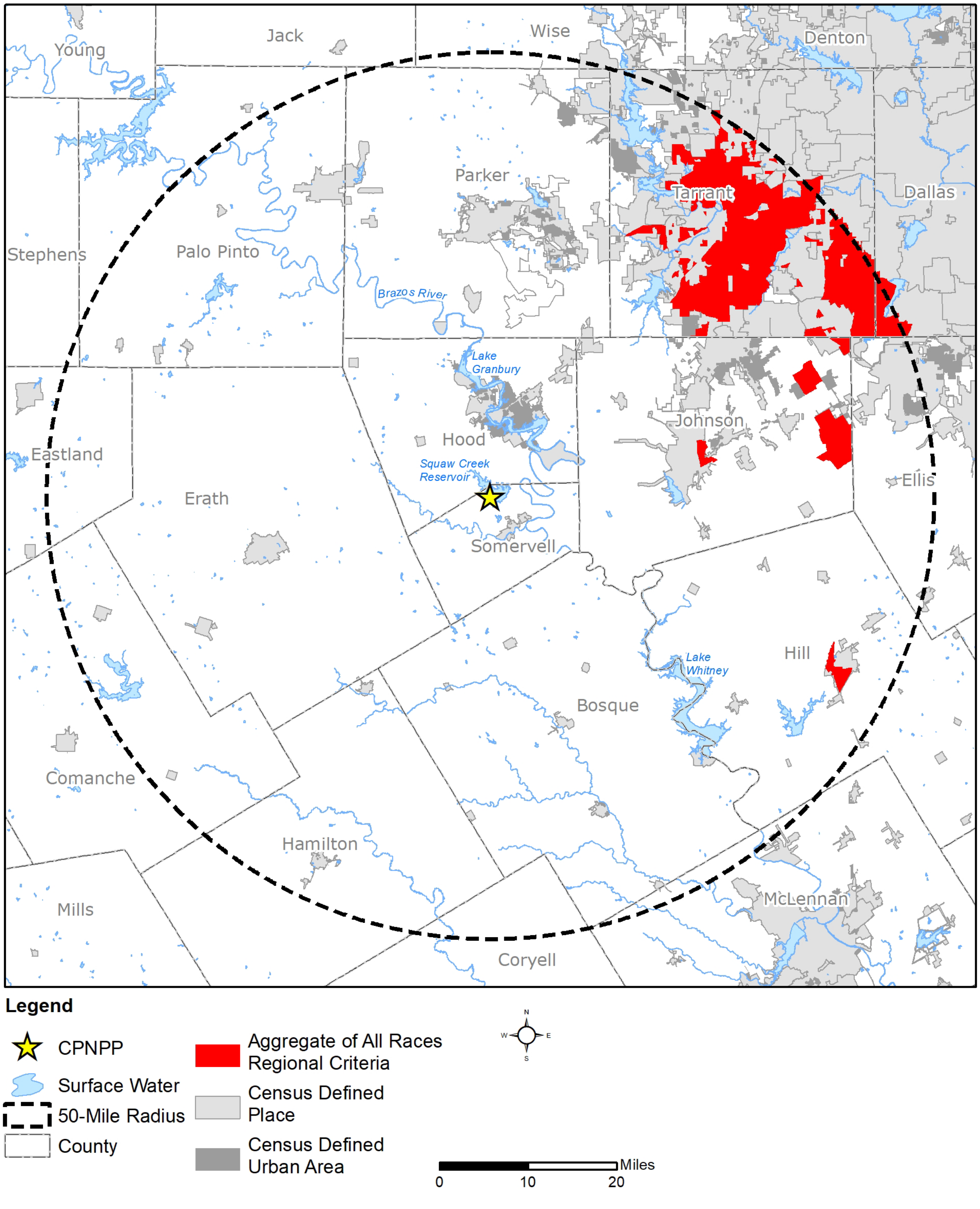


Figure 3.11-1 Aggregate of All Races Populations (Regional)

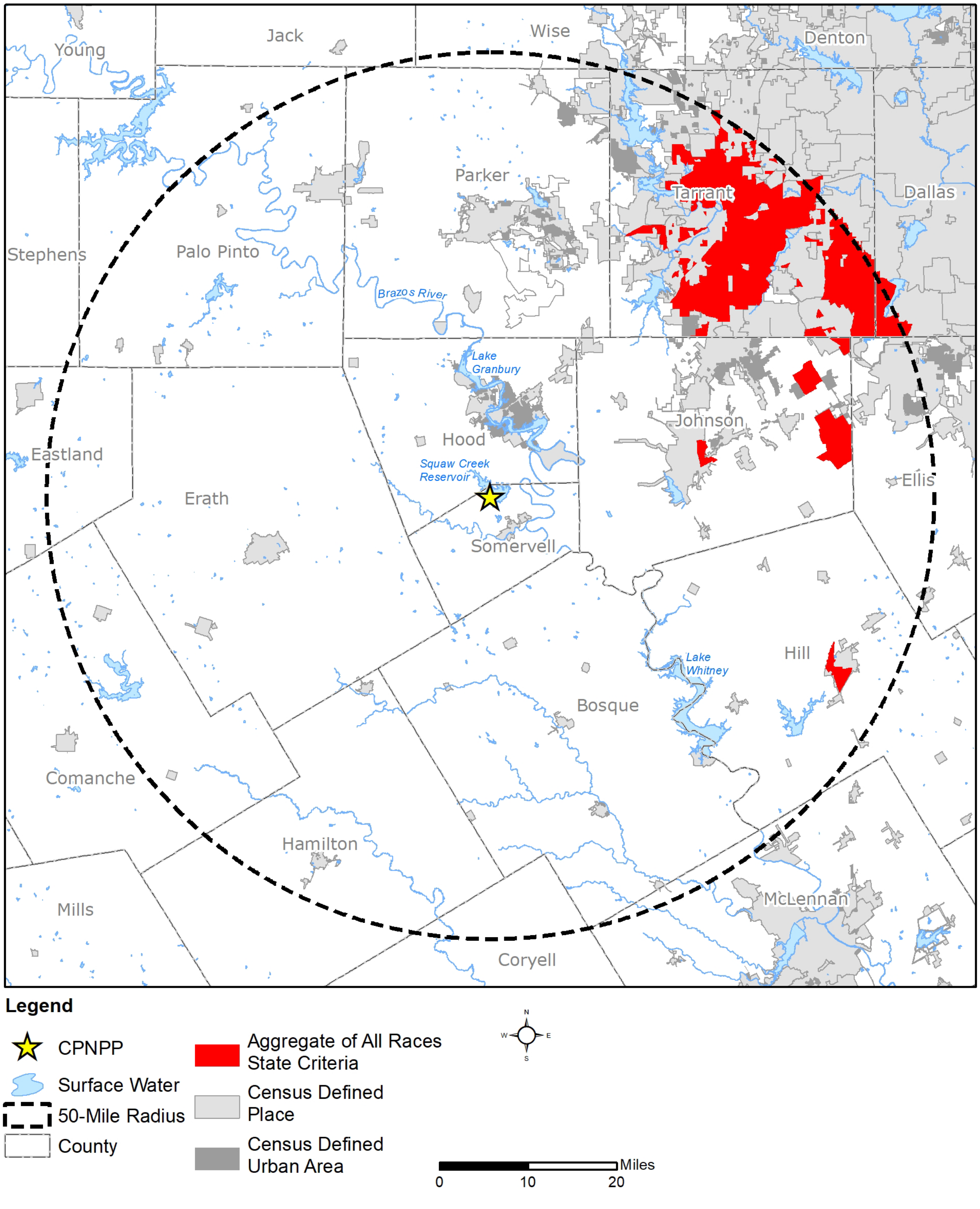


Figure 3.11-2 Aggregate of All Races Populations (Individual State)

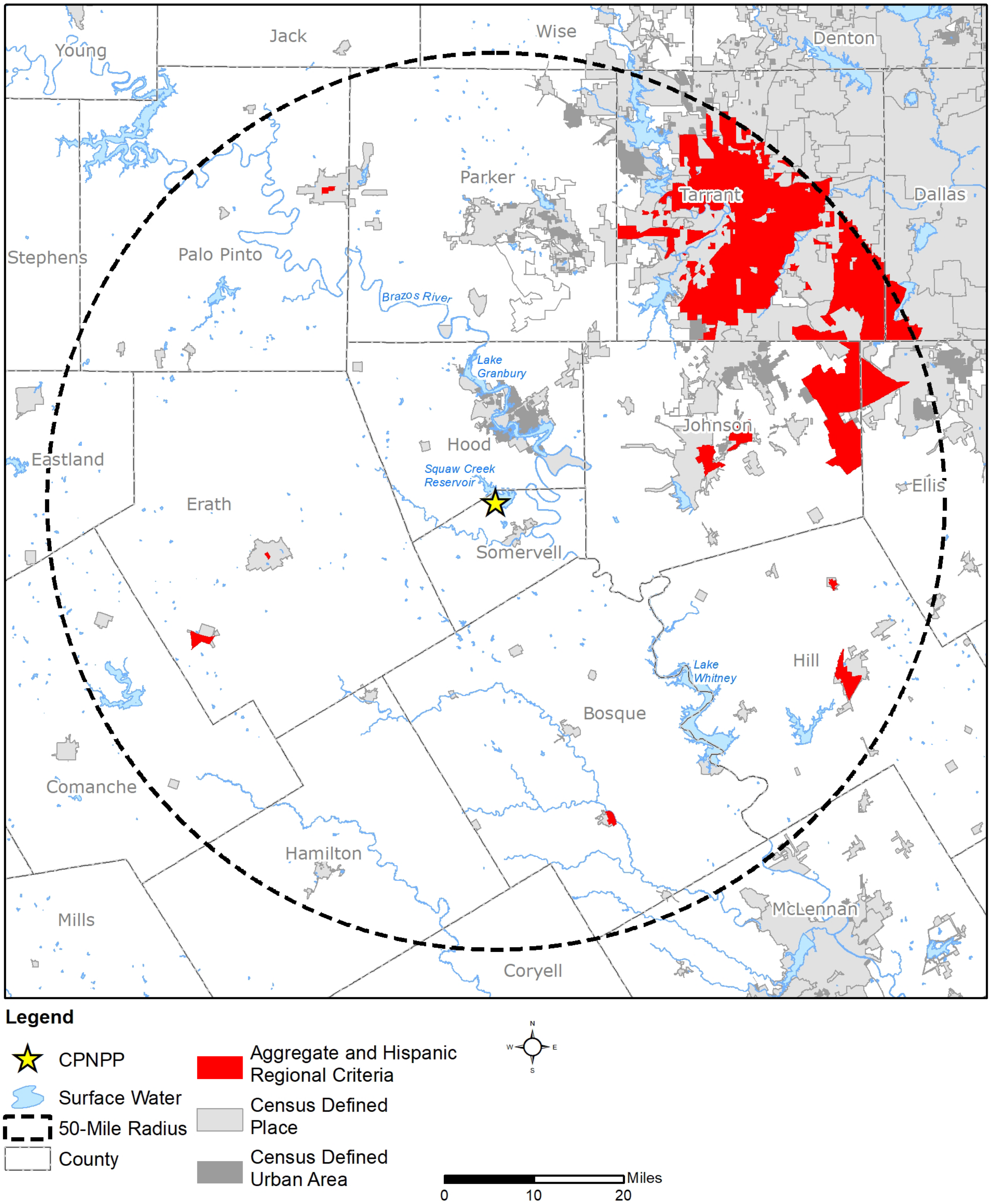


Figure 3.11-3 Aggregate and Hispanic Populations (Regional)

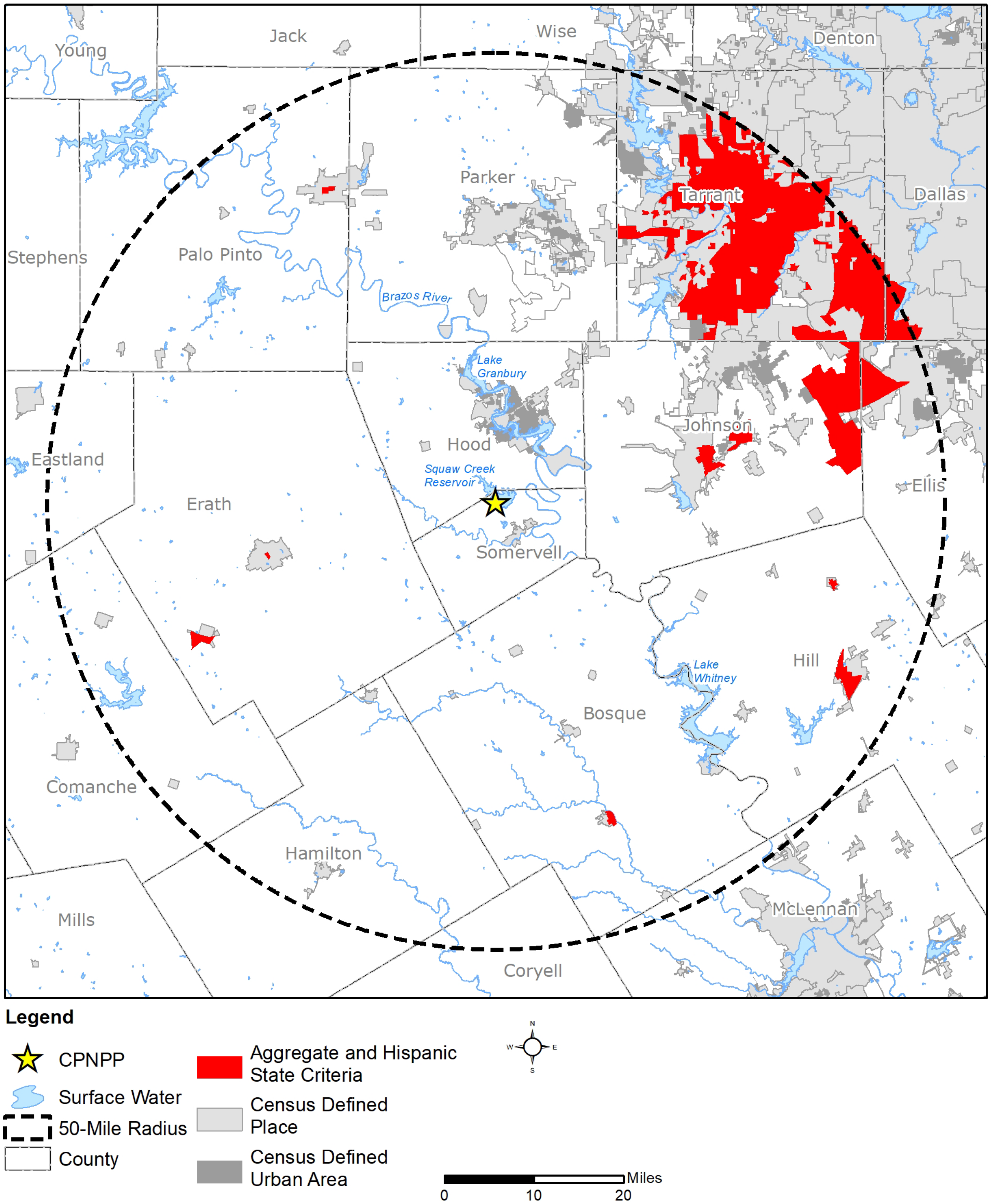


Figure 3.11-4 Aggregate and Hispanic Populations (Individual State)

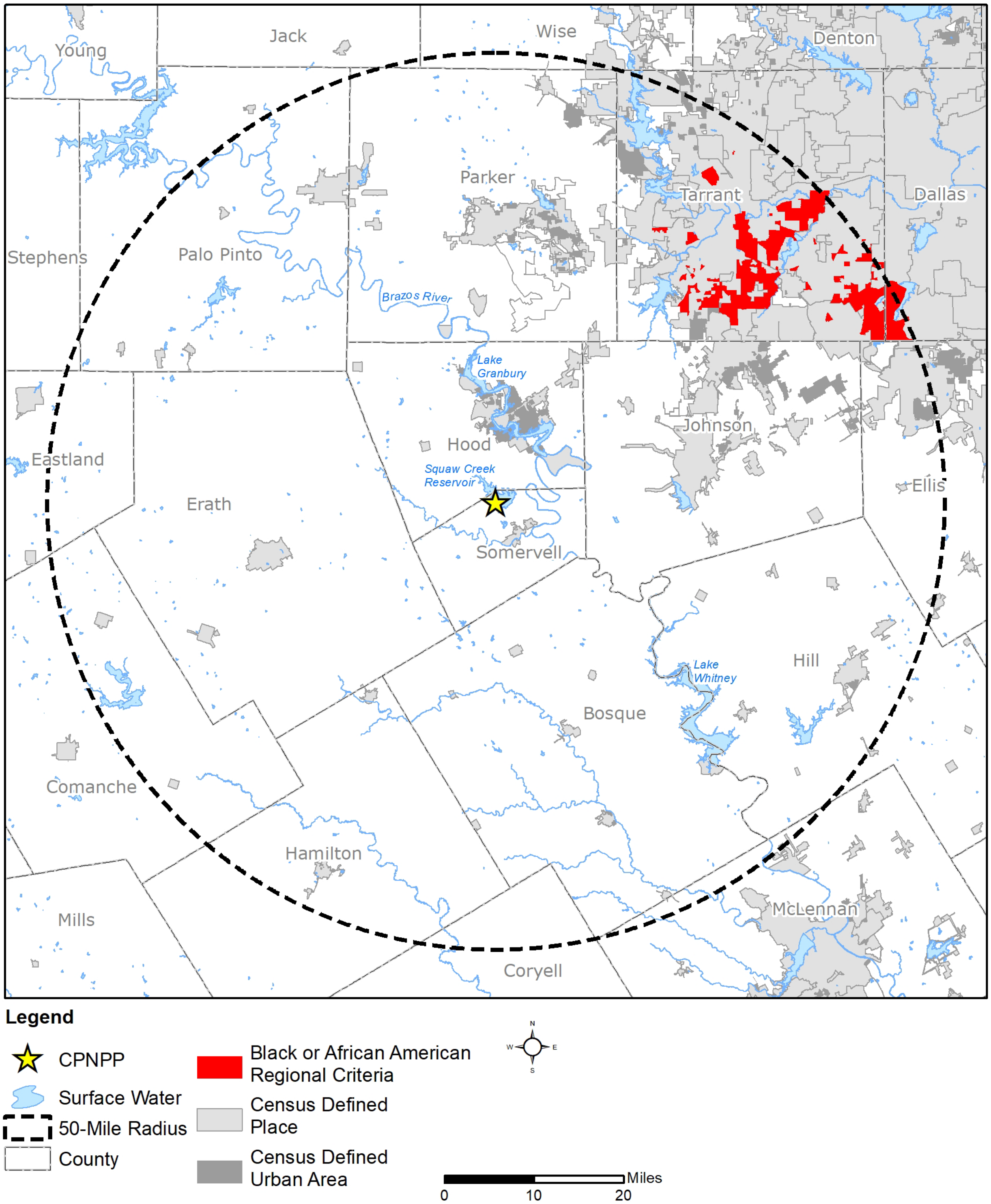


Figure 3.11-5 Black or African American Populations (Regional)

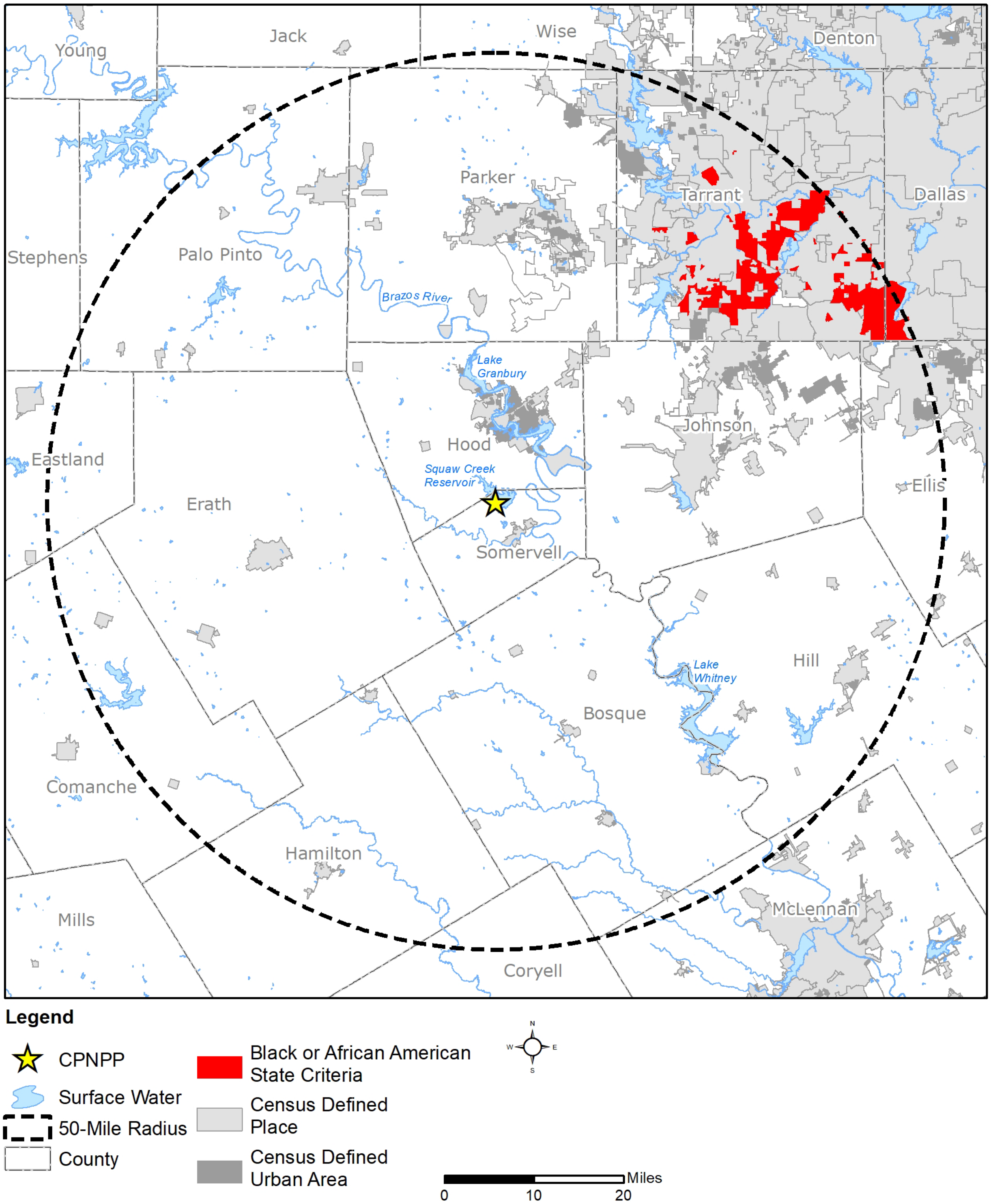


Figure 3.11-6 Black or African American Populations (Individual State)

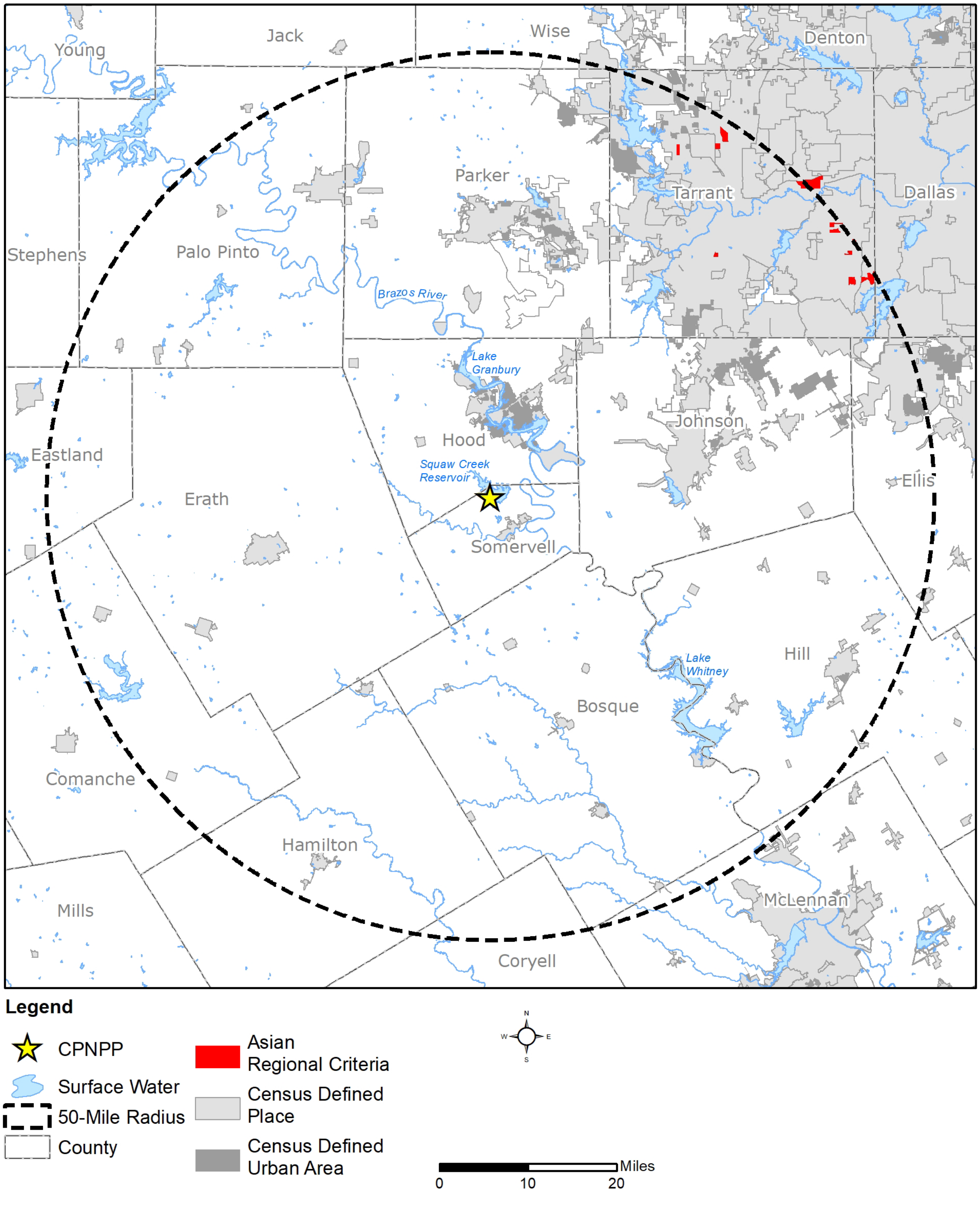


Figure 3.11-7 Asian Populations (Regional)

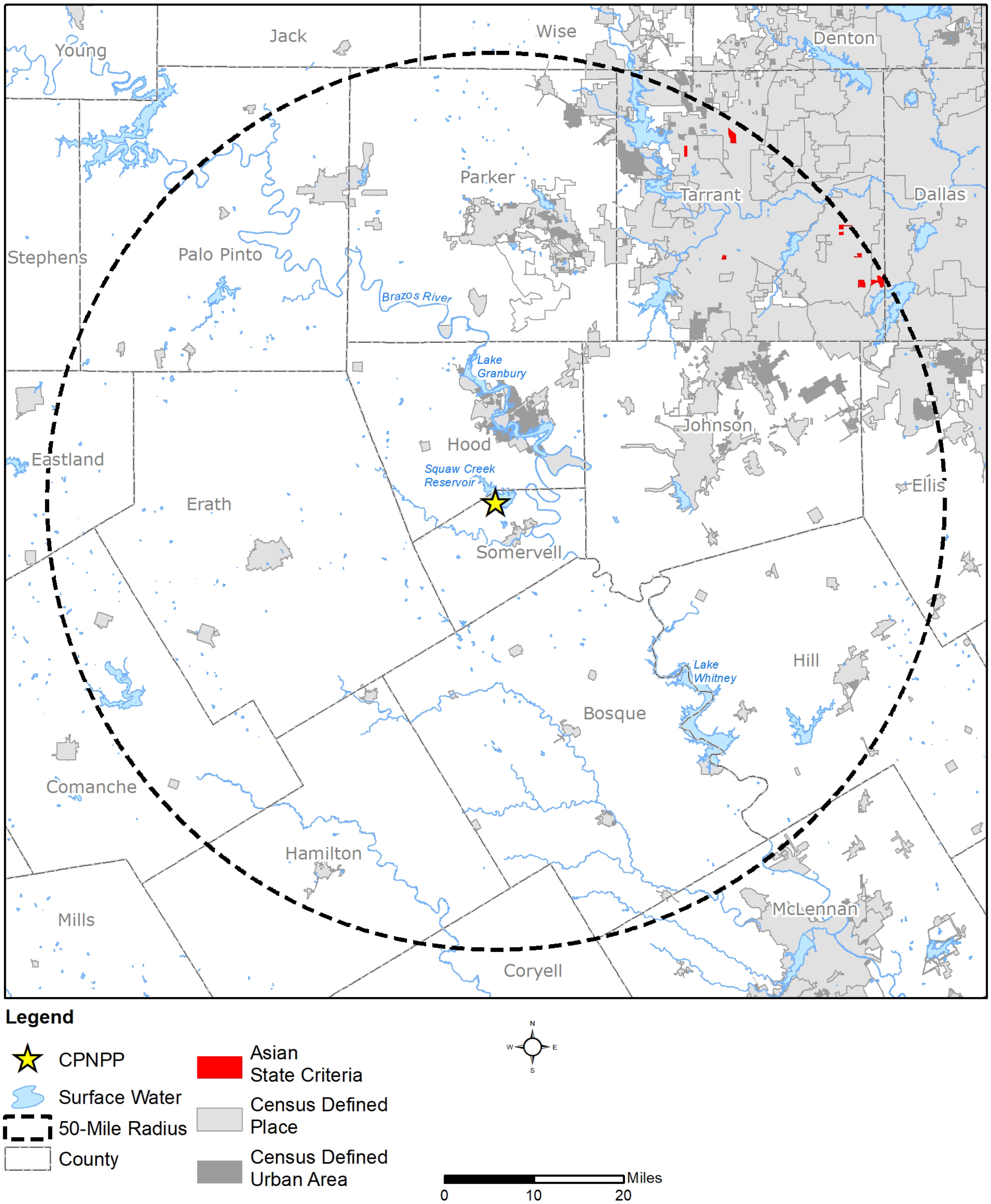


Figure 3.11-8 Asian Populations (Individual State)

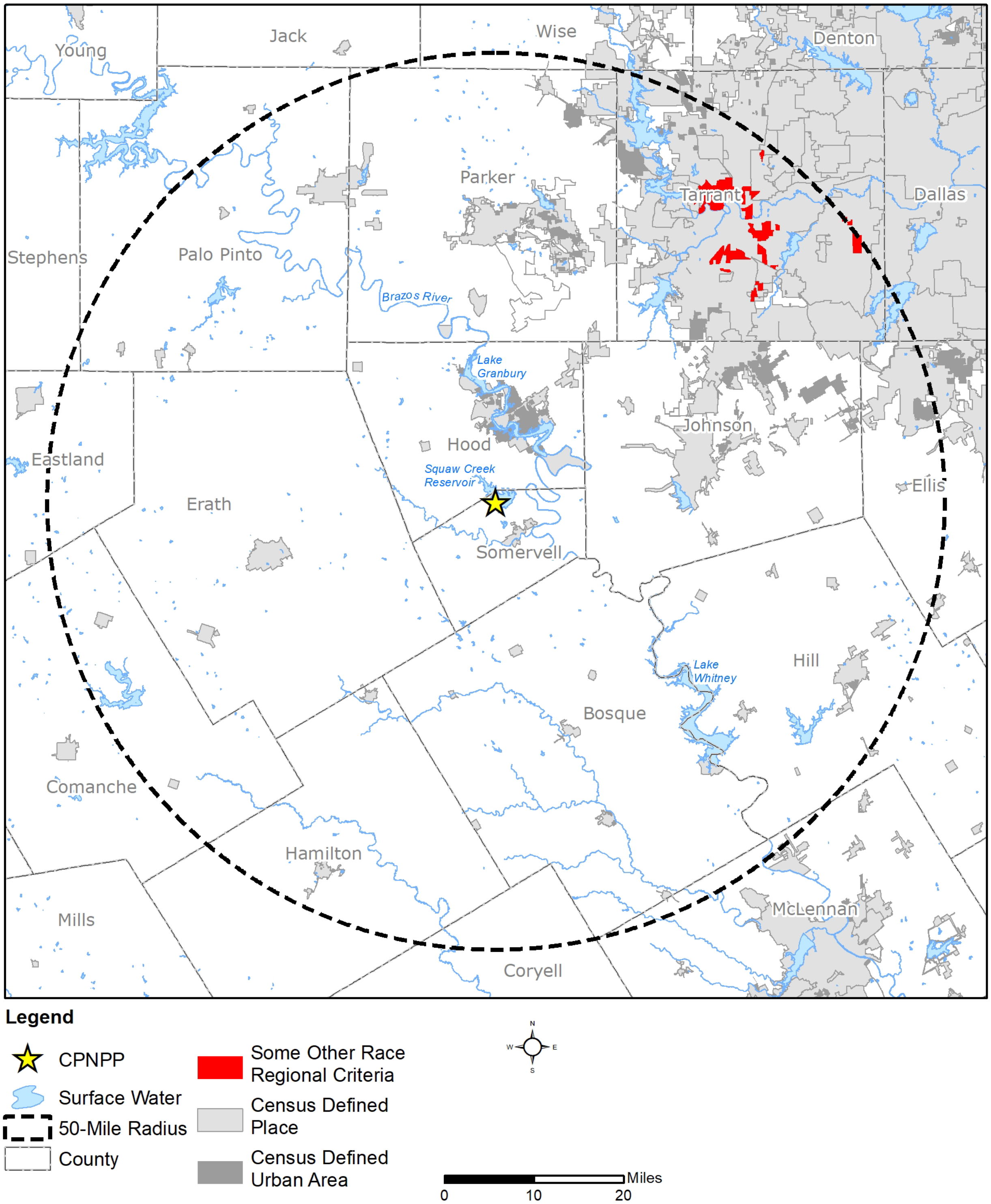


Figure 3.11-9 Some Other Race Populations (Regional)

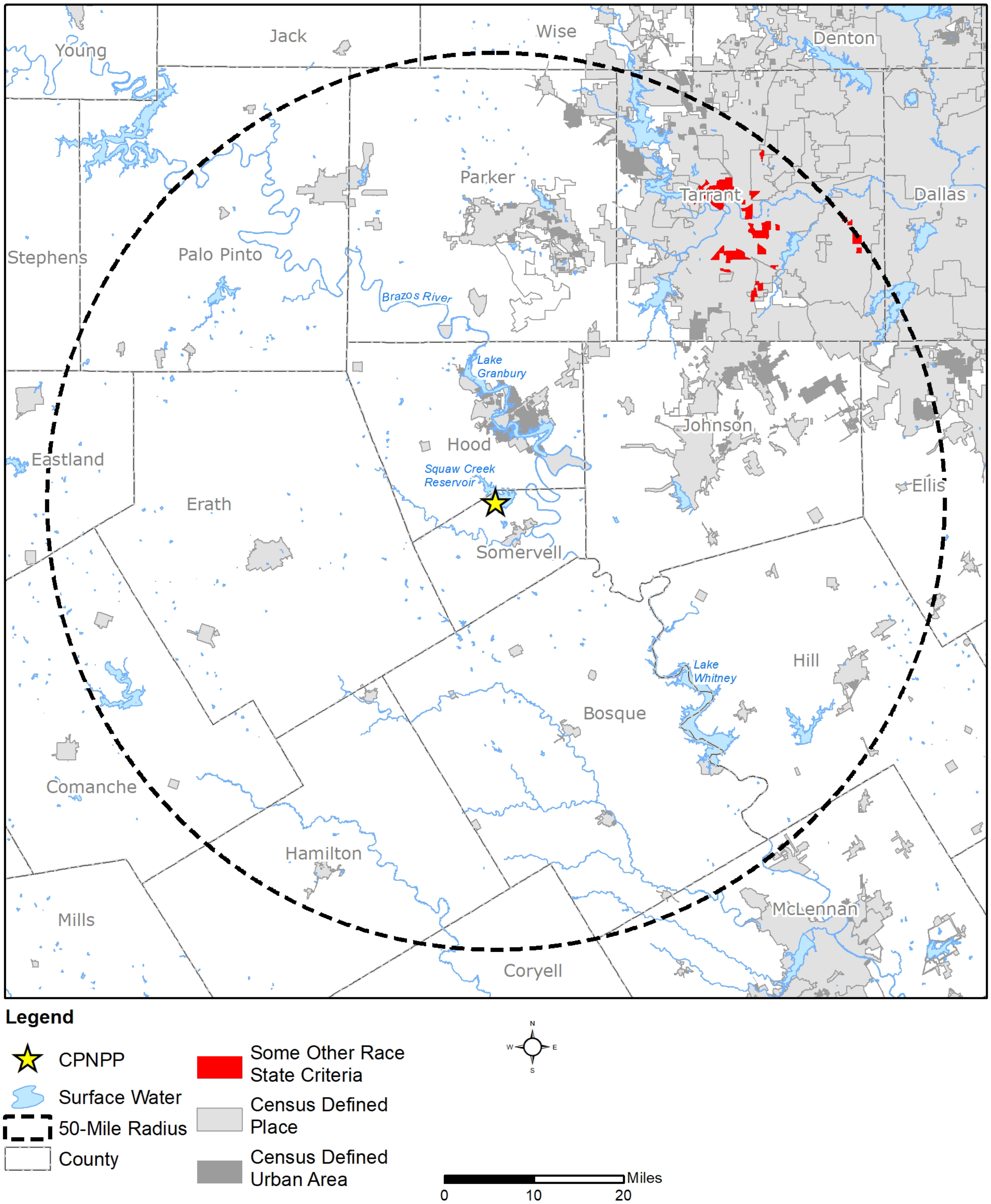


Figure 3.11-10 Some Other Race Populations (Individual State)

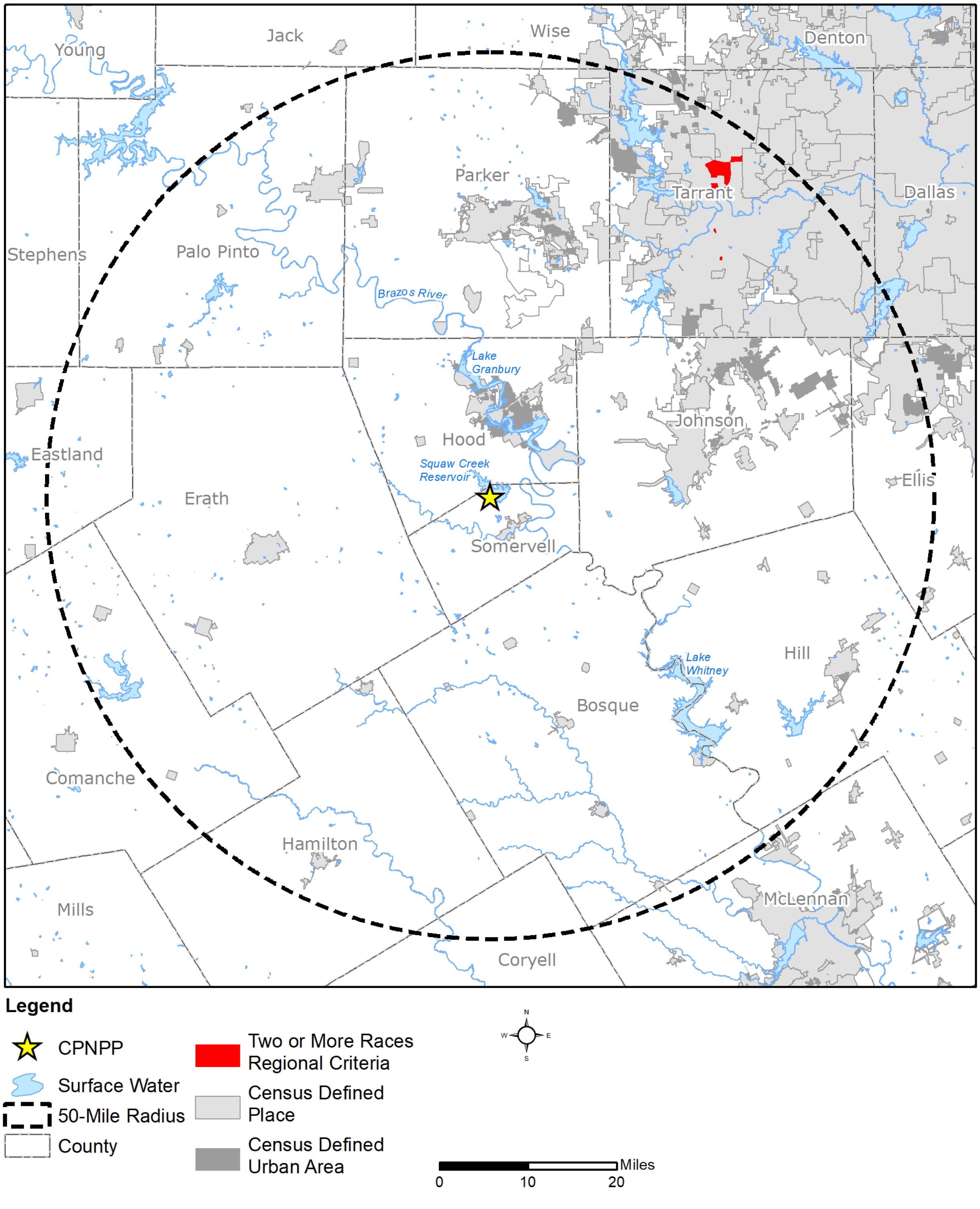


Figure 3.11-11 Two or More Races Populations (Regional)

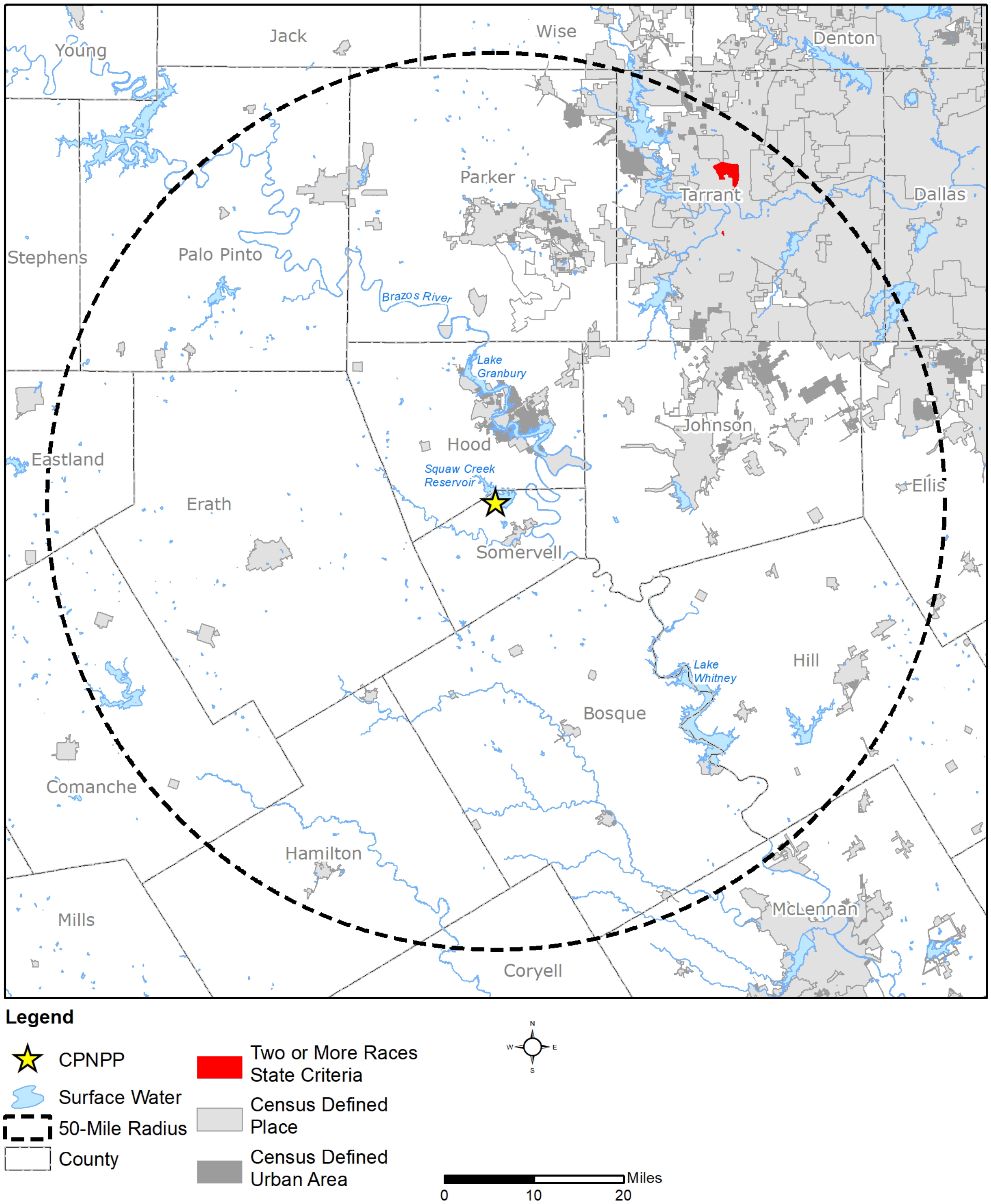


Figure 3.11-12 Two or More Races Populations (Individual State)

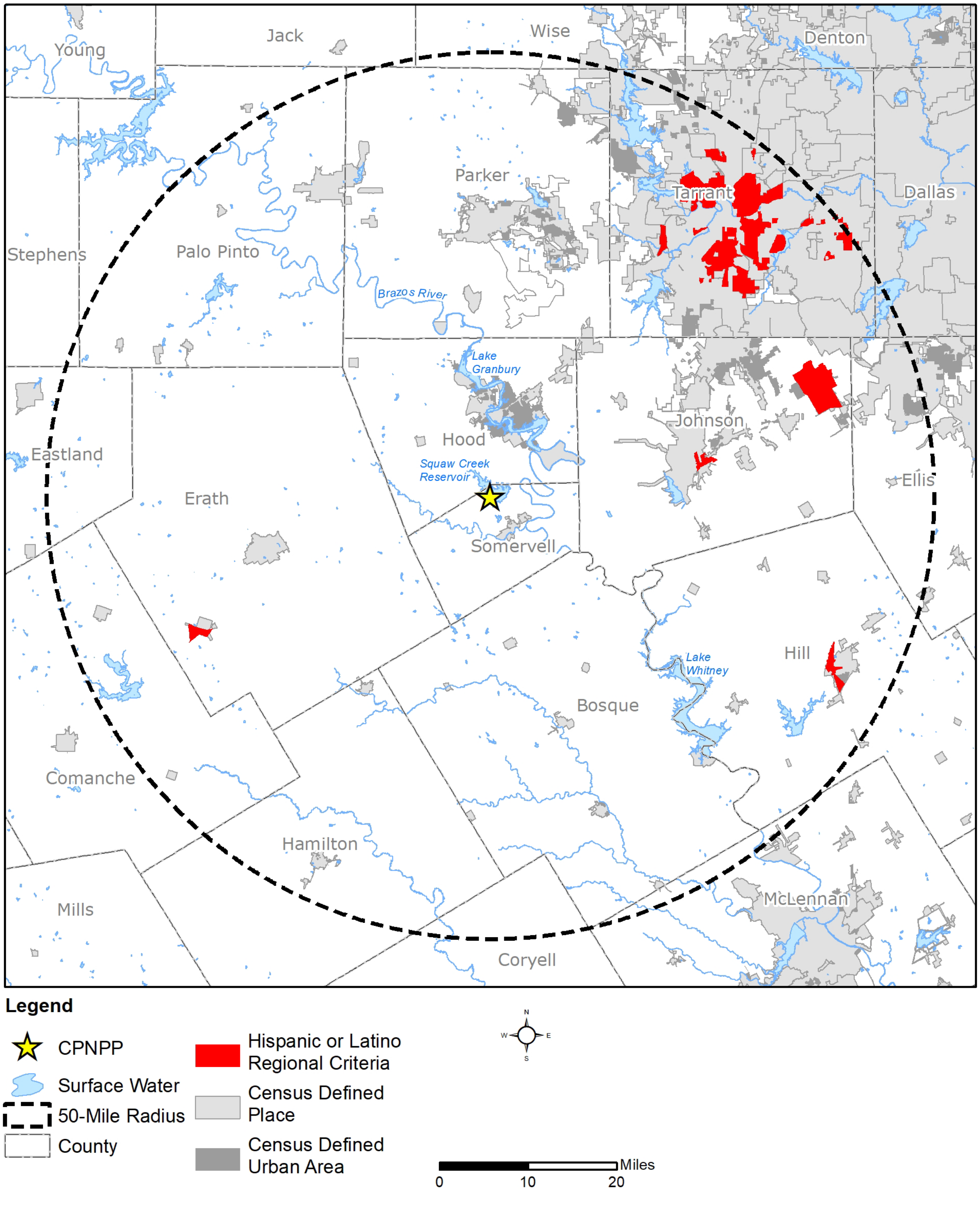


Figure 3.11-13 Hispanic or Latino Populations (Regional)

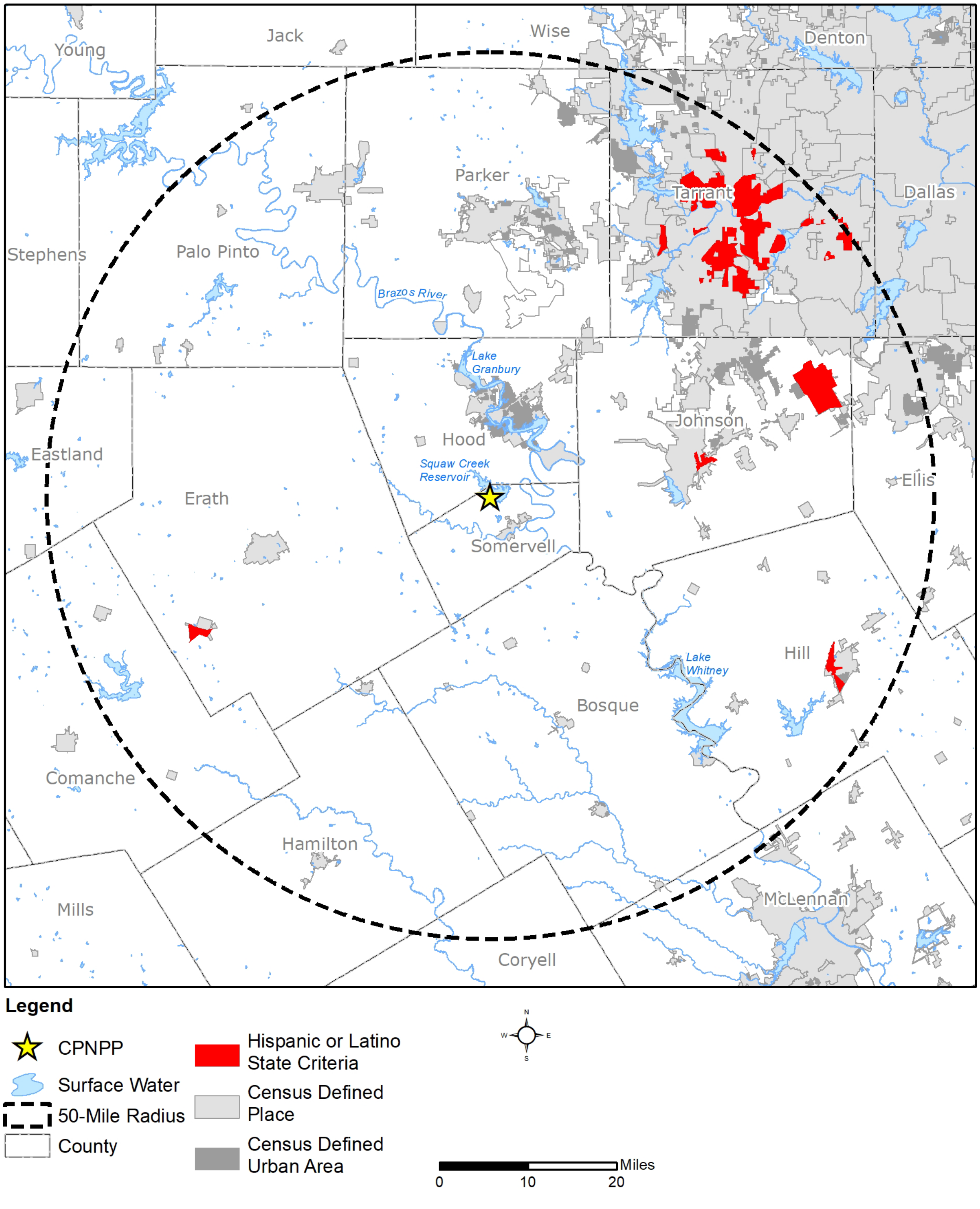


Figure 3.11-14 Hispanic or Latino Populations (Individual State)

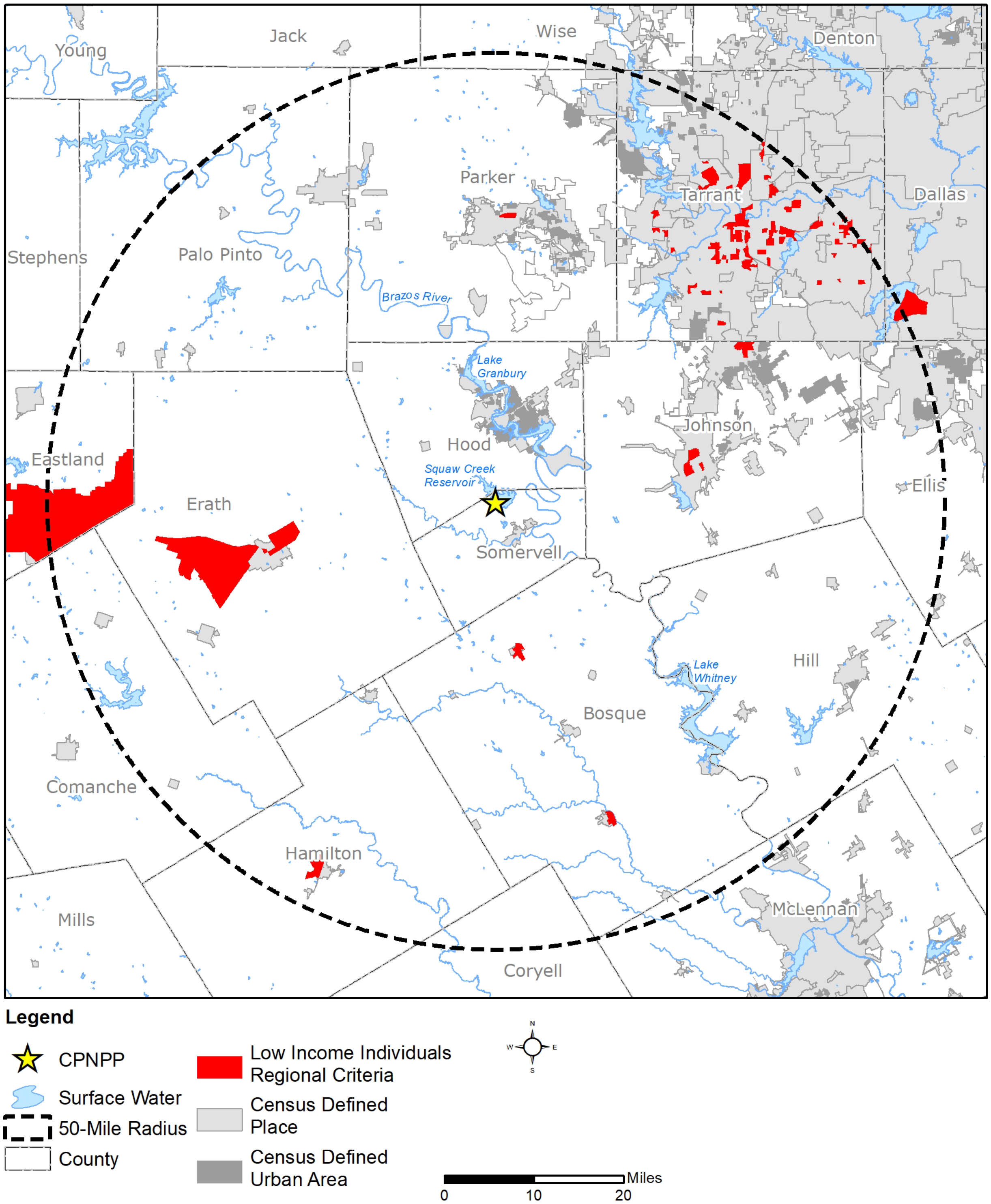


Figure 3.11-15 Low Income Individuals (Regional)

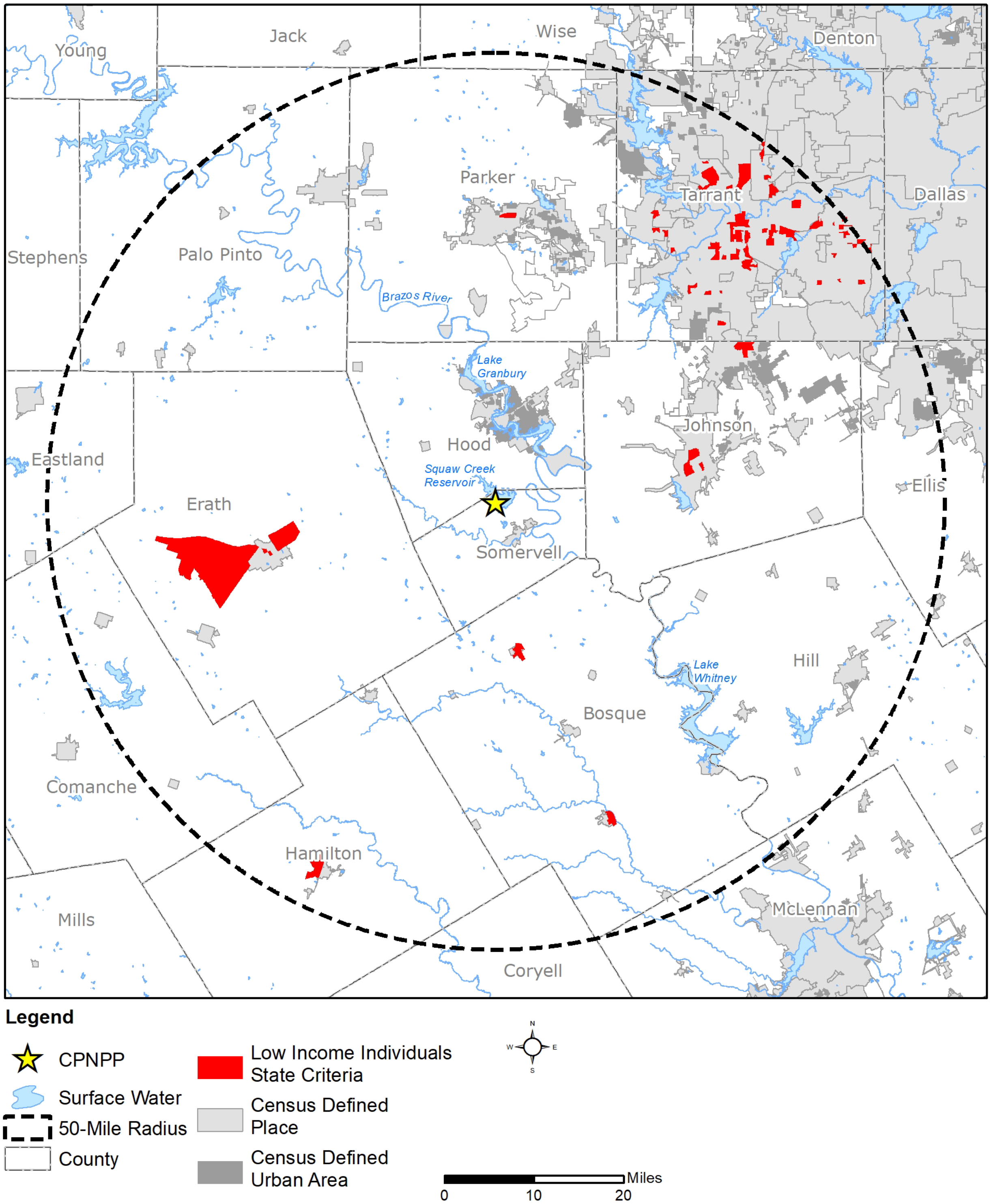


Figure 3.11-16 Low Income Individuals (Individual State)

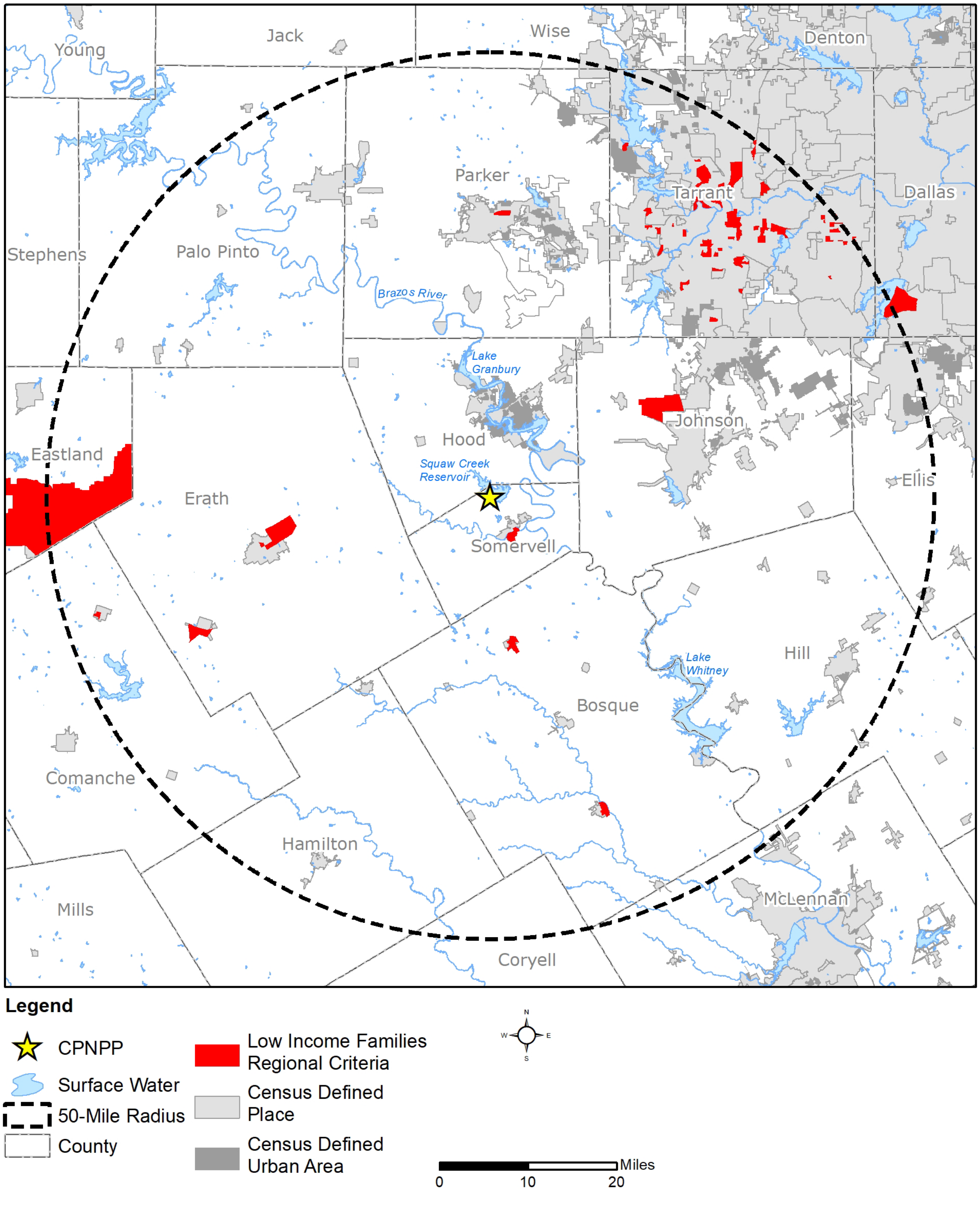


Figure 3.11-17 Low Income Families (Regional)

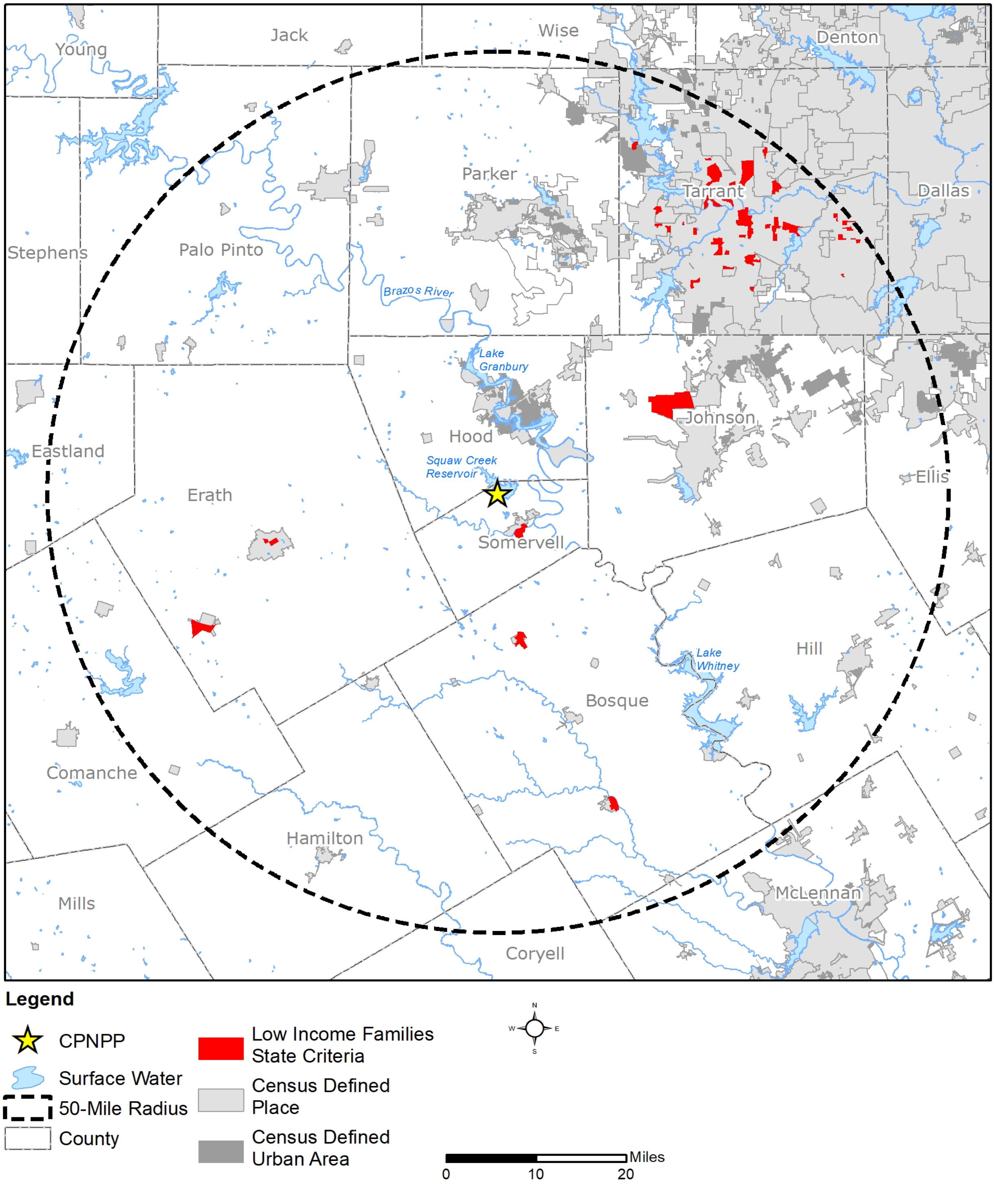


Figure 3.11-18 Low Income Families (Individual State)

3.12 Waste Management

In addressing the plant's radioactive and nonradioactive waste management systems and program, NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information requested in this section can be incorporated by reference to Section 2.2 of the ER (NRC 2013b, Section 3.11). Therefore, consistent with NRC Regulatory Guide 4.2, Vistra OpCo is providing the information below to address CPNPP's radioactive and nonradioactive waste management systems and program.

3.12.1 Radioactive Waste Management

Section 2.2.6 includes a discussion of CPNPP's liquid, gaseous, and solid radwaste systems. The section provides a description of the systems, management of LLMW, radwaste storage, spent fuel storage, and permitted facilities currently utilized for offsite processing and disposal of radioactive waste.

3.12.2 Nonradioactive Waste Management

Section 2.2.7 includes a discussion of CPNPP's RCRA nonradioactive waste management program, types of waste generated, waste minimization practices, and permitted facilities currently utilized for disposition of waste.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

The environmental report must include an analysis that considers . . . the environmental effects of the proposed action . . . and alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

The environmental report shall . . . discuss . . . the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance. [10 CFR 51.45(b)(1)]

The information submitted . . . should not be confined to information supporting the proposed action but should also include adverse information. [10 CFR 51.45(e)]

The NRC has identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated these issues as Category 1, Category 2, or uncategorized. The NRC designated an issue as Category 1 if the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for offsite radiological impacts-collective impacts from other than the disposal of spent fuel and high-level waste).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to be not sufficiently beneficial to warrant implementation.

If the NRC concluded that one or more of the Category 1 criteria could not be met, the NRC designated the issue as Category 2, which requires plant-specific analysis. The NRC designated one issue as uncategorized (chronic effects of electromagnetic fields), signifying that the categorization and impact definitions do not apply to this issue. Until such time that this uncategorized issue is categorized, applicants for license renewal are not required to submit information on this issue [10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 6]; therefore, this issue is not included in Tables 4.0-1, 4.0-2, or 4.0-3, nor is it addressed in Section 4.9. NRC rules do not require analyses of Category 1 issues that were resolved using generic findings [10 CFR Part 51, Subpart A, Appendix B, Table B-1] as described in the GEIS. Therefore, an applicant may reference the GEIS findings for Category 1 issues, absent new and

significant information. The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). In this guidance, new and significant information is defined as follows:

- Information that identifies a significant environmental issue not considered or addressed in the GEIS and consequently not codified in Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants, in Appendix B, Environmental Effect of Renewing the Operating License of a Nuclear Power Plant, to Subpart A, National Environmental Policy Act-Regulations Implementing Section 102(2), of 10 CFR Part 51; or
- Information not considered in the assessment of impacts evaluated in the GEIS, leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1.
- Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

4.0.1 Category 1 License Renewal Issues

The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(i)]

[A]bsent new and significant information, the analyses for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal . . . . (61 FR 28483)

Vistra OpCo has determined that, of the 60 Category 1 issues, eight are not applicable to CPNPP because they result from design or operational features that do not exist at the facility. Table 4.0-1 lists these eight issues and provides a brief explanation of why they are not applicable to the site. Table 4.0-2 lists the 52 issues which are applicable to the site. Vistra OpCo reviewed the NRC findings on these 52 issues and identified no new and significant information that would invalidate the findings for the site (Chapter 5). Therefore, Vistra OpCo adopts by reference the NRC findings for these Category 1 issues.

4.0.2 Category 2 License Renewal Issues

The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(ii)]

The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

The NRC designated 17 issues as Category 2. Vistra OpCo has determined that, of the 17 issues shown in Table 4.0-3, 6 issues are not applicable to CPNPP because they are applicable to plants with a different type of cooling system or to a plant with greater groundwater withdrawals. For the 11 issues applicable to the site, the corresponding sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to renewal of the CPNPP Units 1 and 2 OLs and, when applicable, discuss potential mitigation alternatives to the extent appropriate. With the exception of threatened and endangered species/EFH, historic and cultural resources, and environmental justice, Vistra OpCo has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3 as follows:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small as the term is used in 10 CFR Part 51, Appendix B, Table B-1.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource. For issues where probability is a key consideration (i.e., accident consequences), probability was a factor in determining significance.

Consistent with NRC guidance, Vistra OpCo identified the significance of the impacts for the three Category 2 issues of threatened and endangered species/EFH, historic and cultural resources, and environmental justice as follows:

- For threatened and endangered species (ESA), the significance of the effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, (1) would have no effect on federally listed species; (2) are not likely to adversely affect federally listed species; (3) are likely to adversely affect federally listed species; or (4) are likely to jeopardize a federally listed species or adversely modify Designated Critical Habitat. For EFH (Magnuson Stevens Fishery Conservation and Management Act), the significance of effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, would have: (1) no adverse impact; (2) minimal adverse impact; or (3) substantial adverse impact to the essential habitat of federally managed fish populations. (NRC 2013a)

- For historic and cultural resources (NHPA), the significance of the effects from license renewal can be characterized based on a determination that: (1) no historic properties are present (no effect); (2) historic properties are present but would not be adversely affected (no adverse effect); or (3) historic properties are adversely affected (adverse effect). (NRC 2013b)
- For environmental justice, impacts would be based on disproportionately high and adverse human health and environmental effects on minority and low-income populations. (NRC 2013b)

In accordance with NEPA practice, Vistra OpCo considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are SMALL receive less mitigation consideration than impacts that are LARGE).

4.0.3 Uncategorized License Renewal Issues

The NRC determined that its categorization and impact-finding definitions did not apply to the chronic effects of electromagnetic fields. Because the categorization and impact finding definitions do not apply as noted in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 5, applicants are not currently required to submit information on this issue.

4.0.4 Format of Issues Reviewed

Chapter 4 follows Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b) regarding content for the license renewal issues identified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. For Category 1 issues, the generic issues resolved by the NRC in NUREG-1437, Revision 1 (NRC 2013a), Vistra OpCo presents the results of its new and significant information review. For Category 2 issues which were not resolved in NUREG-1437, Revision 1, Vistra OpCo presents a site-specific analysis. The format for Category 2 issues is outlined below.

- *Issue:* Title of the issue.
- *Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1:* The findings for the issue from 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants.
- *Requirement:* Restatement of the applicable 10 CFR 51.53 requirement.
- *Background:* A background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.
- *Analysis:* An analysis of the environmental impact, taking into account information provided in the GEIS and 10 CFR Part 51, Subpart A, Appendix B, as well as current site-specific information. If an issue is not applicable, the analysis lists the explanation. The analysis section also provides a summary conclusion of the environmental impacts and identifies, as applicable, either ongoing or additional planned mitigation measures to reduce adverse impacts.

Table 4.0-1 Category 1 Issues Not Applicable to CPNPP

Issue	Comment
Land Use	
Offsite land use in transmission line rights-of-way (ROWs)	All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located completely within the CPNPP site boundaries.
Surface Water Resources	
Altered salinity gradients	CPNPP does not have cooling towers and does not discharge to an estuary.
Effects of dredging on surface water quality	No dredging has occurred, is planned, or is anticipated for CPNPP.
Groundwater Resources	
Groundwater quality degradation (plants with cooling ponds in salt marshes)	CPNPP is located on a freshwater body and does not utilize cooling ponds.
Terrestrial Resources	
Cooling tower impacts on vegetation (plants with cooling towers)	CPNPP uses once-through cooling.
Aquatic Resources	
Impingement and entrainment of aquatic organisms (plants with cooling towers)	CPNPP uses once-through cooling.
Thermal impacts on aquatic organisms (plants with cooling towers)	CPNPP uses once-through cooling.
Effects of dredging on aquatic organisms	No dredging has occurred, is planned, or is anticipated for CPNPP.

Table 4.0-2 Category 1 Issues Applicable to CPNPP (Sheet 1 of 2)

Resource	Issue
Land Use	Onsite land uses
	Offsite land uses
Visual Resources	Aesthetic impacts
Air Quality	Air quality impacts (all plants)
	Air quality effects of transmission lines
Noise	Noise impacts
Geologic Environment	Geology and soils
Surface Water Resources	Surface water use and quality (non-cooling system impacts)
	Altered current patterns at intake and discharge structures
	Altered thermal stratification of lakes
	Scouring caused by discharged cooling water
	Discharge of metals in cooling system effluent
	Discharge of biocides, sanitary wastes, and minor chemical spills
	Surface water use conflicts (plants with once-through cooling systems)
	Temperature effects on sediment transport capacity
Groundwater Resources	Groundwater contamination and use (non-cooling system impacts)
	Groundwater use conflicts (plants that withdraw less than 100 gpm)
	Groundwater quality degradation resulting from water withdrawals
Terrestrial Resources	Exposure of terrestrial organisms to radionuclides
	Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)
	Bird collisions with plant structures and transmission lines
	Transmission line ROW management impacts on terrestrial resources
	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)
Aquatic Resources	Entrainment of phytoplankton and zooplankton (all plants)
	Infrequently reported thermal impacts (all plants)
	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication
	Effects of nonradiological contaminants on aquatic organisms
	Exposure of aquatic organisms to radionuclides
	Effects on aquatic resources (non-cooling system impacts)
	Impacts of transmission line ROW management on aquatic resources
	Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses

Table 4.0-2 Category 1 Issues Applicable to CPNPP (Sheet 2 of 2)

Resource	Issue
Socioeconomics	Employment and income, recreation and tourism
	Tax revenues
	Community services and education
	Population and housing
	Transportation
Human Health	Radiation exposures to the public
	Radiation exposures to plant workers
	Human health impact from chemicals
	Microbiological hazards to plant workers
	Physical occupational hazards
Postulated Accidents	Design-basis accidents
Waste Management	Low-level waste storage and disposal
	Onsite storage of spent nuclear fuel
	Offsite radiological impacts of spent nuclear fuel and high-level waste disposal
	Mixed-waste storage and disposal
	Nonradioactive waste storage and disposal
Uranium Fuel Cycle	Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste
	Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste
	Nonradiological impacts of the uranium fuel cycle
	Transportation
Termination of Nuclear Power Plant Operations and Decommissioning	Termination of plant operations and decommissioning

Table 4.0-3 Category 2 Issues Applicability to CPNPP (Sheet 1 of 2)

Resource Issue	Applicability	ER Section
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	4.5.1
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gpm)	Not Applicable	4.5.3
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	Not Applicable	4.5.2
Groundwater quality degradation (plants with cooling ponds at inland sites)	Not Applicable	4.5.4
Radionuclides released to groundwater	Applicable	4.5.5
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts)	Applicable	4.6.5
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	4.6.4
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	Applicable	4.6.1
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	Applicable	4.6.2
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	4.6.3
Special Status Species and Habitats		
Threatened, endangered, and protected species and EFH	Applicable	4.6.6
Historic and Cultural Resources		
Historic and cultural resources	Applicable	4.7
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river) Note: The 10 CFR Part 51, Subpart A, Appendix B, Table B-1 finding states, "These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers." Thus, plants using lakes for cooling (like CPNPP) are included as plants where this Category 2 issue is applicable.	Applicable	4.9.1
Electric shock hazards	Applicable	4.9.2

Table 4.0-3 Category 2 Issues Applicability to CPNPP (Sheet 2 of 2)

Resource Issue	Applicability	ER Section
Postulated Accidents		
Severe accidents	Applicable	4.15.2
Environmental Justice		
Minority and low-income populations	Applicable	4.10.1
Cumulative Impacts		
Cumulative Impacts	Applicable	4.12

4.1 Land Use and Visual Resources

Impacts to land use and visual resources are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to land use and visual resources. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.2 Air Quality

Impacts to air quality are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to air quality. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.3 Noise

Impacts to noise are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to noise. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.4 Geology and Soils

Impacts to geology and soils are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to geology and soils. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.5 Water Resources

Impacts to water resources evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1, are listed in Section 4.0. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to water resources Category 1 issues. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The Category 2 issues for water resources are discussed below.

4.5.1 Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts could be of small or moderate significance, depending on makeup water requirements, water availability, and competing water demands.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river . . . must be provided.

Background [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Closed-cycle cooling is not completely closed, because the system discharges blowdown water to a surface water body and withdraws water for makeup of both the consumptive water loss due to evaporation and drift (for cooling towers) and blowdown discharge. For plants using cooling towers, the makeup water needed to replenish the consumptive loss of water to evaporation can be significant and is reported at 60 percent or more of the condenser flow rate. Cooling ponds will also require makeup water as a result of naturally occurring evaporation, evaporation of the warm effluent, and possible seepage to groundwater.

Consumptive use by plants with cooling ponds or cooling towers using makeup water from a river during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment (EA) by the NRC. In the 1996 GEIS, application of this issue applied only to rivers with low flow to define the difference between plants located on "small" versus "large" rivers. However, any river, regardless of size, can experience low flow conditions of varying severity during periods of drought and changing conditions in the affected watershed such as upstream diversions and use of river water. The NRC subsequently determined that use of the term "low flow" in categorizing river flow is of little value, considering that all rivers can experience low flow conditions. Population growth around nuclear power plants has increased demand on municipal water systems, including systems that rely on surface water. Municipal intakes located

downstream from a nuclear power plant could experience water shortages, especially in times of drought. Similarly, water demands upstream from a plant could impact the water availability at the plant's intake.

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands.

Analysis

As presented in Section 2.2.3 of this ER, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable and further analysis is not required.

4.5.2 Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

Background [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would occur naturally, although withdrawals for makeup water would increase the effect.

Analysis

As presented in Section 2.2.3 of this ER, CPNPP utilizes a once-through cooling system and does not utilize a closed-cycle cooling system for condenser cooling purposes. Therefore, this issue is not applicable and further analysis is not required.

4.5.3 Groundwater Use Conflicts (Plants that Withdraw More than 100 GPM)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Plants that withdraw more than 100 gpm could cause groundwater use conflicts with nearby groundwater users.

Requirement [10 CFR 51.53(c)(3)(ii)(C)]

If the applicant's plant pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater must be provided.

Background [GEIS Section 4.5.1.2]

A nuclear plant may have several wells with combined pumping in excess of 100 gpm (378 liters per minute). Overall site pumping rates of this magnitude have the potential to create conflicts with other local groundwater users if the cone of depression extends to the offsite well(s). Large offsite pumping rates for municipal, industrial, or agricultural purposes may, in turn, lower the water level at power plant wells. For any user, allocation is normally determined through a state-issued permit.

Groundwater use conflicts have not been observed at any nuclear power plants, and no significant change in water well systems is expected over the license renewal term. If a conflict did occur, it might be possible to resolve it if the power plant relocated its well or wellfield to a different part of the property. The siting of new wells would be determined through a hydrogeologic assessment.

Analysis

As presented in Section 3.6.3.2, four water supply wells were plugged in 2013. The PWSs associated with three other water supply wells were deactivated in 2018. The STC water well is used to supply water for cattle with groundwater withdrawal limited by the Prairie Lands Groundwater Conservation District to 281,750 gpy (0.54 gpm rate). The SCP Office water well had a maximum withdrawal of 32,104 gallons (0.06 gpm) in 2017 and 44,740 gallons (0.9 gpm) in 2018. The SCP Boat Dock water well had a maximum withdrawal of 162,060 gallons (0.31 gpm) in 2017 and 97,200 gallons (0.19 gpm) in 2018. SCP is currently closed to the public but is expected to reopen to visitors on a seasonal basis in the future. The one remaining 2020 PWS (PW#2130037) associated with the recreation/training water supply well (Rifle Range Well) was deactivated on August 24, 2021. The Rifle Range Well had a permitted maximum withdrawal rate of 82,000 gpy (0.16 gpm). The average withdrawal rate for the Rifle Range well was reported by Vistra OpCo as an average of 98.09 gpd (0.07 gpm) in 2020 and averaged 143.27 gpd (0.010 gpm) between 2016 and 2020.

It is not anticipated that groundwater withdrawals significantly above these reported quantities will be required during the LR operating term; therefore, because CPNPP pumps significantly less than 100 gallons (total onsite) of groundwater per minute, this issue is not applicable and further analysis is not required.

4.5.4 Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Inland sites with closed-cycle cooling ponds could degrade groundwater quality. The significance of the impact would depend on cooling pond water quality, site hydrogeologic conditions (including the interaction of surface water and groundwater), and the location, depth, and pump rate of water wells.

Requirement [10 CFR 51.53(c)(3)(ii)(D)]

If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.

Background [GEIS Section 4.5.1.2]

Some nuclear power plants that rely on unlined cooling ponds are located at inland sites surrounded by farmland or forest or undeveloped open land. Degraded groundwater has the potential to flow radially from the ponds and reach offsite groundwater wells. The degree to which this occurs depends on the water quality of the cooling pond; site hydrogeologic conditions (including the interaction of surface water and groundwater); and the location, depth, and pump rate of water wells. Mitigation of significant problems stemming from this issue could include lining existing ponds, constructing new lined ponds, or installing subsurface flow barrier walls. Groundwater monitoring networks would be necessary to detect and evaluate groundwater quality degradation. The degradation of groundwater quality associated with cooling ponds has not been reported for any inland nuclear plant sites.

Analysis

As presented in Section 2.2.3 of this ER, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds. Therefore, this issue is not applicable and further analysis is not required.

4.5.5 Radionuclides Released to Groundwater

Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. Groundwater protection programs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics.

Requirement [10 CFR 51.53(c)(3)(ii)(P)]

An applicant shall assess the impact of any documented inadvertent releases of radionuclides into groundwater. The applicant shall include in its assessment a description of any GPP used for the surveillance of piping and components containing radioactive liquids for which a pathway to groundwater may exist. The assessment must also include a description of any past inadvertent releases and the projected impact to the environment (e.g., aquifers, rivers, lakes, ponds, ocean) during the license renewal term.

Background [GEIS Section 4.5.1.2]

The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites which involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons learned review of these incidents. On September 1, 2006, the task force issued its report: Liquid Radioactive Release Lessons Learned Task Force Report.

The most significant conclusion dealt with the potential health impacts on the public from the inadvertent releases. Although there were numerous events during which radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety were adversely impacted.

On the basis of the information and experience with these leaks, the NRC concludes that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel in identifying and stopping the leak in a timely fashion.

Analysis

A description of the CPNPP GPP is presented in Section 3.6.2.4. Table 3.6-3 presents well construction details for the CPNPP groundwater monitoring wells, while Figure 3.6-5 shows the location of the wells. Table 3.6-8 presents information on 39 registered water wells located

within a 2-mile band around the CPNPP property boundary, while Figure 3.6-8 shows the locations of these offsite wells.

As presented in Section 3.6.4.2.1, no unplanned liquid or gaseous radioactive releases occurred at CPNPP in 2018 and 2019. In 2020, as presented in Section 3.6.4.2, tritium levels detected in MW-11 ranged from 1,040 to 1,890 pCi/L, which are less than the required lower limit of discrimination of 2,000 pCi/L and much less than the drinking water limit of 20,000 pCi/L and the environmental reportable criteria of 30,000 pCi/L. In 2021, a courtesy notification was submitted to the NRC for approximately 2.7 millicuries of tritium released from a quantity of over 100 gallons of demineralized water due to the failure of a buried pipe. This amount of tritium is well below the reportable quantity of 100 Curies. The release material was excavated and the resin/water mixture that could be recovered was collected/containerized and handled properly.

Therefore, since water from plant uses continues to be processed and monitored in compliance with licensing and permitting, and monitoring demonstrates that the radionuclides do not exceed permissible regulatory levels, Vistra OpCo concludes that impacts from radionuclides to groundwater are SMALL and do not warrant additional mitigation measures in accordance with CPNPP's existing GPP.

4.6 Ecological Resources

Impacts to ecological resources evaluated in the GEIS and considered to be generic (the same or similar at all plants), or Category 1, are listed in Section 4.0. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to ecological resources Category 1 issues. Therefore, Vistra OpCo incorporates the findings of NRC Finding from 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The Category 2 issues for ecological resources are discussed below.

4.6.1 Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, OR LARGE. The impacts of impingement and entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site.

Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current CWA 316(b) determinations or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from impingement and entrainment.

Background [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. At some nuclear power plants, other vertebrate species may also be impinged on the traveling screens or on intake netting placed within intake canals.

Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs and larvae), larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 inches at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening techniques, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

Analysis

The two nuclear power generating units at CPNPP use a once-through cooling water system. Cooling water for both units is withdrawn from SCR. The intake structure at CPNPP is located in an excavated recess of the SCR shoreline and consists of 8 CWS pumps and 12 travelling screens. The intake extends approximately 50 feet below the surface of SCR. Noncontact cooling water is discharged from a common outfall located across the peninsula from the intake.

Two screen wash pumps per unit are located downstream of the traveling water screens. Each pump provides about 2.7 cfs (1,200 gpm) of water to the traveling water screens. Each unit has four vertical, mixed flow, wet pit circulating water pumps, located downstream of the screens. Each circulating water pump provides a total of 613 cfs (275,000 gpm) to the condensers for the units. The facility's maximum design flow is about 2,200,000 gpm (3,168 mgd). Under normal conditions, all four pumps operate. The plant can operate at reduced loads operating two or three pumps per unit.

CPNPP has a screenhouse structure that is recessed from the shoreline, on the north side of the peninsula. The screenhouse contains trash racks installed to prevent large debris from entering the intake bays. In addition, traveling water screens are located behind the trash racks to prevent smaller debris from entering and to help reduce entrainment. Circulating water pumps are located downstream of the traveling water screens to transport the screened flow to the condensers.

As presented in Section 3.7.7 and discussed below, a baseline entrainment and impingement study was conducted at CPNPP. For impingement, sampling was conducted weekly from October 18, 1993, through March 1994, semi-monthly from April 1994 through August 1994 and weekly from September through October of 1994. For entrainment, sampling was conducted

weekly from April 6 through August 24 of 1994 (spawning season in most Texas reservoirs) using a half meter, 500-micron mesh net towed from a boat in the vicinity of the intake. The results indicated that there was no significant adverse environmental impact to the SCR as a result of CPNPP operations and that the plant was operating under the BTA.

The impingement study conducted from October 1993 through March 1994 consisted of weekly sampling and involved utilizing a basket inserted into the debris sump to collect fish off of the travelling screens. Approximately 262,498 fish, comprising 13 species, were impinged by the CWS during this timeframe. Ninety-six percent of those impinged were threadfin shad. Game fish including largemouth bass, white bass, channel catfish, and white crappie accounted for less than 1 percent combined of the total impingement. These results were consistent with those of plants of similar design and location. Forage species are most likely to dominate impingement losses due to their abundance, their pelagic habit, tendency to move in schools, and reduced physiological condition at high temperatures. The low number of gamefish impinged, and the high reproductive capacity of threadfin shad were determined to not create a significant impact on the gamefish community at SCR.

Additional sampling was completed biweekly from February 2006 through February 2007 by collecting samples impinged from the facilities intake screens. A total of 58,121 aquatic organisms, including 12 fish species, were collected in impingement samples at CPNPP. Threadfin shad accounted for 92 percent of the total impingement, followed by bluegill (4 percent), mud crab (2 percent), inland silverside (1 percent), and largemouth bass (1 percent). However, this total included a threadfin shad die-off that occurred in the reservoir on August 22 and 23, 2006, due to stress from high water temperatures. The number (39,071) of threadfin shad collected during this single event made up 69 percent of the total number of fish collected during the study.

Impingement rates (number of fish/million gallons) for each sample event from February 2006 through February 2007 were used to estimate total impingement for the study year in the SCR. The estimated total number of fish impinged was approximately 295,000. These estimates included approximately 253,000 threadfin shad and 28,844 bluegill. Approximately 83 percent of threadfin shad and 96 percent of bluegill were believed to be less than 1 year of age. Impingement rates were compared to various facility and environmental variables to identify possible relationships and water temperature appeared to be the only variable that really influenced impingement. This conclusion was made evident by the threadfin shad die off.

Entrainment sampling of ichthyoplankton was conducted from April through August 1994. Boat-mounted nets were towed in front of the trash racks weekly. The entrainment estimate utilized data on all species and life stages captured in the net. Two juveniles, Dorosoma and Lepomis, were captured and likely represent an overestimate of impact to their populations. Eggs and larvae were also sent to the lab and identified down to the genus. Daily, weekly, monthly, annual, and seasonal estimates for entrainment characterization were calculated based upon the actual and maximum operating conditions of the CWS. Taxa identified includes sunfish, shad, white bass, inland silverside, crappies, and drums. Assuming 100 percent mortality, 30

million eggs/larvae were estimated to have been entrained in 1994. The results indicated that drums, sunfish, threadfin, and gizzard shad likely accounted for most of the loss (from egg to juvenile) and game fish losses were likely minimal.

In 2015, SCR was designated as a CCRS. According to the EPA, CCRSs are highly effective in reducing impingement and entrainment by reducing intake flow. These reductions in flow and the concurrent reductions in impingement and entrainment impacts are among the highest reductions in adverse environmental impact possible at an intake structure. The use of SCR as a CCRS is considered the BTA for impingement as determined by the TCEQ.

In 2018, two fine mesh intake technologies were evaluated to make a BTA determination on entrainment, fine-mesh traveling water screens with fish friendly features, and narrow-slot cylindrical wedgewire screens. Further, an alternative water source and a mechanical draft CCRS were considered to reach a BTA determination. It was later determined that the CWIS is BTA, and the social costs of the alternatives were not justified by the social benefit. No additional control requirements are necessary beyond what Vistra OpCo is already doing.

A copy of Vistra OpCo's 316(b) permit and supporting documentation is attached as required by 10 CFR 51.53(c)(3)(ii)(B). During the period of extended operation, Vistra OpCo will perform additional studies similar to those currently required and will ensure that CPNPP continues to use the BTA to minimize entrainment and impingement to the fullest extent practicable to maintain compliance with the TPDES permit. The current permit expires in October 2024 and per TCEQ regulations for permit renewal a renewal application will be submitted by Vistra OpCo in a timely manner. Vistra OpCo concludes that impacts from impingement and entrainment of aquatic organisms during the proposed operating term would be SMALL. Adherence to the 316b rule (79 FR 48300), and Texas Administrative Code (Chapter 308, §308.91), combined with continued compliance to permit regulation with BTA and ongoing studies to identify any potential concerns, will minimize the already existing SMALL impacts.

4.6.2 Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Most of the effects associated with thermal discharges are localized and not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area.

Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of a 316(a) variance in accordance with 40 CFR Part 125, or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from thermal changes.

Background [GEIS Section 4.6.1.2]

Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, NRC classified heat shock as a Category 2 issues that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

Analysis

Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can demonstrate that thermal discharge limitations are more stringent than necessary, and using a variance, obtain alternative facility-specific thermal discharge limits [33 USC 1326]. The maximum thermal limit associated with the CPNPP TPDES permit is 116°F. The 316(a) determination under the TPDES permit (Attachment B) defines thermal effluent discharge limits that CPNPP adheres to, in order to reduce impacts on aquatic organisms. The current permit expires in October 2024 and a renewal application will be submitted by Vistra OpCo in a timely manner. A copy of Vistra OpCo's 316(a) variance and supporting documentation is attached as required by 10 CFR 51.53(c)(3)(ii)(B).

As discussed in Section 3.7.3, CPNPP has a once-through heat dissipation system and SCR is considered to be a CCRS. CPNPP withdraws cooling water from SCR at a peak rate of about 3,168 MGD for both units, which is equivalent to recirculating the entire volume of water in the reservoir every 16 days. In the summer, the recirculation is confined to the upper half of the water column, and it would take about 8 days to recirculate the upper half of the water column. CPNPP operates all four pumps on both Units 1 and 2 for the rate of 3,168 MGD; during the winter, three pumps per unit are operated for a rate of 2,376 MGD. SCR was created specifically as a source of cooling water for CPNPP. The reservoir also contains a SSI, which is connected to the reservoir by a 40-foot channel. According to the 2017 acoustic bathymetry survey, the reservoir, including the SSI, has a capacity of 149,732 acre-feet encompassing a surface area of 3,272 acres at the conservation elevation of 775 feet above mean sea level. The dam controls a drainage area of about 64 square miles.

Temperature distribution was studied shortly after initial operation of Units 1 and 2 in 1993. The results indicated that the thermocline decreased very slightly (less than 4°F) from 40 to 50 feet and then temperatures dropped sharply at 60 feet and then decreased slowly to the bottom of the reservoir. The area around the thermal plume at the time decreased only 2-4°F down to 15 feet. Warmer water and vertical mixing with depth, below 20 feet, have been observed in SCR

since CPNPP Unit 1 became operational. In the first year that Units 1 and 2 were operational, temperatures below the thermocline down to 70 feet averaged about 4°F warmer than in 1991 when the CPNPP Unit 2 effect was minimal. The average of all deep-water areas surveyed at 50 feet were 3.8°F more than in 1991, while average temperatures at 60 feet and 70 feet were 6.4°F and 1.0°F warmer, respectively, than 1991. Temperatures at 80 feet, however, have remained about 57°F since Unit 1 became operational. The study concluded that the decreased thermocline and increased heat budget down to 70 feet is likely result of CPNPP Unit 2 operation. (Luminant 2013b).

A thermal study was conducted in 2007 to assess increasing the thermal uprate to 3,650 MWt. The report utilized a compilation of previous studies as well as additional modelling techniques to evaluate intake temperatures and evaporation rates from the increase in thermal output. The three-dimensional model was run with full load conditions using the current reactor thermal output of approximately 3,458 megawatts (MW) per unit with a waste heat load of 2,260 MW per unit, also called the "base case." The base case was used for comparison of intake temperatures and evaporation rates against the "uprate case." The uprate case includes the nominal 3,650 MW thermal output per unit and an equivalent waste heat load of 2,400 MW per unit. The results indicated a small increase in temperature at both the intake and discharge locations. The difference between the base case and the uprate case at the discharge and intake structures was 1.2°F and 0.6°F, respectively. Another study in 2017 modeled the temperature changes in the SCR due to the thermal plume. Results indicated that the dilution effect of the submerged outfall location reduced the discharge temperature rise. The plume is estimated to be largest in mid-winter and smallest during the hottest part of the summer. The differential heat loss from the plume is driven by hydrometeorology. Colder temperatures imply a lower rate of heat dissipation and a correspondingly larger plume. Similarly, a higher wind speed entails higher heat transfer and a smaller plume. The mid-winter scenario is dominated by the much lower water temperatures, hence a much-enlarged plume with the model indicating a size of 1,864 acres during the normal-late summer, and 2,914 acres during normal mid-winter. The species present in the reservoir have adapted to the warmer temperatures. When the thermal impacts reach their higher limits during the summer months, fish and shellfish are able to move away from the plume and to other areas within the reservoir depending on their thermal requirements and tolerances. Studies conducted to monitor the fish community in the SSI found similar results, documenting 12 species.

The TCEQ approved designation of SCR as a CCRS in 2015. SCR is man-made, has a stocked and managed fishery, and has no documented state, federal, or threatened species, or critical habitat. Because Squaw Creek is designated a CCRS and was created specifically for the purpose of being used as a cooling water source for CPNPP, the fish and shellfish community is not expected to be diverse. However, the species present are more adapted to warmer water and continued stocking of sport fish maintains the aquatic community near CPNPP. The thermal discharge likely has little long-term impact on the aquatic community of SCR. CPNPP is operating in conformance with its TPDES permit and therefore, it remains in compliance with CWA requirements. Because there are no planned operational changes during the proposed LR

operating term that would increase the temperature of CPNPP's existing thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted.

4.6.3 Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on stream (aquatic)…ecological communities must be provided.

Background [GEIS Section 4.6.1.2]

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or a combination of such factors. Water use conflicts with biological resources in stream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

Analysis

As discussed in Section 3.7.3, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable, and further analysis is not required.

4.6.4 Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Findings from 10 CRF Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance.

Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action of water availability and competing water demands, the flow of the river, and related impacts on riparian (terrestrial) ecological communities must be provided.

Background [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time.

Analysis

As discussed in Section 3.7.3, CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable and further analysis is not required.

4.6.5 Effects on Terrestrial Resources (Non-Cooling System Impacts)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Applications of BMPs would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats.

Background [GEIS Section 4.6.1.1]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear powerplant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time.

Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the site (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state or maintain current trends of change.

Terrestrial habitats and wildlife could be affected by ground disturbance from refurbishment related construction activities. Land disturbed during the construction of new ISFSIs would range from about 2.5–10 acres. Other activities may include new parking areas for plant employees, access roads, buildings, and facilities. Temporary project support areas for equipment storage, worker parking, and material laydown areas could also result in the disturbance of habitat and wildlife.

Successful application of environmental review procedures, employed by the licensees at many of the operating nuclear plant sites, would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce wildlife disturbance in adjacent habitats, could greatly reduce the impacts of continued operations and refurbishment activities.

Analysis

Refurbishment Activities

As discussed in Section 3.7.8.4, no LR-related refurbishment activities have been identified. Therefore, there would be no LR-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

Operational Activities

Terrestrial resources are described in Section 3.7.2. No LR-related construction activities or changes in operational practices have been identified that would involve disturbing habitats. Vistra OpCo would continue to conduct ongoing plant operational and maintenance activities during the proposed LR operating term. However, these activities are anticipated to occur within previously disturbed habitats.

Ground's maintenance consists of mowing roadside habitat periodically during the growing season, tree trimming in the spring and fall, as well as regular cleaning of the yards. Pipeline maintenance is not regularly scheduled; however, vegetation management and leak repairs were performed in 2019. Additional maintenance outside of scheduled activities is completed through a preventative maintenance work order.

Furthermore, as discussed in Section 9.6, Vistra OpCo has administrative controls in place at CPNPP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as

stormwater management, spill prevention, dredging, and herbicide use, further serve to minimize impacts to terrestrial resources.

For example, Vistra OpCo has a procedure in place to document BMPs for any ground disturbing activities as well as a stormwater permit for any disturbances greater than an acre. This procedure provides guidance for meeting the terms and conditions of TPDES general permit No. TXR050000 for monitoring and reporting storm water outfall discharges. In addition, monthly monitoring activities identified in the procedure are intended to go beyond SWPPP compliance by including proactive measures to minimize potential environmental impacts of station activities. These measures include quarterly visual monitoring, a monthly comprehensive site evaluation, as well as weekly equipment inspections.

Although the need for additional onsite storage space for spent fuel is not known to be required during the license renewal term, previously disturbed tracts of land in the vicinity of the existing ISFSI are likely to be sufficient for the construction of a new ISFSI and to require similar acreage. Vistra OpCo has guidance in place for management of ground-disturbing activities, should they occur.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the proposed LR operating term for CPNPP. Therefore, Vistra OpCo concludes the impacts to the terrestrial ecosystems from the proposed LR are SMALL and no additional mitigation measures beyond current management programs and existing regulatory controls are required.

4.6.6 Threatened, Endangered, and Protected Species, and Essential Fish Habitat

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

The magnitude of impacts on threatened, endangered, and protected species, critical habitat, and EFH would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with federal laws protecting wildlife, including but not limited to, the ESA, and EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

Background [GEIS Section 4.6.1.3]

There are several federal acts that provide protection to certain species and habitats that are treated here under a single issue. The issue includes impacts to biological resources such as threatened and endangered species and their critical habitat under the ESA, EFH as protected under the Magnuson-Stevens Fishery Conservation and Management Act and impacts to mammal species protected under the Marine Mammal Protection Act.

Factors that could potentially result in impacts on listed terrestrial species include habitat disturbance, cooling tower drift, operation and maintenance of cooling systems, transmission line ROW maintenance, collisions with cooling towers and transmission lines, and exposure to radionuclides. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present.

Potential impacts of continued operations and refurbishment activities on federally or state-listed threatened and endangered species, protected marine mammals, and EFH could occur during the license renewal term. Factors that could potentially result in impacts to these species and habitats include impacts of refurbishment, other ground-disturbing activities, release of contaminants, effects of cooling water discharge on dissolved oxygen, gas supersaturation, eutrophication, thermal discharges, entrainment, impingement, reduction in water levels due to the cooling system operations, dredging, radionuclides, and transmission line ROW maintenance.

Analysis

Refurbishment Activities

As discussed in Section 3.7.8.5, no LR-related refurbishment activities have been identified. Therefore, there would be no LR-related refurbishment impacts to threatened, endangered, and protected species, or EFH, and no further analysis is required.

Operational Activities

As discussed in Section 3.7.8.5, no EFH exists at SCR and no HAPCs or EFH areas protected from fishing are located on or adjacent to CPNPP. No EFH exists within any enclosed freshwater habitat. Therefore, CPNPP operations have NO EFFECT on EFH.

As discussed in Section 3.7.8.1, there are five federally protected species under the ESA in Hood and Somervell counties. In addition, as discussed in Section 3.7.8.2, nine species are listed as state protected, although four of these are cross listed under the ESA.

Suitable habitat for the following federal and state listed species is not located within the portions of the CPNPP site used for operations: black rail, Texas fawnsfoot, Texas heelsplitter, and Brazos River water snake. Black rails prefer tidal marshes on the coast and inhabit grassy marshes inland (Audubon 2021b). A review of the TXNDD and eBird species observation data yielded no observations of black rails within 6 miles of the CPNPP site (eBird 2021; TPWD 2022a). Specimens of Texas fawnsfoot have been documented within 6 miles of CPNPP in the

Brazos River (TPWD 2022a). However, it is considered intolerant of reservoirs and therefore is not likely to be found in SCR (TPWD 2021a; TPWD 2021b). The Brazos River water snake has been documented within 6 miles of CPNPP and is endemic in the Brazos River (TPWD 2022a). The current known range of the Texas heelsplitter does not occur within 6 miles of the CPNPP site. Occurrences of these species within these areas would be incidental or is unlikely unless intentionally or unintentionally relocated. Due to the lack of suitable habitat, and the unlikely probability of these species to occur on the CPNPP site, the continued operation of CPNPP will have NO EFFECT on these species.

Habitat for seven federal and state protected species is either located near the CPNPP site, or the species are highly mobile and may occur onsite and warrant further discussion. These species are golden-cheeked warblers, piping plovers, rufa red knots, white-face ibises, whooping cranes, and THLs. However, piping plovers and rufa red knots are only considered for protection under the ESA for wind projects.

Marginal habitat for THLs may be on portions of the CPNPP site not used for operations. During the site visits for the CPNPP Unit 3 and 4 COLA, harvester ant colonies were found onsite. Harvester ants are the THL's primary source of food and can be indicative of their presence onsite. Following this observation, the site was surveyed for individuals, and none were found onsite. (Luminant 2013b) There have been no reports of the THL at the CPNPP site since the time of the 2007 survey. Maintenance activities at the site have been largely limited to previously disturbed areas and there have been no activities/developments at the CPNPP site that would have resulted in increased habitat availability for the THL. Further, no land disturbance has been identified during the LR term that would have potential impacts to the THL. Compliance with all regulatory requirements associated with these listed species will continue to be an administrative control practiced by Vistra OpCo for the life of the facility. As such, the continued operation of the CPNPP site for the proposed operating term will have NO EFFECT on the THL.

Habitat for the golden-cheeked warbler exists near SCR and individuals have been documented within 6 miles of CPNPP (eBird 2021; TPWD 2022a). However, informal surveys for the golden-cheeked warbler and the black-capped vireo were conducted during April 2007 at various times of day over the course of three days. Recordings of the songs and calls of both species were studied prior to field survey, and survey methods consisted of walking transects on an east-west axis spaced approximately 100 meters apart. Neither species was audibly nor visually identified during the April survey. (Luminant 2013b) Further, no tree or vegetation clearing is proposed during the LR term that would potentially impact this species. As such, the continued operation of the CPNPP site for the proposed operating term will have NO EFFECT on the golden cheeked warbler.

Piping plovers and red knots are shorebirds that use open habitats, such as beaches and mudflats. Both are small birds not known to be exceptionally prone to collision mortality, so the likelihood of collision with tall structures associated with CPNPP is expected to be minimal. Piping plovers and red knots are only federally considered for wind projects but are also state

listed as threatened for both Hood and Somervell counties (TPWD 2021a; TPWD 2021b; USFWS 2021b). Potential habitat for both species likely exists along the Brazos River, which is within the 6-mile vicinity of CPNPP; however, review of the TXNDD and eBird species observation data yielded no observations of these species within 6 miles of the CPNPP site (eBird 2021; TPWD 2022a). Compliance with all regulatory requirements associated with these listed species will continue to be an administrative control practiced by Vistra OpCo for the life of the facility; thus, the continued operation of the CPNPP site for the proposed operating term will have NO EFFECT on piping plovers or red knots.

Habitat exists for the white-faced ibis along the Brazos River and portions surrounding SCR. The white-faced ibis seems to prefer freshwater marshes, where it can find insects, newts, leeches, earthworms, snails, and especially crayfish, frogs, and fish. They roost on low platforms of dead reed stems or on mud banks. During the nesting season, they are colonial and will construct a deep cup of dead reeds among beds of bulrushes, on floating mats of dead plants, or they may nest in trees. A review of the TXNDD and eBird species observation data yielded multiple observations of this species along SCR and the Brazos River (eBird 2021; TPWD 2022a).

Suitable stopover habitat for the whooping crane exists within the 6-mile radius. Their preferred stopover habitat includes areas along rivers, in grain fields, and in shallow wetlands. A review of the TXNDD and eBird species observation data yielded no observations of this species within 6 miles of the CPNPP site (eBird 2021; TPWD 2022a).

Vistra OpCo is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support LR likely would be limited to previously disturbed areas onsite, and no additional land disturbance has been identified for the purpose of the LR. In addition, there are no plans to alter plant operations in a way which would affect threatened, endangered, and protected species during the proposed LR operating term.

Activities on the CPNPP site are evaluated to ensure compliance under Chapter 68 of the TPWD code, BGEPA, ESA, and MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. Compliance with all regulatory requirements associated with these species will continue to be an administrative control practice by Vistra OpCo for the life of the CPNPP facility. Adherence to these controls, as well as compliance with laws and regulations, will minimize impacts to these species. Further, as discussed in Section 3.7.8, no state or federally listed species have been documented within areas used for operations; thus, the continued operation of CPNPP will have NO EFFECT on these species.

As discussed in Section 9.6, Vistra OpCo has administrative controls in place at CPNPP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. In addition, regulatory programs that the site is subject to, such as those presented in Chapter 9, further serve to minimize impacts to any

threatened, endangered, and protected species. In an effort to obtain an independent review, letters requesting consultation have been submitted to the USFWS and TPWD. Responses to these requests have been received. Both agencies recommend the evaluation of the proposed actions for the potential to result in adverse impacts to listed species and to include a determination. Through this review, it has been determined that operation of the site would have NO EFFECT on any federally protected or state-listed species. Copies of the consultation letters to the USFWS and TPWD and their responses are provided in Attachment C.

In summary, no LR-related refurbishment activities have been identified. As discussed above, the continued operation of the site would have NO EFFECT on any federally protected or state-listed species. Therefore, Vistra OpCo concludes that the impacts from the proposed LR would not affect threatened, endangered, and protected species in the vicinity of CPNPP and mitigation measures beyond Vistra OpCo's current management programs and existing regulatory controls are not warranted.

4.7 Historic and Cultural Resources

The following sections address the historic and cultural issues applicable to CPNPP, providing background on issues and analysis regarding the proposed LR operating term.

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Continued operations associated with license renewal are expected to have no license renewal-related impacts as no refurbishment or construction activities have been identified; administrative procedure ensures protection of historic properties in the event of excavation activities. The NHPA requires the federal agency to consult with the State Historic Preservation Officer (SHPO) and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

Requirement [10 CFR 51.53(c)(3)(ii)(K)]

All applicants shall identify any potentially affected historic or archaeological properties and assess whether any of these properties will be affected by future plant operations and any planned refurbishment activities in accordance with the NHPA.

Background [GEIS Section 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The license renewal APE is the area that may be impacted by ground-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through: (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or building), landscaping, agricultural, or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines has not changed significantly over time; therefore, additional viewshed impacts to historic and cultural resources are not anticipated.

Analysis

Refurbishment Activities

As presented in Section 2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no LR-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

Operational Activities

As presented in Section 3.8.5, there have been five previous cultural resources surveys within the 7,700-acre CPNPP property (Table 3.8-1). While there are 33 entries on the THC Atlas, there are no NRHP eligible cultural resources confirmed within the 7,700-acre CPNPP property (Table 3.8-1). There are no structures within the CPNPP property listed on the historic sites' atlas. The Hopewell Cemetery is located within the CPNPP property and is protected by state burial laws.

As presented in Section 3.8.6, although no LR-related ground-disturbing activities have been identified, Vistra OpCo has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. These consist of a control of site excavation procedure and an excavation permit plan for the unanticipated discovery of any cultural resources over 50 years of age. Therefore, no adverse effects are anticipated to these sites during the CPNPP proposed LR operating term.

The area within a 6-mile radius of the site, is archaeologically sensitive (Table 3.8-3). There are 108 offsite cultural resources within 6 miles of CPNPP. Adverse impacts, however, would only occur to such sites as a result of soil-intrusive activities. Because Vistra OpCo has no plans to conduct such soil-intrusive activities at any location outside of the property boundary under a renewed license, no adverse effects to these archaeological sites would occur.

There are four NRHP listed aboveground historic properties within a 6-mile radius of the site (Table 3.8-4). These four NRHP listed resources include the Somervell County Courthouse, Barnards Mill, the Oakdale Park Historic District, and the Glen Rose Downtown Historic District. All four of these NRHP listed structures within 6 miles of the CPNPP property but are over 4.5 miles away from the CPNPP facility. Due to the distance, and the local terrain, aesthetic, and noise impacts to these resources as a result of the continued operations of CPNPP are not

expected, and no adverse effects to the physical or historical integrity of these sites are anticipated.

As discussed above, no LR-related refurbishment or construction activities have been identified. No offsite NRHP-listed historic properties will be adversely impacted as a result of continued operations of CPNPP, and there are no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of this LRA. In addition, administrative procedural controls are in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. Therefore, Vistra OpCo concludes that there will be no adverse effects as a result of continued operation of CPNPP during the proposed CPNPP operating term, and additional mitigation measures beyond Vistra OpCo's existing procedural administrative controls are not warranted. As described in Section 3.8, the THC and Native American groups recognized as potential stakeholders have been notified by Vistra OpCo of the proposed action (Attachment D).

4.8 Socioeconomics

Impacts to socioeconomics are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to socioeconomics. Therefore, Vistra OpCo incorporates the findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.9 Human Health

4.9.1 Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River)

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics.

Requirement [10 CFR 51.53(c)(3)(ii)(G)]

If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river, an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided.

Background [GEIS Section 4.9.1.1.3]

N. fowleri, which is the pathogenic strain of the free-living amoebae *Naegleria* spp., appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms.

Changes in microbial populations and in the public use of water bodies might occur after the OL is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affect water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water.

<u>Analysis</u>

As mentioned above, *Naegleria* spp. is the thermophilic organism of greatest concern regarding nuclear power plant thermal discharges. As presented in Section 3.10.1, *Naegleria* spp. is ubiquitous in nature and thrives in heated water bodies at temperatures ranging from 95–106°F or higher. In compliance with the TDPES permit (included in Attachment B), CPNPP's discharge area could have temperatures above 95°F (Attachment B). However, as explained in Section 3.10.1, the submerged discharge is pumped to a deep arm of the SCR and the discharge outlet terminates at 35–40 feet in lake depth, promoting high-velocity mixing. In-water barriers restrict approach by the public to the discharge point by more than 1,800 feet. Should SCR experience an increase in ambient water temperature from climate change, the lower depths of the lake would remain cooler than surface temperatures and high-velocity mixing would continue to rapidly incorporate the heated discharge bringing the temperature back to ambient conditions.

The risk of contracting primary amebic meningoencephalitis, the infection from *N. fowleri,* is very low. There have been 37 cases of primary amebic meningoencephalitis in Texas through 2020 (CDC 2020). The risk of infection is higher in shallow, still waters. SCR is a deep lake and CPNPP's cooling water system pumps and wind provide water movement, so the water is not still. Further, the route of infection is through the nasal passages which requires immersion and as stated in Section 3.10.1, SCR recreational activities do not include swimming. CPNPP's deep, high velocity thermal discharge would not enhance the concentration of *N. fowleri* and lake conditions along with restricting access to the discharge area and not allowing swimming would further reduce the risk of *N. fowleri* infection. These conditions would also reduce the risk of infection from other human pathogens mentioned in Section 3.10.1. Therefore, the microbiological hazard to the public from CPNPP's thermal discharge during the LR term would be SMALL.

Vistra OpCo consulted the Texas Department of State Health Services, the state agency responsible for environmental health, regarding the potential existence and concentration of the above microorganisms in the receiving waters for plant cooling water discharge. The Texas Department of State Health Services' initial response indicated that there are no known reports of outbreaks in the human population of reportable disease caused by thermophilic organisms in the recent past related to CPNPP that would prompt investigation by the Department. A second response agrees that continued operations would not have an impact with regard to public

health risk from the thermal discharge. Correspondence with the Texas Department of State Health Services regarding the CPNPP thermal discharge is included in Attachment E.

4.9.2 Electric Shock Hazards

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Electrical shock potential is of small significance for transmission lines that are operated in adherence with the National Electrical Safety Code (NESC). Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential.

Requirement [10 CFR 51.53(c)(3)(ii)(H)]

If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided.

Background [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 mA. With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received OLs with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines, within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically.

Analysis

As discussed in Section 3.10.2, the in-scope transmission lines (Figure 2.2-2) span between the switchyards and the power block and are wholly within the OCA. Thus, any risk to the public is minimized due to restricted site access. Section 3.10.2 also discusses the evaluation of the in-scope transmission lines for compliance with the NESC and processes to maintain compliance. The lines were evaluated in 2008 as part of the CPNPP uprate project for their compliance with 2007 NESC clearance standards. The study found that the lines were in compliance with NESC standards with exception of the clearance over one light pole which was subsequently

corrected. The 2017 NESC, the current code, does not require modification of existing installation that comply with previous versions of the code. Therefore, the in-scope transmission lines comply with current NESC clearance standards. Vistra OpCo also has procedures in place to review and control proposed structural changes to maintain compliance with the NESC clearance standards. Finally, procedures govern the use of equipment near transmission lines to maintain adequate distance to prevent electrical shock. Given that the GEIS determined that the electrical shock potential is of small significance for transmission lines that are operated in adherence with the NESC, the electric shock hazards from the CPNPP in-scope transmission lines are SMALL.

4.10 Environmental Justice

The NRC identified only one issue for environmental justice. This is a Category 2 issue and is discussed below, providing background and the analysis identified as pertaining to the proposed LR operating term.

4.10.1 Minority and Low-Income Populations

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See NRC Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040).

Requirement [10 CFR 51.53(c)(3)(ii)(N)]

Applicants shall provide information on the general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant that could be affected by the renewal of the plant's OL, including any planned refurbishment activities, and ongoing and future plant operations.

Background [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from operating a nuclear power plant.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power

plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

<u>Analysis</u>

Refurbishment Activities

As presented in Section 2.3, no LR-related refurbishment activities have been identified. Therefore, there would be no license-renewal-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

Operational Activities

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Vistra OpCo's analyses of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of CPNPP during the LR operating term would either be SMALL or non-adverse. Therefore, high, or adverse impacts to the general human population would not occur.

As described in Section 3.10, CPNPP maintains a REMP. With this program, Vistra OpCo monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding CPNPP. The results of the program indicate CPNPP has created no adverse environmental effects or health hazards. Therefore, no environmental pathways have been adversely impacted and are not anticipated to be impacted during the CPNPP LR term.

Section 3.11.2 identifies the locations of minority and low-income populations as defined by NRR Office Instruction LIC-203 (NRC 2020c). Section 3.11.3 describes the search for subsistence populations near CPNPP, of which none were found. The figures accompanying Section 3.11.2 show the locations of minority and low-income populations within a 50-mile radius of CPNPP. None of those locations, when considered in the context of impact pathways described in this chapter, are expected to be disproportionately impacted.

Therefore, no disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations, are anticipated as a result of LR.

4.11 Waste Management

Impacts to waste management are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to waste management. Therefore, Vistra OpCo incorporates the findings of NRC Finding from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.12 Cumulative Impacts

Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

Cumulative impacts of continued operations and refurbishment associated with license renewal must be considered on a plant-specific basis. Impacts would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource.

Requirement [10 CFR 51.53(c)(3)(ii)(O)]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect.

Background [GEIS Section 4.13]

Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative impacts analysis takes into account all actions, however minor since impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region to cumulative impacts are regulated and monitored through a permitting process (e.g., National Pollutant Discharge Elimination System (NPDES)) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

Analysis

Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of CPNPP during the proposed LR operating term with past, present, and reasonably foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such actions.

Vistra OpCo considered potential cumulative impacts during the proposed LR operating term in its environmental analysis associated with the resources discussed in the following sections. For the purposes of this analysis, past actions are those related to the resources at the time of plant licensing and construction; present actions are those related to the resources at the time of current operation of the power plant; and future actions are those that are reasonably foreseeable through the end of plant operation, which would include the proposed 20-year license renewal term. These criteria are in line with Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). The geographic area over which past, present, and future actions would occur is dependent on the type of action considered and is described below for each impact area.

The impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions regardless of which agency (federal or non-federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR Part 1508.7 and include individually minor, but collectively significant, actions taking place over a specified period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

As discussed in Section 2.3, no LR-related refurbishment activities have been identified. As indicated in Section 3.1.4, no major changes to CPNPP Units 1 and 2 operations or plans for future expansion of plant infrastructure during the LR term are anticipated. The effects of past actions are already reflected in the description of the affected environment in Chapter 3. CPNPP has determined that the current onsite ISFSI pad has enough space for canister storage to operate through the current licensing term, but insufficient space to operate through the proposed LR operating term. However, planning the expansion of the CPNPP ISFSI for the proposed LR operating term is not reasonably foreseeable, because ISFSI expansion plans would depend on the status of the DOE's future performance of its obligation to accept SNF or the availability of other interim storage options. If future planning includes the expansion of CPNPP ISFSI storage capabilities onsite during the proposed LR operating term, there is more than sufficient room to expand the ISFSI in the area adjacent to the existing pad. This would cause no significant environmental impact.

Section 3.1.4 describes other (non-CPNPP) projects in the vicinity of CPNPP. The TxDOT continues road maintenance and construction projects, and the SCWD has been adding new waterlines to the county distribution network. More water lines are anticipated to be installed in the future, but currently a schedule has not been established.

4.12.1 Land Use and Visual Resources

CPNPP operations have a SMALL impact on the land use (NRC 2013b). The land use impact of CPNPP is characterized as SMALL in Section 4.1. As described in Section 3.1.4, there are

currently no planned projects for the CPNPP site, therefore nothing is expected to require a change in land use. As described in Section 3.1.1 and illustrated in Figure 3.1-1, the CPNPP vicinity falls within rural portions of both Hood and Somervell counties and its boundary encloses SCR. As discussed in Section 3.2.1, there are no zoning or land development regulations in place for unincorporated areas containing CPNPP.

Land use changes are anticipated for the TxDOT's ongoing road maintenance and construction projects. Because of the relatively small amount of land change due to road widening as compared to the rest of the land use in the county, the land use impacts due to this project are not expected to contribute significantly to cumulative land use impacts. Therefore, the cumulative land use impact of CPNPP and other reasonably foreseeable projects in the region would be SMALL.

As stated in Section 3.2.3, the surrounding hilly terrain provides some screening of predominate visual features of the site, these features are visible in some areas. However, the continued use of existing structures associated with CPNPP would not alter their visual impact. The visual characteristics of other reasonably foreseeable projects in the region are surface and subsurface projects that will not contribute to cumulative visual impacts. Because the visual impacts due to CPNPP are SMALL, not expected to change or to contribute to other projects, the cumulative visual impacts are expected to be SMALL.

4.12.2 Air Quality and Noise

4.12.2.1 Air Quality

Section 3.3.3 discusses regional air quality and CPNPP air emission sources. Nine of the 19 counties within the region, including Somervell County, are in attainment. Ten counties make up the non-attainment area for 8-hour ozone (2008 standard). Nine of those counties make up the non-attainment areas for 8-hour ozone (2015 standard). Also as presented in Section 3.3.3, there is no mandatory Class I federal areas within 100 miles of CPNPP.

CPNPP air pollutant emissions are minimal and stem from intermittent use, maintenance, and testing of stationary diesel generators, fire pumps, and an auxiliary boiler. For air emission details at CPNPP, see Section 3.3.3.2. The planned projects listed in Section 3.1.4 could result in localized temporary air emissions from construction and demolition equipment. Implementing fugitive dust BMPs and maintaining portable equipment in proper working order will minimize air emissions. Compliance with the existing air permit and any future permit would minimize impacts to air quality.

Section 3.2.2 describes the area surrounding CPNPP as rural and undeveloped. The state of Texas provides municipalities with the authority to implement and enforce zoning regulations. There are no laws giving county governments the same authority. The future land use changes for the area surrounding CPNPP are not reasonably foreseeable because there are no zone areas surrounding the site. Therefore, land adjacent to the site is expected to remain the same and is not expected to have air emission sources. The area will continue to experience air

emissions from vehicles on the adjacent roadways and boating on the SCR. Any air emissions from future projects would be subject to state air permitting and regulations. The cumulative air quality impact would be SMALL.

4.12.2.2 Climate Change

Climate change can impact air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels have been found to be particularly sensitive to climate change. Sunshine, high temperatures, and air stagnation are favorable meteorological conditions leading to higher levels of ozone. Although surface temperatures are expected to increase, ozone levels will not necessarily increase because ozone formation is also dependent on the relative amounts of precursors available. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQS. States, however, must continue to comply with the CAA and ensure air quality standards are met. (NRC 2015)

Meteorological conditions conducive to ozone formation occur when high-pressure systems dominate local weather patterns. Clear skies and stagnate air on warm sunny days allow for the highest concentrations of ozone (TCEQ 2021b). Because the fuel source for Units 1 and 2 do not produce carbon dioxide (CO_2) emissions or other GHG emissions, the continued operation of Units 1 and 2 would avoid millions of tons of GHGs from a fossil fuel-fired alternative such as the natural gas-fired combined-cycle (NGCC) alternative discussed in Chapter 7.

Given that climate change trends in air temperature and precipitation are increasing but continued operation would contribute only small emissions of GHGs from minor air emission sources, the cumulative impact on climate change from present and future actions would be SMALL. Moreover, continued operation of CPNPP avoids the emission of millions of tons of CO_2 from alternative fossil-fuel generation (Section 7.2.3.1.3), positively impacting the climate change factor of CO_2 concentrations.

4.12.2.3 Noise

CPNPP operations have a SMALL impact on the noise environment (NRC 2013a). The surrounding land use discussed above in Section 4.12.1 is rural and no development is reasonably foreseeable. Therefore, cumulative noise impacts from continued plant operations over the license renewal term would be SMALL.

4.12.3 Geology and Soils

Impacts to geology and soils could result from ground-disturbing activities and stormwater runoff. As noted in Section 2.3, CPNPP has no plans to conduct LR-related refurbishment or replacement activities. Section 3.1.4 discusses future projects that may include road widening and water pipeline production in the vicinity of CPNPP.

The NRC concluded that a site's impact on geology and soils would be SMALL (NRC 2013a). Although no ground-disturbing activities are reasonably foreseeable, any onsite ground-disturbing activities during the proposed LR operating term would be governed by a stormwater construction permit and/or the SWPPP. Given ground disturbances at the CPNPP site would be limited to the current site area, subject to construction and stormwater permitting and applicable BMPs, the cumulative land use impact would be SMALL.

4.12.4 Water Resources

4.12.4.1 Surface Water

Surface water use impacts for once-through cooling was generically determined by the NRC to be SMALL (NRC 2013a). Any modifications would be under a TPDES permit issued by the TCEQ, and water use impacts would be considered by TCEQ prior to issuance of the permit. There are no plant operations or modifications planned for the proposed LR operating term including any modifications that would alter current patterns at the intake and discharge structures.

As for surface water quality cumulative impacts, CPNPP complies (Chapter 9) with its TPDES permit discharge limits and the discharge rapidly mixes in the SCR. As discussed in Section 3.6.4.1, there are no impaired waters identified near CPNPP. Therefore, the cumulative impact to surface water quality would be SMALL. Given CPNPP compliance with its TPDES permit and compliance with stormwater permits and regulations, CPNPP would have only a small contribution to any surface water quality cumulative impact.

4.12.4.2 Groundwater

As presented in Section 3.6.4.2, the quality of groundwater at the site is unsuitable for irrigation due to local soil conditions and the sodium content of the water. As stated in Section 3.6.3.2, groundwater use from aquifers in the vicinity of CPNPP is not expected to increase significantly because the aquifers are variable in their hydraulic characteristics and quality. Potable water is supplied by the SCWD. There are four remaining water supply wells (one at the rifle range, one at the Somervell Training Center, and two at SCP). No groundwater is withdrawn from the site as part of plant operations.

It is not anticipated that groundwater withdrawal for operations will be required during the proposed LR operating term. As discussed above, land development in the CPNPP vicinity is not anticipated. CPNPP will continue to maintain and implement its site-specific spill prevention plans to prevent spills that would contaminate soils, groundwater, and surface water during the proposed LR operating term. Therefore, the cumulative impact to groundwater resources would be SMALL.

4.12.4.3 Climate Change

Climate change can affect the availability of water resources due to climatic changes such as changes in temperature and precipitation patterns (NRC 2013a). The availability of water is

expected to decline due to warmer temperatures, increased evaporation, and increased transpiration reducing average river flows (EPA 2016). However, CPNPP withdraws water exclusively from the SCR for operational purposes and uses a once-through cooling system, which reduces demand on water resources. A substantial amount of supplemental water from Lake Granbury and other sources is available under an existing agreement with the BRA (Section 3.6.3). As discussed above, CPNPP operations do not require significant surface water consumption or any groundwater withdrawals, and CPNPP operates in compliance with its permits for water withdrawals and discharges. Because CPNPP uses a once-through cooling system and complies with its permitted withdrawals, its contribution to the cumulative impacts on water availability would be SMALL.

Warmer water and higher air temperatures can reduce the efficiency of thermal power plant cooling technologies. In addition, discharge permit conditions may limit operations for some power plants as water temperatures rise (NRC 2013a). However, the primary function of SCR is to act as a cooling water reservoir for CPNPP (NRC 2008c). Although no changes are reasonably foreseeable, if any changes were to occur, CPNPP would continue to operate within permitted conditions.

Given that the continued operation would have a SMALL impact on water resources and its continued operation could avoid millions of tons of CO_2 from alternative fossil-fuel generation, the continued operation of CPNPP could be viewed as a net beneficial contribution to climate change impacts.

4.12.5 Ecological Resources

4.12.5.1 Terrestrial

The impacts on terrestrial species during the proposed LR term are described as SMALL in Section 4.6.5. The continued operation of CPNPP Units 1 and 2 is governed by regulations, CPNPP procedures, and plans. As discussed in Section 9.6, CPNPP has administrative controls in place to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Successful application of the regulations, procedures, plans, and administrative controls would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce disturbance of wildlife in adjacent habitats could greatly reduce the impacts of continued operations (NRC 2013a). Regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, dredging, and herbicide usage, further serve to minimize impacts to terrestrial resources. With continued application of these programs and procedures, the land-based impacts would largely be confined to CPNPP property and would have minimal opportunity to contribute to cumulative impacts.

As discussed in Sections 3.7.8.1, 3.7.8.2, and 4.6.6, habitat for federally and state-listed terrestrial species does occur on the CPNPP site. However, adherence to regulatory and permit requirements to avoid take of protected species and CPNPP administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to these species. Vistra OpCo is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support license renewal likely would be limited to previously disturbed areas of the CPNPP site. There is no contribution to cumulative impacts on protected species from CPNPP. Overall, the cumulative impacts to terrestrial ecological resources are anticipated to be SMALL.

4.12.5.2 Aquatic

Aquatic ecological communities at CPNPP could be impacted through impingement and entrainment and thermal discharges to the surface waters and wetlands. As discussed in Section 4.6.1, aquatic resource impacts due to impingement and entrainment during the proposed LR operating term were concluded to be SMALL. Ongoing studies ensure that CPNPP continues to use the BTA to minimize entrainment and impingement and comply with the TPDES permit. As discussed in Section 4.6.2, aquatic resource impacts due to thermal discharge during the proposed LR term were concluded to be SMALL. Because the SCR is a man-made reservoir created specifically for the purpose of being used as a cooling water source for CPNPP, continually stocked with sport fish, and designated as a CCRS, the thermal discharge likely has little long-term impact on the aquatic community of SCR.

Because the SCR is a man-made reservoir and complies with the TPDES permit, it is not expected to contribute to cumulative aquatic ecological impacts in the region.

4.12.5.3 Climate Change

According to the EPA, climate change could impact terrestrial species in the vicinity due to drier conditions and desertification causing changes in habitat (EPA 2016). As discussed in Section 9.6, Vistra OpCo has administrative controls in place at CPNPP to ensure that operational changes or construction activities are reviewed, and any impacts minimized, through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Adherence to regulatory and permit requirements to avoid take of protected species and CPNPP administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to terrestrial species. Therefore, the cumulative impacts of climate change and CPNPP activities on terrestrial species would be SMALL.

According to the EPA, as average temperatures increase evaporation, average rainfall is likely to decrease during winter, spring, and summer. The increased evaporation and decreased rainfall are both likely to reduce the average flows of rivers and streams (EPA 2016). As presented in Section 4.12.4, the SCR is a man-made reservoir with limited ecological value and is in compliance with the TPDES permit. Any impacts to aquatic species in the SCR are not expected to contribute to cumulative aquatic ecological impacts for the region. The continued operation of CPNPP would be a small contributor to climate change effects that impact

vulnerable aquatic species due to rising temperatures. Therefore, cumulative impacts to aquatic ecological communities from CPNPP and climate change are anticipated to be SMALL during the proposed LR operating term.

4.12.6 Historic and Cultural Resources

As presented in Section 2.3, no refurbishment activities or other construction activities are currently planned to support LR operations. Therefore, the LR consists of an administrative action relative to historic and cultural resources. Although construction of the existing CPNPP facility itself would have impacted any archaeological resources that may have been located within its footprint, much of the surrounding area remains largely undisturbed. As stated in Section 4.7, Vistra OpCo has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. The section also states that there will be no adverse effects on historic and cultural resources as a result of continued operations of CPNPP during the proposed LR operating term. Therefore, no cumulative adverse effects are anticipated to cultural resources on the site during the proposed LR operating term or due to reasonably foreseeable future projects.

4.12.7 Socioeconomics

As discussed in Section 2.5, the proposed LR does not include plans to add permanent workers, so the SMALL adverse impacts that are the result of workers' impact on community services, education, and infrastructure including transportation would not change. Tax payments from the operating plant (Section 3.9.5) are anticipated to continue through the proposed LR operating term and the economic contributions of the plant's workers, thus the beneficial socioeconomic impacts would also continue. Thus, significant beneficial socioeconomic impacts would also continue during the proposed LR operating term.

4.12.8 Human Health

Radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impacts of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR Part 20 and 40 CFR Part 190. For this analysis, the region of influence is the surrounding 50-mile region.

No other nuclear facilities were presented in Section 3.1.1 as being within 50-miles of the site. As presented in Section 3.10.3, CPNPP prepares annual radiological environmental operating reports and annual radiological effluent reports. The report for 2019 indicate that doses to members of the public comply with NRC and EPA radiation protection standards and are not increasing. The 3-year (2016–2018) average annual occupational dose [(TEDE)] was 0.089 rem. The annual TEDE limit is 5 rems [10 CFR 20.1201(a)(1)].

The cumulative impact of CPNPP's Units 1 and 2 operation and any other radiation sources would be expected to be SMALL because all routine releases and occupational exposure would

be subject to federal regulations. Therefore, operating CPNPP for an additional 20-year period would not cause an increase in annual radioactive effluent releases.

Nonradiological human health impacts occur with temperatures optimal to grow thermophilic organisms such as those listed in Section 3.10.1. As mentioned in Sections 3.10.1 and 4.9.1 these temperatures occur near a submerged outlet into a deep arm of the SCR. However, public access to the outlet is restricted and swimming is not allowed in the reservoir. Section 4.9.1 concluded that public risk is SMALL. There are no other thermal discharges in SCR. Therefore, the CPNPP's thermal discharge would not contribute to any other thermal discharges since there would be no overlap. Therefore, the cumulative nonradiological health impact is SMALL.

Compliance with NESC and CPNPP procedures minimize occupational risk from electrical shock hazards (Section 4.9.2). As described in Section 2.2.5.5, CPNPP maintains as comprehensive occupational safety program. Therefore, cumulative impacts to human health from nonradiological hazards are not expected. The cumulative impacts on human health are expected to be SMALL.

4.12.9 Waste Management

As presented in Section 2.2.6, the comprehensive regulatory controls in place for management of radiological waste and CPNPP's compliance with these regulations and use of only licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed LR operating term. The NRC oversees the licensing of radiological waste treatment and disposal facilities. There are four facilities providing low-level radioactive waste disposal services in the United States (NRC 2020d).

As presented in Section 3.10.3, CPNPP's annual reports indicate that radiological doses to members of the public were negligible and in accordance with NRC and EPA radiation protection standards. There are no other operating nuclear power plants, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of CPNPP (NRC 2021b).

As presented in Sections 2.2.6 and 2.2.7, CPNPP has programs in place to manage its hazardous and nonhazardous waste streams. Continuation of existing systems and procedures to ensure proper storage and disposal during the proposed LR operating term would allow the impacts to be SMALL. The other facilities within the 50-mile region of CPNPP are also required to comply with appropriate EPA and state requirements for the management of radioactive and nonradioactive wastes. Thus, the cumulative waste management impact would be SMALL.

4.13 Impacts Common to all Alternatives: Uranium Fuel Cycle

Impacts to the uranium fuel cycle are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to uranium fuel

cycle. Therefore, Vistra OpCo incorporates the findings of NRC Finding from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.14 Termination of Nuclear Power Plant Operations and Decommissioning

Impacts to the termination of nuclear power plant operations and decommissioning are evaluated in the GEIS and are considered to be generic (the same or similar at all plants), or Category 1. Vistra OpCo conducted a new and significant information review and identified no new and significant information related to termination of nuclear power plant operations and decommissioning. Therefore, Vistra OpCo incorporates the NRC findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

4.15 Postulated Accidents

4.15.1 Category 1 Issue—Design-Basis Accidents

The following Category 1 issue related to postulated accidents was reviewed for new and significant information that could make the generic finding as described in the GEIS (NRC 2013e) not applicable to CPNPP: Issue 65—Design-Basis Accidents.

Section 5.3 of the 1996 GEIS discusses the impacts of potential accident, their consequences, and addresses the general characteristics of design-basis accidents (DBAs), including characteristics of fission products, meteorological considerations, possible exposure pathways, potential adverse health effects, avoiding adverse health effects, accident experience and observed impacts, and emergency preparedness. In the 2013 LR GEIS (NRC 2013e), the NRC found that the environmental impacts of DBAs are of SMALL significance for all nuclear plants. This conclusion was reached because the plants were designed to successfully withstand these accidents, and a licensee is required to maintain the plant within acceptable design and performance criteria, including during any LR term. It is also stated that the environmental impacts during a LR term should not differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Impacts from DBAs would not be affected by changes in plant environment because such impacts (1) are based on calculated radioactive releases that are not expected to change; (2) are not affected by plant environment because they are evaluated for the hypothetical maximally exposed individual; and (3) have been previously determined acceptable.

The GEIS also observes that additional experience has contributed to improved plant performance as measured by trends in plant-specific performance indicators, a reduction in operating events, and lessons learned that improve the safety of all the operating nuclear power plants. This is also confirmed by analysis which indicates that, in many instances, improved plant performance and design features have resulted in reductions in initiating event frequency, core damage frequency (CDF), and containment failure frequency.

To receive NRC approval to operate a nuclear power plant, an applicant for an initial OL must submit a safety analysis report (SAR) as part of its application. The SAR presents the design

criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that prevent and mitigate accidents. The NRC staff (the staff) reviews the application to determine if the plant design meets the NRC's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the staff evaluate to ensure that the plant can withstand normal and abnormal transients and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public. Many of these postulated accidents are not expected to occur during the life of the plant but are evaluated to establish the design basis for the preventive and mitigative safety systems of the nuclear power plant. 10 CFR Part 50 and 10 CFR Part 100 describe the acceptance criteria for DBAs.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the nuclear power plant to withstand these accidents is demonstrated to be acceptable before issuance of the OL. The results of these evaluations are found in license documentation such as the applicant's FSAR - the staff's safety evaluation report, and the final environmental statement (FES). A licensee is required to maintain the acceptable design and performance criteria throughout the life of the nuclear power plant, including any period of extended operation. The consequences for these events are evaluated for the hypothetical maximum exposed individual. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for LR, the environmental impacts, as calculated for DBAs, should not differ significantly from initial licensing assessments over the life of the nuclear power plant, including the LR period. Accordingly, the design of the nuclear power plant, relative to DBAs during the extended period, is considered to remain acceptable; therefore, the environmental impacts of those accidents were not examined further in the GEIS.

<u>Conclusions for Design Basis Accident Consequences</u>

The environmental impacts of DBAs are of small significance for all nuclear power plants because the plants were designed to withstand these accidents. Due to the requirements for nuclear plants to maintain their licensing basis and implement aging management programs during the LR term, the environmental impacts during a LR term are not expected to differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Therefore, for the purposes of LR, DBAs are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs makes them a part of the CLB of the plant; the CLB of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under LR. The NRC, through its CLB oversight, has not determined that the plant's design basis is unacceptable.

Vistra OpCo reviewed the NRC findings on this issue and identified no new and significant information. Therefore, Vistra OpCo adopts and incorporates by reference the findings in the GEIS and Table B-1 for this issue.

4.15.2 Category 2 Issue—Severe Accidents

CPNPP submitted an application for an OL which was approved in 1990 for Unit 1 (NRC 1990b) and in 1993 for Unit 2 (NRC 1993). A severe accident mitigation design alternatives (SAMDAs) evaluation was performed to support the Nuclear Regulatory Commission's (NRC's) review of the initial licensing application (TU 1989).

NUREG-0775, "Final Environmental Statement related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2" (NRC 1989), documents the NRC's evaluation of the alternative of facility operation with the installation of severe-accident-mitigation design features. The NRC did not discover any substantial changes in the proposed action as previously evaluated in the FES (NRC 1989) that are relevant to environmental concerns nor significant new circumstances or information relevant to environmental concerns and bearing on the licensing of CPNPP Units 1 and 2.

A set of SAMDAs was developed for CPNPP to address the accident sequences or sequence groups identified in the FES as well as risk contributors identified in more recent studies which could be applicable to CPNPP. This was done on a generic basis since a plant-specific probabilistic risk assessment (PRA) for CPNPP was not available at the time of the NRC review. In assessing the risk reduction potential, each SAMDA was conservatively assumed to avert all the residual risk estimated in NUREG-0775. This risk reduction was compared to the estimated costs associated with each SAMDA based on $1,000 per averted person-rem. None of the nine SAMDAs were found to be cost effective. This conclusion was due in large part to the low population around the CPNPP site and low residual risk. In light of these insights, the NRC concluded that there was no basis to require modifications to the plant for the purpose of further mitigating environmental concerns.

In summary, the NRC did not find any new information that would call into question the FES conclusion that "the risks of acute fatality from potential accidents at the site are small in comparison with the risks of acute fatality from other human activities in a comparably sized population" and that "there are no special or unique features about the CPNPP site and environs that would warrant special or additional engineered safety features for CPNPP." (NRC 1989)

In the longer term, severe accident issues were being pursued by the NRC in a systematic way for all utilities through the Severe Accident Program (SAP) described in SECY-88-147 (NRC 1988), "Integration Plan for Closure of Severe Accident Issues." The plan included provisions for an Individual Plant Examination (IPE) (TU 1992) for each operating reactor, a Containment Performance Improvement (CPI) Program, and an Accident Management (AM) Program. These programs were intended to produce a more complete picture of the risk profiles of operating plants and the benefits of potential design improvements, including SAMDAs. The NRC stated that the SAP is the proper vehicle for addressing severe accident issues at nuclear power plants, including CPNPP.

Since that time, additional rulemaking, much of it in support of extended OLs, was promulgated. In accordance with 10 CFR 51.53(c)(3)(ii)(L) and Table B-1 of Appendix B to 10 CFR Part 51, Subpart A, LR ERs must provide a consideration of alternatives to mitigate severe accidents if the NRC staff has not previously considered such alternatives for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an EA. Some plants (e.g., Limerick Generating Station) performed analyses of SAMDAs as components of initial plant licensing environmental reviews. Hence, the NRC considered such analyses in the EISs regarding initial plant licenses for those plants.

A LR applicant for a plant that has already had a severe accident mitigation alternatives (SAMA) analysis considered by the NRC as part of an EIS, supplement to an EIS, or EA, does not need to provide another SAMA analysis in the LR ER. In the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (61 FR 28467), the 1996 Part 51 Final Rule determined that the original Comanche Peak SAMDA analysis was a SAMA analysis for purposes of this Part 51 rule. More specifically, the Commission's statement of considerations for the 1996 Part 51 rulemaking point to the original SAMDA analysis and states as follows: "NRC staff considerations of severe accident mitigation alternatives have already been completed and included in an EIS or supplemental EIS for Limerick, Comanche Peak, and Watts Bar. Therefore, severe accident mitigation alternatives need not be reconsidered for these plants for license renewal."

In forming its basis for determining which plants needed to submit SAMA analyses at LR, the Commission noted that all licensees had undergone, or were in the process of undergoing, more detailed site-specific severe accident mitigation analyses through processes separate from LR, specifically the CPI, IPE, and Individual Plant Examination of External Events (IPEEE) programs. Considering these studies, the Commission stated that it did not expect future SAMA analyses to uncover "major plant design changes or modifications that will prove to be cost-beneficial." As stated in Appendix E of NUREG-1437, Revision 1 on Page E-45 (NRC 2013e), the NRC's experience in completed LR proceedings has confirmed this prediction. Nevertheless, the applicant's ER must contain any new and significant information of which the applicant is aware [10 CFR 51.53(c)(3)(iv)].

NEI 17-04, Revision 1 (NEI 2019b) provides a model approach for assessing the significance of new information of which the applicant for renewal of a nuclear power reactor OL is aware that relates to either (1) the SAMDA analysis or SAMA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 50 (or Part 54) of the reactor's initial (or renewed) OL or (2) the SAMDA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 52 of the reactor's combined license and the design certification incorporated therein by reference, if any.

The analyses below follow the model approach in NEI 17-04, Revision 1 (NEI 2019b), for determination of whether there is new and significant information regarding the SAMA analyses. The NRC staff has reviewed the NEI 17-04, Revision 1, document and found it to be acceptable

for use by the licensees that have communicated their intent to apply for subsequent license renewal (SLR) after December 31, 2019. For the CPNPP LR, the consideration of new and significant changes since the time of the initial licensing is consistent with the GEIS (NRC 2013e) Supplement 49 (NRC 2014). Section 5.3.9 of GEIS Supplement 49 states the following:

> *New information is significant if it provides a seriously different picture of the impacts of the federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring.*

The implication of this statement is that "significance" is not solely related to whether or not a SAMA is cost beneficial, but it also depends on a SAMA's potential to significantly reduce risk to the public (NEI 2019b).

The following Category 2 issue (requirement) related to severe accidents has been defined by the NRC in 10 CFR 51.53(c)(3)(ii)(L):

> *If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.*

The NRC finding regarding severe accidents is stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, as follows:

> *The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.*

The NRC has ruled that when a plant qualifies for the exception from the requirement to consider SAMAs in 10 CFR 51.53(c)(3)(ii)(L), the exception operates to designate this Category 2 issue as the "functional equivalent" of a Category 1 issue (NRC 2013f). Accordingly, Vistra OpCo reviewed this issue for new and significant information that would cause the following generic conclusions in the GEIS (NRC 2013e) concerning this issue to be inapplicable to CPNPP.

1. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants.
2. LR ERs for plants for which SAMAs have been previously considered need not consider SAMAs.

The assessment process for new and significant information related to the first generic conclusion (i.e., the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants) of the GEIS included: (1) interviews with subject matter experts on the validity of the conclusions of the 2013 GEIS as they relate to CPNPP; and (2) review of documents related to predicted impacts of severe accidents at CPNPP. Consideration was given to developments in plant operation and accident analysis that could have changed the assumptions made concerning severe accident consequences after SAMDAs were previously evaluated by the NRC for CPNPP during the initial licensing application (TU 1989).

Developments in the following areas included:

- New internal events information
- External events
- New source term information
- Power uprates
- Higher fuel burnup
- Other considerations, including population increase and risk-beneficial plant changes implemented in response to recommendations from the Fukushima Dai-Ichi Near Term Task Force.

<u>New Internal Events</u>

In the 2013 GEIS, the NRC reviewed the boiling water reactor (BWR) and pressurized water reactor (PWR) accident frequencies (CDF) for internal events that formed the basis for the environmental impacts shown in the 1996 GEIS, finding them in most cases to be comparable to or higher than updated accident frequencies.

In the 2013 GEIS, the NRC notes that changes in the likelihood of accidents that release substantial amounts of radioactive material to the environment affect the probability-weighted offsite consequences from airborne, surface water, and groundwater pathways, as well as the resulting economic impacts from such pathways. Considering the decreasing trend observed in the likelihood of severe accidents caused by internal events since 1996 and the conservative dose values used in the 1996 GEIS, the 2013 GEIS concludes that the 1996 GEIS estimates of offsite consequences from severe accidents initiated by internal events remain valid.

Since the CPNPP licensing application and SAMDA evaluation (TU 1989), there have been many improvements to the plant's risk profile. CPNPP did not use a PRA model quantification to evaluate its noted SAMDAs in the original operation license but has subsequently performed evaluations of external events in its IPEEE (TU 1995). The current CPNPP PRA has an updated internal events model as well as an updated internal fire study and internal flooding study; other external events have not been explicitly incorporated into the CPNPP PRA model of record. The Revision 3 CPNPP PRA had an internal events CDF of approximately 9.30E-6/year. The

Revision 3 PRA internal events including internal flooding CDF is 9.37E-6/year. The noted CPNPP IPE CDF was 5.72E-5/year and was based on Unit 1 and determined to be applicable to both Unit 1 and Unit 2. The current model of record (Revision 5) PRA has a CDF of approximately 1.1E-6/year for each unit. The current internal events including internal flooding CDF is 1.22E-6 and 1.25E-6 per year for Unit 1 and Unit 2, respectively. The current internal events including internal flooding LERF is 1.11E-7 and 1.12E-7 per year for Unit 1 and Unit 2, respectively. These PRA model refinements represent an approximately 98 percent reduction in CDF from the IPEEE CDF (about a factor of 46) and an approximately 88 percent reduction in CDF from the Revision 3 CDF (about a factor of 7) for each unit for the internal events (i.e., excluding internal flooding) PRA. Therefore, Vistra OpCo concludes that no new and significant information exists for CPNPP concerning offsite consequences from severe accidents initiated by internal events. Accordingly, the conclusions of the 2013 GEIS on this topic are considered appropriate for the CPNPP renewal.

Revision 4 of the CPNPP PRA was peer reviewed in March 2011 following the Nuclear Energy Institute process. The Facts and Observations generated by this peer review were addressed in 2015 and 2016 and subsequently reviewed in November 2019 as having closed all peer review findings. Revision 5 of the CPNPP PRA maintains those resolutions.

External Events

In the 2013 GEIS, the NRC reviewed accident frequencies (CDFs) for external events reported in NUREG-1150 and NUREG/CR-5305, finding them to be generally one or more orders of magnitude lower than the CDFs that formed the basis of the 1996 GEIS. The primary focus of the assessment was on seismic and fire events, which the NRC had determined would contribute most to plant risk from external events. In the 2013 GEIS, internal fire events were considered external events. Therefore, "internal fire" is categorized as an "external" event in this document for consistency with the 2013 GEIS usage. Based on a comparison of the risks from internal events to risks from seismic and fire events, the 2013 GEIS concluded that it would be reasonable to assume that contributions to plant risk from fire events and seismic events are each comparable to the contribution from internal events, although a preliminary assessment from Generic Issue 199 indicated that, on average, updated seismic CDFs remained slightly (approximately 30 percent) less than the internal events CDF.

As for seismic risk, CPNPP is located in an area with low seismic activity. According to the CPNPP individual plant examination of external events, the CPNPP-specific seismic screening program was approved by the NRC based on a walkdown of structures, systems, and components rather than having a full seismic margin assessment calculation (TU 1995). In its response to post-Fukushima Near Term Task Force recommendation 2.1, CPNPP re-evaluated its seismic risk by comparing its updated plant-specific Ground Motion Response Spectrum (GMRS) developed by the Electric Power Research Institute against the 1.3 times the site's safe shutdown earthquake (SSE) level, and concluded that the updated GMRS was lower than the site's safe shutdown earthquake at a range of 1 Hz to 100Hz, indicating that the seismic hazard at CPNPP is low and bounded by the design basis value of 0.10g peak ground acceleration.

NRC staff confirmed that the GMRS developed by the NRC staff are bounded by the CPNPP SSE over the same range. Therefore, a seismic risk evaluation, spent fuel pool evaluation, and a high frequency confirmation were not merited for CPNPP (NRC 2016).

A high winds PRA has not been developed for CPNPP. Section 5.1.4 and Table 5.1.6 of the IPEEE (TU 1995) indicates that the overall CDF for tornados at CPNPP is estimated at approximately 3.7E-06. Station Blackout (SBO) is the principal contributor to the overall CDF for tornados. The dominant contributor to the SBO sequences is the random failure of both diesel generators following the tornado strike. Based on the qualitative evaluation documented on Table 2-1 of Appendix A, no potential cost-effective SAMAs were identified for high winds and tornados at CPNPP. Therefore, a quantitative high wind evaluation is not merited for CPNPP.

Because the CPNPP internal fire PRA model has been developed since the time of the SAMDA, it is considered new information and is used in the quantitative PRA calculation to evaluate SAMAs for the potential for significance.

Vistra OpCo concludes that no new and significant information exists for CPNPP concerning offsite consequences of severe accidents caused by external events. As such, the conclusions of the 2013 GEIS on this topic are considered appropriate for the CPNPP LR.

New Source Term Information

Based on a comparison of NRC studies from 1982 (NUREG-0773 (NRC 1982) and 1997 NUREG/CR-6295 (NRC 1997a), which included data for CPNPP, the 2013 GEIS concluded that the 1997 source term information indicated that the timing from dominant severe accident sequences is comparable to the analysis forming the basis of the 1996 GEIS. Generally, the release frequencies and release fractions estimated in the 1997 study were significantly lower than previously estimated. Thus, the environmental impacts used as the basis for the 1996 GEIS (i.e., the frequency-weighted consequences) were higher than impacts that would be estimated using the 1997 source term information. Therefore, the updated estimates of offsite consequences remained within the bounds of the 1996 GEIS evaluation.

For the new and significant evaluation, SAMAs were grouped if similar, and all were evaluated for the impact they would have on the CPNPP Source Term Category (STC) frequencies if they were implemented. No SAMAs were found to reduce at least one STC frequency by at least 50 percent.

Vistra OpCo reviewed and determined that the previously evaluated source terms (TU 2015) used to assess offsite radiological consequences of severe accidents are bounded by the conclusions of the 2013 GEIS and are considered appropriate for CPNPP license renewal.

Power Uprates

The NRC approved an approximate 4.8 percent SPU for CPNPP on June 27, 2008, from reactor core power of 3,458 MWt to 3,612 MWt (TU 2007). The increase was supported by plant

modifications to replace high-pressure turbines as well as setpoint changes for the reactor trip system and the engineered safety features actuation system.

The analysis input to the PRA model was updated with a small change to model results that is included in the current CDF and LERF values. The Unit 1 LERF changed from 4.87E-07 to 4.91E-07 and Unit 2 LERF changed from 6.11E-07 to 6.32E-07. Based on this evaluation, it is concluded that the risk increases due to the impacts of the power uprate conditions for internal events, external events, and shutdown operations are very small and within the acceptance criteria of Regulatory Guide 1.174 (TU 2007).

Since the PRA was previously updated, the effects of the power uprate are also included in the quantitative SAMA evaluations for the CPNPP license renewal.

Higher Fuel Burnup

The 2013 GEIS evaluates updated information from NUREG/CR-6703 (NRC 2001) to account for the effect of future increased fuel burnup on consequences of postulated accidents as predicted in the 1996 GEIS. The future peak burnup considered in the 2013 GEIS was 62 gigawatt-days per metric ton of uranium (GWd/MTU) for PWRs. Average peak rod fuel burn-up limit for each CPNPP unit during the terms of the extended licenses will not exceed 62,000 MWd/MTU.

Taken in combination with the other information presented in the 2013 GEIS, the NRC concluded that increased peak fuel burnup from 42 to 75 GWd/MTU for PWRs would have effects on risk and environmental impacts of severe accidents that are bounded by the 1996 GEIS. Because CPNPP peak fuel burnup is within the range considered by the NRC in the 2013 GEIS for PWRs, Vistra OpCo concludes that no new and significant information exists for CPNPP concerning the effect of peak fuel burnup on risk and environmental impacts of severe accidents. Accordingly, the conclusions of the 2013 GEIS on this topic are considered appropriate for the CPNPP renewal.

Low Power and Shutdown Events

As discussed in SECY 97-168, existing regulatory controls for shutdown operations have evolved through a series of industry actions which have been successful in achieving an acceptable level of safety of low power and shutdown operation. (NRC 1997b). Therefore, the offsite consequences of severe accidents, considering low power and shutdown events, would not exceed the impacts predicted in either the 1996 or 2013 GEIS. At CPNPP, low power and shutdown events are in line with the conclusions in the GEIS. Vistra OpCo concludes that no new and significant information exists for CPNPP concerning lower power and shutdown events.

Spent Fuel Pool Accidents

Consistent with NUREG-1738, the impacts of accidents in spent fuel pools (SFPs) at CPNPP is comparable to or lower than those from reactor accidents and are bounded by the 1996 GEIS.

There are no spent fuel configurations that would distinguish CPNPP from the evaluated plants such that the assumptions in the 1996 and 2013 GEIS would not apply. The 2013 GEIS (NRC 2013e) indicates that analyses performed and mitigative measures employed since 2001 have further lowered the risk of accidents involving spent fuel pools. As a result of post-Fukushima Near-Term Task Force 2.1 recommendations, implementation of diverse and flexible coping strategies (FLEX), provides additional resources to maintain SFP water inventory and risk reduction. Therefore, Vistra OpCo concludes that there is no new and significant information related to SFP accidents at CPNPP.

BEIR VII Risk Coefficient

The risk coefficients from biological effects of ionizing radiation (BEIR) VII are applicable to the health effects from radiation exposures and cancers associated with them. As stated in SECY-05-0202, "the major conclusion is that current scientific evidence is consistent with the hypothesis that there is a linear, no-threshold dose response relationship between exposure to ionizing radiation and the development of cancer in humans. This conclusion is consistent with the system of radiological protection that the NRC uses to develop its regulations. Therefore, the NRC's regulations continue to be adequately protective of public health and safety and the environment." (NRC 2005). Additionally, the 2013 GEIS (NRC 2013e) confirms that using newer risk coefficients like BEIR VII is expected to have a small impact on the results presented in the 1996 GEIS. Because the CPNPP SAMA analysis does not find any SAMAs that reduced the risk metrics by at least 50 percent, no offsite doses are computed as part of a full Level 3 evaluation. Therefore, the BEIR VII risk coefficients have no impact on the CPNPP SAMA Stage 1 analysis, and there is no new and significant information.

Uncertainties

The 1996 GEIS used 95th percentile upper confidence bound estimates whenever available for its estimates of the environmental impacts of severe accidents, which applies conservatism to cover uncertainties. The 2013 GEIS (NRC 2013e) concludes that "the impact and magnitude of uncertainties, as estimated in the 1996 GEIS, bound the uncertainties introduced by the new information and considerations." The 2013 GEIS also concludes "the reduction in estimated environmental impacts from the use of new internal event and source term information outweighs any increases from the consideration of external events, power uprates, higher fuel burnup, low power and shutdown risk, and spent fuel pool risk." The assessments in the previous sections provide additional information and insights to areas of uncertainty. It is concluded that there is no new and significant information regarding uncertainties at CPNPP.

Another consideration for uncertainty is population growth. According to NEI 17-04, Revision 1, Section 2.1, population growth is considered new information, but not necessarily significant for the Stage 1 analysis. Detailed population information including population projection information is presented in Section 3.11.1 of this report. For the 50-mile radius from the plant, the 2020 permanent population was 5,910,067, and the projected 2053 permanent and transient population is 9,465,735. This is less than a factor of two change that overlaps the 40 to 60 years renewal period of interest.

As can be seen from the data in Tables 5.10 and 5.11 of the 1996 GEIS, the estimated risk of early and latent fatalities from individual postulated nuclear power plant accidents is SMALL using very conservative 95th-percentile, upper-confidence bound estimates for environmental impact. The early and latent fatalities represent only a small fraction of the risk to which the public is exposed from other sources. As provided in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," the CDF risk metric is used as a surrogate for the individual latent cancer fatality risk, and the LERF risk metric is used as a surrogate for the individual early fatality risk. Given the substantial reduction in the CPNPP CDF by a factor of 46 (5.72E-05/1.22E-06), as explained in the PRA internal events section above, and the currently small CPNPP LERF value of 1.11x10-7/year demonstrates that the risk of early and latent fatalities from individual postulated nuclear power plant accidents has decreased since the issuance of the 1996 GEIS (NRC 1996b). Furthermore, as discussed in Section E.3.3 of the 2013 GEIS, more recent estimates give significantly lower release frequencies and release fractions for the source term than was assumed in the 1996 GEIS. Specifically, the 2013 GEIS states that "a comparison of population dose from newer assessments illustrates a reduction in impact by a factor of 5 to 100 when compared to older assessments, and an additional factor of 2 to 4 due to the conservatism built into the 1996 GEIS values." The effect of this reduction in total dose impact far exceeds the effect of a population increase. It can be concluded that the overall effect of increased population around the plant during the CPNPP period of extended operation does not result in significant increases in impacts. Thus, it can be concluded that no new and significant information exists for CPNPP concerning population increases that would alter the conclusions reached in the 2013 GEIS.

The CPNPP SAMAs are evaluated against the 50 percent risk reduction maximum benefit (MB) calculation for new and significant determination in the Stage 1 analysis. Per Section 3.1 of NEI 17-04, "*if a plant is able to demonstrate that none of the SAMAs evaluated in the Stage 1 assessment are potentially significant, then the Stage 2 inputs, such as the projected population within a 50-mile radius of the plant, should be listed as "new information", but no work to estimate the actual 50-mile population is required*."

Therefore, the NRC conclusion in the 1996 and 2013 GEISs that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small" is considered appropriate for the CPNPP LR and is incorporated herein by reference.

Therefore, the effect of population growth is expected to be bounded by the assessment in the 1996 GEIS.

It is concluded that there is no new and significant information regarding population increases at CPNPP.

Conclusion of Severe Accident Consequences

No new and significant information was identified for the areas listed above. The CDF from internal events has followed a decreasing trend at CPNPP since the previous SAMDA analysis was performed (TU 1989). Physical changes in the plant have significantly reduced risk in aspects of the PRA. Also, changes have been implemented at the site in response to Fukushima Dai-Ichi Near Term Task Force recommendations and other plant-specific programs that are "risk-beneficial" but not all are credited in CPNPP PRA model.

As stated in the 2013 GEIS, "given the difficulty in conducting a rigorous aggregation of these results (due to the differences in the information sources utilized), a fairly simple approach is taken." The 2013 GEIS estimated the net increase by a factor of 4.7 for consideration of the five areas leading to an increase in best-estimate impacts, external events, spent fuel pool accidents, higher fuel burnup, low power and reactor shutdown events, and population increase. (NRC 2013f).

For CPNPP, the newer internal event information accounts for a decrease in CDF by a factor of seven. The conservatism in the upper bound estimates utilized in the 1996 GEIS account for other potential reductions in risk, including a factor of 5 for newer source term and population dose, an additional factor of 2 to account for conservatism built in the 1996 GEIS, and a factor of 3 to address areas of uncertainty. These factors are on the conservative end of the ranges provided. When these factors are applied, the net change in risk for CPNPP is reduction by a factor 12.3 (7 + 5 + 2 + 3 – 4.7 = 12.3).

Therefore, the NRC conclusion in the 2013 GEIS that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small" is considered appropriate for the CPNPP LR, is incorporated herein by reference, and no further analysis is needed.

Regarding the second conclusion (i.e., LR ERs for plants for which SAMAs have been previously considered need not consider SAMAs) of the GEIS, the subsections below describe the methodology and review of SAMAs to demonstrate there is no new and significant information.

4.15.3 Methodology for Evaluation of New and Significant SAMAs

4.15.3.1 Overview

The evaluations of the CPNPP LR SAMAs are consistent with the NEI 17-04 Revision 1 methodology (NEI 2019b). The relevant steps from the methodology are described in the following subsections.

NEI 17-04 Revision 1 provides a model approach for assessing the significance of new information of which the applicant for renewal of a nuclear power reactor OL is aware that relates to either (1) the SAMDA analysis or SAMA analysis documented in the NRC's final

environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 50 (or Part 54) of the reactor's initial (or renewed) OL or (2) the SAMDA analysis documented in the NRC's final environmental statement (FES, FSEIS, or EA) that supported issuance pursuant to 10 CFR Part 52 of the reactor's combined license and the design certification incorporated therein by reference, if any.

At the direction of the Commission (61 FR 28467), the NRC Staff asked the applicant in a request for additional information (Exelon 2014), why the set of potentially cost beneficial SAMAs that were identified for plants similar in design to Limerick after the performance of Limerick's 1989 Severe Accident Mitigation Design Alternatives (SAMDA) analysis were not new and significant information. This event was site-specific; however, because a similar request could be made of any LR/SLR applicant, it may be advisable for applicants to consider whether potentially cost beneficial SAMAs identified in U.S. license renewal applications (LRAs) after submittal of the SAMA analysis for the analyzed plant could be new information.

- BWRs should assess SAMAs from other BWRs and PWRs should assess SAMAs from other PWRs.

If there is a basis for excluding this body of SAMAs from the pool of "new information" to be evaluated for significance, the rationale should be documented.

NEI 17-04 (Revision 1) (NEI 2019b) describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis. In Stage 1, the LR/SLR applicant uses PRA risk insights and/or risk model quantifications to estimate the percent reduction in the MB associated with (1) all unimplemented "final plant-specific" SAMAs for the analyzed plant and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and determined to be applicable to but not already implemented at the analyzed plant. Consistent with the NRC's rulings that new and significant information is that which "presents a 'seriously different picture' of the environmental impacts compared to the previously issued final environmental impact statement (FEIS)," the first stage examines whether these potentially cost-beneficial SAMAs might reduce severe accident risk substantially. If it can be demonstrated that none of these SAMAs being evaluated can reduce the MB by 50 percent or more, then the applicant may document the conclusion that there is no new and significant information relevant to the previous SAMA analysis. If one or more of those SAMAs are shown to have the potential to reduce the MB by 50 percent or more, then the applicant must complete Stage 2 by developing updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the MB by 50 percent or more, then the applicant must complete Stage 3 by performing a cost-benefit analysis for the "potentially significant" SAMAs identified in Stage 2. Applicants that can demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 evaluations. The application of the NEI 17-04 methodology is described in the following subsections.

4.15.3.1.1 Definitions of New and Significant Information

The following definitions of "new" and "significant" involve significant reproduction of material from reference (NEI 2019b). Portions that do not apply to CPNPP have been revised or removed, but the relevant portions of the methodology are identical.

As discussed by the NRC in Section 5.3.9 of NUREG-1437, Supplement 49 (NRC 2014), "New information is significant if it provides a seriously different picture of the impacts of the Federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the Federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring. The implication of this statement is that "significance" is not solely related to cost benefit, but also depends on a SAMA's potential to significantly reduce risk to the public.

4.15.3.2 Definition of "New" Information

"New" information pertains to data used in a SAMA analysis that has changed or become available since the time the preceding SAMDA analysis was performed.

NUREG-0775, "Final Environmental Statement related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2" (NRC 1989), documents the NRC's evaluation of the alternative of facility operation with the installation of severe-accident-mitigation design features. The NRC did not discover any substantial changes in the proposed action as previously evaluated in the FES (NRC 1989) that are relevant to environmental concerns nor significant new circumstances or information relevant to environmental concerns and bearing on the licensing of CPNPP Units 1 and 2.

A set of SAMDAs was developed for CPNPP to address the accident sequences or sequence groups identified in the FES as well as risk contributors identified in more recent studies which appear to be applicable to CPNPP. This was done on a generic basis since a plant-specific PRA for CPNPP was not available at the time of the NRC review. In assessing the risk reduction potential, each SAMDA was conservatively assumed to avert all the residual risk estimated in NUREG-0775. This risk reduction was compared to the estimated costs associated with each SAMDA based on $1,000 per averted person-rem. None of the nine SAMDAs were cost effective. This was due in large part to the low population around the CPNPP site and low residual risk. In light of these considerations, the NRC had no basis for concluding that modifications to the plant were justified for the purpose of further mitigating environmental concerns.

In summary, the NRC did not find any new information that would call into question the FES conclusion that "the risks of acute fatality from potential accidents at the site are small in comparison with the risks of acute fatality from other human activities in a comparably sized

population" and that "there are no special or unique features about the CPNPP site and environs that would warrant special or additional engineered safety features for CPNPP."

In the longer term, severe accident issues were being pursued by the NRC in a systematic way for all utilities through the SAP described in SECY-88-147 (NRC 1988b), "Integration Plan for Closure of Severe Accident Issues." The plan includes provisions for an IPE (TU 1992) for each operating reactor, a CPI Program, and an AM Program. These programs were intended to produce a more complete picture of the risk profiles of operating plants and the benefits of potential design improvements, including SAMDAs. The NRC believes that the SAP is the proper vehicle for addressing severe accident issues at nuclear power plants, including CPNPP.

There are some inputs to the SAMDA analysis that are expected to change, or to potentially change, for all plants. These inputs include:

- Updated Level 3 model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
    - Population, as projected within a 50-mile radius of the plant
    - Value of farm and non-farm wealth
    - Core inventory (e.g., due to power uprate)
    - Evacuation timing and speed
    - Level 3 methodology updates
- NUREG/BR-0058 (NRC 2004) cost-benefit methodology updates.

In addition, other changes that could be "new information" are dependent on plant activities or site-specific changes. These types of changes include:

- The identification of a new hazard.
- An updated plant risk model (e.g., a fire PRA that replaces the IPEEE analysis).
    - The impacts of plant changes included in the plant risk models will be reflected in the model results and do not need to be assessed separately.
- Non-modeled modifications/changes to the plant.
    - Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps), unless they impact a specific input to SAMA (e.g., a new low-pressure turbine in the power conversion system that results in a greater net electrical output).

For risk model updates performed to reflect the latest PRA model state of the practice, it is noted that the actual physical plant risk may not have changed, but because the best estimate assessment/understanding of the risk has changed, it is considered to be "new information."

4.15.3.3 Definition of "Significant" Information

Consistent with the NEI 17-04 methodology (NEI 2019b), the CPNPP PRA model is used to determine the level of significance of new information. The PRA models reflect the most up-to-date understanding of plant risk at the time of the analysis. As noted above, the criterion established for new information being "potentially significant" is if the new information would cause the MB calculated for any previously unimplemented, potentially cost beneficial SAMA for CPNPP to be reduced by a factor of two or more if the SAMA were implemented. If it can be shown that a particular SAMA would not reduce the CDF or any of the significant Level 2 release category group frequencies in the PRA model by more than a factor of two, then that SAMA could not reduce the MB by 50 percent or more. Therefore, that SAMA would not be considered evidence that new and potentially significant information exists and would not be evaluated further in assessing the significance of new information. This criterion was applied to the SAMA screening evaluation presented in Section 2.0.

All SAMAs were screened using the Stage 1 qualitative or quantitative screening criteria from NEI 17-04 (See Section 2.0) (NEI 2019b). Therefore, Stage 2 of the NEI guidance (update/development of the Level 3 PRA for detailed benefit calculations) was not required, and all SAMAs were found to not meet the criteria for "new and significant information" in Stage 1.

4.15.4 Analysis of New and Significant SAMAs

4.15.4.1 Stage 1 Assessment: Overview

For the CPNPP LRA, new and significant changes since the issuance of the OL were considered. The list of candidate SAMAs for the CPNPP LRA was developed from plant-specific and industry sources. For the plant-specific portion, the CPNPP PRA are examined for insights. The purpose is to determine if there is any new and significant information regarding the SAMDA analyses that would affect the decision to renew the OL. Over the course of plant operation, changes are made to the plant design, operation, and maintenance practices. Periodic updates to the CPNPP PRA have ensured that the PRA includes the relevant changes and continues to reflect the current plant design and operation. PRA updates also include updates to the plant-specific initiating event and equipment data utilized, and improvements in state-of-the-art analysis of severe accidents. Therefore, the PRA provides valuable insights into the risk significance of the plant changes over time.

For evaluation of the industry sources, the supplements of NUREG-1437, Revision 1 (NRC 2014) were examined for SAMAs found to be cost-effective at plants similar to CPNPP. Any such items found to be cost-effective at similar plants were considered for their significance at CPNPP. Industry SAMAs from Table 14 of NEI 05-01 was also reviewed to identify potential cost-effective SAMAs.

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to CPNPP, or already exist at CPNPP (including plant modifications since issuance of the OL). In

addition, two other screening criteria were applied to eliminate SAMAs that have excessive cost. These SAMAs were screened if they were not found to reduce the CPNPP MB by >50 percent.

The remaining SAMAs were then grouped (if similar) based on similarities in mitigation equipment or risk-reduction benefits, and all were evaluated for the impact they would have on the CPNPP CDF and significant source term category (STC) grouped frequencies (i.e., Small Early Release Frequency (SERF), Large Late Release Frequency (LLRF) and Large Early Release Frequency (LERF)) if implemented. If any of the SAMAs reduced the total CDF, SERF, LLRF or LERF by at least 50 percent, then the SAMA would be retained for a full Level 3 PRA evaluation of the reduction in MB. As seen below in Section 2.2 and Section 3.0, all SAMAs were screened as not significant without the need to perform a Level 3 PRA.

4.15.4.2 Stage 1 Assessment – Identification and Qualitative Screening

A total of 283 industry SAMAs, 2 SAMAs from Table 14 of NEI 05-01 (NEI 2005), 9 SAMDAs from the initial OL (TU 1989), and 5 plant-specific SAMAs were considered in the LRA, yielding a total of 301 SAMAs considered. A total of 24 were retained after the qualitative screening evaluation. This list of 24 SAMAs was then further edited into nine cases for bounding SAMA evaluation. This grouping is presented in Table 4.15-2.

4.15.4.3 Stage 1 Assessment – Quantitative Screening

This section presents the quantitative screening of the CPNPP SAMAs. The NEI 17-04 (NEI 2019b) methodology considers a potential SAMA to not be significant unless it reduces the MB by at least 50 percent. The Stage 1 quantitative screening process evaluates this using the criteria of total CDF and no STC frequency being reduced by at least 50 percent. Since the MB is the sum total of the contribution of each STC, if no STC decreases by at least 50 percent, then the total MB reduction cannot exceed 50 percent. However, the approach of evaluating every STC is not necessary to ensure the MB reduction is less than 50 percent. Many individual STCs have a frequency that is insignificant, and while an insignificant STC could in theory be reduced by >50 percent, its impact on MB would be negligible. Additionally, many STCs have conditional offsite consequences that are negligible compared to the dominant STC groups (i.e., SERF, LLRF and LERF).

For this analysis, the significant STC groups (i.e., SERF, LLRF and LERF) are summed to calculate percentage reduction. If the total CDF and total STC group is not reduced by 50 percent or more, then the MB is also not reduced by 50 percent or more and the SAMA is screened. SAMAs screened in this manner are not considered "significant" and are screened as part of the Stage 1 assessment.

The evaluations were selected conservatively to provide assurance that they are bounding. As seen in Table 4.15-2, none of the bounding quantitative screening evaluations resulted in a reduction of total CDF or total LERF greater than 50 percent. Therefore, a Stage 2 assessment is not required and was not performed.

4.15.5 Conclusions for New and Significant SAMAs

Appropriate qualitative screening criteria were applied to the industry SAMAs identified for consideration, eliminating many of the industry SAMAs from further consideration. For the remaining industry SAMAs and for the CPNPP-specific SAMAs to evaluate, a series of bounding quantitative analyses were performed. These analyses demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the CPNPP MB by 50% or greater.

Therefore, it is concluded that there is no new and significant information that would alter the conclusions of the original SAMDA analysis for CPNPP.

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 1 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
71	Callaway	185	Add the ability to automatically align emergency core cooling system (ECCS) to recirculation mode upon refueling water storage tank depletion.	Evaluate the impact on the internal events and fire events models for the operator action to switch over to cold leg recirculation by adding automatic capability to align ECCS to recirculation mode upon refueling water storage tank depletion. This evaluation was further refined to remove overly conservative assumptions for fire impact on SERF scenarios. The refined modeling approach credits the same set of Engineered Safety Features Actuation System signals that automatically align the residual heat removal pump suction to the containment sump upon RWST depletion in addition to the current Operator action.	HRAREC
221	Sequoyah 1, 2	32			
227	Sequoyah 1, 2	106			
230	Sequoyah 1, 2	249			
248	Three Mile Island-1	15			
289	CPNPP	SAMDA # 4			

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 2 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
284	NEI 05-01, Table 14	39	Replace two of the four electric safety injection pumps with diesel-powered pumps.	Evaluated the impact of providing diversity within the high and low-pressure safety injection (SI) system by evaluating the reliability of the internal events and fire events models while reducing common cause failure of the system by replacing two of the four ECCS motor pumps (high-pressure Centrifugal Charging pump (HPSI) and intermediate-pressure Safety Injection (IPSI)) with diesel-powered pumps. A second evaluation was performed as part of the proposed modeling strategy in which now three of the six ECCS motor pumps (high-pressure Centrifugal Charging pump (HPSI) and intermediate-pressure Safety Injection (IPSI) and low-pressure Residual Heat Removal pump (LPSI)) were replaced with diesel-powered pumps.	ECCSCCF ECCSCCF-3

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 3 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
285	NEI 05-01, Table 14	44	Replace ECCS pump motors with air-cooled motors.	Evaluated the reliability of the internal events and fire events models by removing Component Cooling Water (CCW) dependency on ECCS equipment. It is important to mention that the 3 ECCS motor-driven pumps (Safety Injection pump, Residual Heat Removal pump and Centrifugal Charging pump) motors are cooled through natural convection to the environment and do not have a direct dependency on CCW. However, the room itself is cooled by using safety chilled water which has a direct dependency on CCW so therefore, to remove this dependency, the basic events that represent the likelihood of any ECCS pump are set to fail if room cooling is lost.	ECCSR

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 4 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
13	Braidwood 1, 2	1	Add a service water pump	Evaluated the reliability of the internal events and fire events models by removing the Service Water System dependency on the Emergency Diesel Generators (EDG) and ECCS equipment in order to increase the availability of cooling water. This was performed by removing the dependency for Train A components that rely on Service Water. This is a bounding strategy to evaluate the impact of adding a service water pump. A second evaluation was performed by changing the probability of failure to start and failure to run of the service water pump to reflect having a second swing SSW pump that would also need to fail. The impact of this new setting represents a better estimate of the impact of the swing pump. This SAMA was also identified as CPNPP SAMDA #1.	ECCSWS ECCSWS-P
15	Braidwood 1, 2	3			
18	Braidwood 1, 2	6			
26	Braidwood 1, 2	16			
39	Byron 1, 2	1			
41	Byron 1, 2	3			
51	Byron 1, 2	16			
97	Cook 1, 2	160			
286	CPNPP	SAMDA # 1			
227	Sequoyah 1, 2	106	Automate RWST refill.	Evaluated the impact of the internal events and fire events models for the addition of an automatic capability to switch over to refill the RWST. This was accomplished by assuming that the operator action to refill the RWST was completely reliable.	HRARWST
230	Sequoyah 1, 2	249			
244	Three Mile Island-1	10			

Table 4.15-1 Grouping of Related Industry and CPNPP-Specific SAMAs for Bounding Evaluation (Sheet 5 of 5)

CPNPP LRA SAMA #	Source	SAMA #	SAMA Description	Grouped Assessment	Case Name
108	Crystal River	35	Update PORV controls to open automatically when operator action was previously required.	Evaluated the impact of the internal events and fire events models for the addition of an automatic capability to implement feed and bleed. This was accomplished by assuming that the operator action to implement feed and bleed was completely reliable.	HRAFB
299	CPNPP	N/A 0	Install incipient detection system(s) for risk-significant cabinets in the MCR and SWGR rooms.	Credited incipient detection in high-risk cabinets in the Main Control Room, Cable Spreading Room, and Switchgear Rooms.	FPRAINC
300	CPNPP	N/A	Install fire barriers above SWGR room electrical cabinets.	Credited fire barriers above high-risk cabinets in MCR, Cable Spreading Room, and switchgear rooms. Assume fire does not impact PRA targets above the cabinet but still fails adjacent PRA targets	FPRABAR
301	CPNPP	N/A	Hot short prevention design for Head Vent and Pressurizer Vent valves component circuits.	Credited hot short prevention design for high-risk components (e.g., Head Vent, Pressurizer Vent valve, and PORV).	FPRAHS

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 1 of 4)

Gate	Truncation	Base Model Result	Case HRAREC	MB %	Case ECCSCCF	MB %	Case ECCSCCW	MB %
Internal Events								
CDF	1.00E-13	1.01E-06	1.01E-06	0.00	1.01E-06	0.00	9.66E-07	4.36
SERF	1.00E-14	2.77E-09	2.77E-09	0.00	2.77E-09	0.00	2.76E-09	0.36
LATE	1.00E-13	8.75E-07	8.75E-07	0.00	8.75E-07	0.00	8.32E-07	4.91
LERF	1.00E-14	1.02E-07	1.02E-07	0.00	1.02E-07	0.00	1.00E-07	1.96
Fire								
CDF	1.00E-11	4.20E-05	3.96E-05	5.71	4.08E-05	2.86	4.05E-05	3.57
SERF	1.00E-12	2.81E-06	2.41E-06	14.23	1.54E-06	45.20	1.53E-06	45.55
LATE	1.00E-12	1.48E-05	1.15E-05	22.30	1.22E-05	17.57	1.19E-05	19.59
LERF	1.00E-12	5.72E-06	5.25E-06	8.22	5.63E-06	1.57	5.61E-06	1.92
MB for Both Internal Events and Fire								
CDF	-	4.30E-05	4.06E-05	5.58	4.18E-05	2.79	4.15E-05	3.59
SERF	-	2.81E-06	2.41E-06	14.22	1.54E-06	45.15	1.53E-06	45.51
LATE	-	1.57E-05	1.24E-05	21.05	1.31E-05	16.59	1.27E-05	18.78
LERF	-	5.82E-06	5.35E-06	8.07	5.73E-06	1.55	5.71E-06	1.92

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 2 of 4)

Gate	Truncation	Base Model Result	Case ECCSWS	MB %	Case HRARWST	MB %	Case HRAFB	MB %
Internal Events								
CDF	1.00E-13	1.01E-06	9.75E-07	3.47	1.01E-06	0.00	9.48E-07	6.14
SERF	1.00E-14	2.77E-09	2.55E-09	7.94	2.77E-09	0.00	2.77E-09	0.00
LATE	1.00E-13	8.75E-07	8.38E-07	4.23	8.75E-07	0.00	8.53E-07	2.51
LERF	1.00E-14	1.02E-07	9.95E-08	2.45	1.02E-07	0.00	9.88E-08	3.14
Fire								
CDF	1.00E-11	4.20E-05	4.08E-05	2.86	3.84E-05	8.57	3.99E-05	5.00
SERF	1.00E-12	2.81E-06	1.53E-06	45.55	1.51E-06	46.26	1.61E-06	42.70
LATE	1.00E-12	1.48E-05	1.22E-05	17.57	1.19E-05	19.59	1.20E-05	18.92
LERF	1.00E-12	5.72E-06	5.72E-06	0.00	5.17E-06	9.62	5.67E-06	0.87
MB for Both Internal Events and Fire								
CDF	-	4.30E-05	4.18E-05	2.87	3.94E-05	8.37	4.08E-05	5.03
SERF	-	2.81E-06	1.53E-06	45.51	1.51E-06	46.22	1.61E-06	42.66
LATE	-	1.57E-05	1.30E-05	16.82	1.28E-05	18.50	1.29E-05	18.00
LERF	-	5.82E-06	5.82E-06	0.04	5.27E-06	9.45	5.77E-06	0.91

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 3 of 4)

Gate	Truncation	Base Model Result	Case FPRAINC	MB %	Case FPRABAR	MB %	Case FPRAHS	MB %
Internal Events								
CDF	1.00E-13	1.01E-06	1.01E-06	0.00	1.01E-06	0.00	1.01E-06	0.00
SERF	1.00E-14	2.77E-09	2.77E-09	0.00	2.77E-09	0.00	2.77E-09	0.00
LATE	1.00E-13	8.75E-07	8.75E-07	0.00	8.75E-07	0.00	8.75E-07	0.00
LERF	1.00E-14	1.02E-07	1.02E-07	0.00	1.02E-07	0.00	1.02E-07	0.00
Fire								
CDF	1.00E-11	4.20E-05	3.64E-05	13.33	3.22E-05	23.33	4.20E-05	0.00
SERF	1.00E-12	2.81E-06	2.81E-06	0.00	2.81E-06	0.00	2.81E-06	0.00
LATE	1.00E-12	1.48E-05	1.46E-05	1.35	1.46E-05	1.35	1.48E-05	0.00
LERF	1.00E-12	5.72E-06	4.84E-06	15.38	4.83E-06	15.56	5.72E-06	0.00
MB for Both Internal Events and Fire								
CDF	-	4.30E-05	3.74E-05	13.02	3.32E-05	22.79	4.30E-05	0.00
SERF	-	2.81E-06	2.81E-06	0.00	2.81E-06	0.00	2.81E-06	0.00
LATE	-	1.57E-05	1.55E-05	1.28	1.55E-05	1.28	1.57E-05	0.00
LERF	-	5.82E-06	4.94E-06	15.12	4.93E-06	15.29	5.82E-06	0.00

Table 4.15-2 Summary of Aggregate SAMA Maximum Benefits (Sheet 4 of 4)

Gate	Truncation	Base Model Result	Case ECCSCCF-3	MB %	Case ECCSSWS-P	MB %
Internal Events						
CDF	1.00E-13	1.01E-06	1.01E-06	0.00	9.75E-07	3.47
SERF	1.00E-14	2.77E-09	2.77E-09	0.00	2.55E-09	7.94
LATE	1.00E-13	8.75E-07	8.75E-07	0.00	8.38E-07	4.23
LERF	1.00E-14	1.02E-07	1.02E-07	0.00	9.95E-08	2.45
Fire						
FIRE CDF	1.00E-11	4.20E-05	4.08E-05	2.86	4.08E-05	2.86
FIRE SERF	1.00E-12	2.81E-06	1.54E-06	45.20	1.53E-06	45.55
FIRE LATE	1.00E-12	1.48E-05	1.22E-05	17.57	1.22E-05	17.57
FIRE LERF	1.00E-12	5.72E-06	5.72E-06	0.00	5.72E-06	0.00
MB for Both Internal Events and Fire						
CDF	-	4.30E-05	4.18E-05	2.79	4.18E-05	2.87
SERF	-	2.81E-06	1.54E-06	45.15	1.53E-06	45.51
LATE	-	1.57E-05	1.31E-05	16.59	1.30E-05	16.82
LERF	-	5.82E-06	5.82E-06	0.00	5.82E-06	0.04

5.0 NEW AND SIGNIFICANT INFORMATION

The ER must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)] The NRC has stated however that an applicant is not required to perform site-specific validation of GEIS conclusions of Category 1 issues (NRC 1996c).

License renewal applicants are required to analyze only those issues the NRC has not resolved generically. While NRC regulations do not require an applicant's ER to contain analyses of the impacts of those Category 1 environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)]

5.1 New and Significant Information Discussion

The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC 2013b). In this guidance, new and significant information is defined as follows:

a) Information that identifies a significant environmental issue that was not considered or addressed in the GEIS and consequently not codified in Table B-1, Summary of Findings on National Environmental Policy Act (NEPA) Issues for License Renewal of Nuclear Plants, in Appendix B, Environmental Effect of Renewing the Operating License of a Nuclear Power Plant, to Subpart A, National Environmental Policy Act—Regulations Implementing Section 102(2), of 10 CFR Part 51; or

b) Information not considered in the assessment of impacts evaluated in the GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1;

c) Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

Based on available guidance and the definitions of SMALL, MODERATE, and LARGE impacts provided by the NRC in 10 CFR 51, Appendix B, Table B-1, Footnote 3, and presented below, Vistra OpCo expects that any new information regarding Category 1 issues with MODERATE or LARGE impacts would be significant. Section 4.0.2 presents the NRC's definitions of SMALL, MODERATE, and LARGE.

5.2 New and Significant Information Review Process

The new and significant information assessment described below meets or addresses regulatory guidance provided above.

Vistra OpCo's new and significant information review process is carried out through its ongoing environmental planning, assessment, monitoring, and compliance activities and through site-specific reviews conducted for the LR ER. Vistra OpCo has knowledge of the license renewal process, the CPNPP site, licensing and permitting, environmental and regulatory issues, license renewals, the NEPA process, and other nuclear industry activities which could potentially provide new and significant information.

Vistra OpCo's new and significant information review included establishment of applicable and non-applicable Category 1 issues through:

- Review of the CPNPP Units 1 & 2 OL stage ER and the GEIS for its Category 1 discussions;
- Identification and review of past or potential modifications to CPNPP, including environmental impacts; and
- Identification and assessment of equipment and operations with the potential to result in changes in emissions, releases, discharge points, land use, noise levels, etc., considering environmental reviews since initial operations, and those anticipated during the proposed LR term.

Vistra OpCo applied an investigative process for purposely seeking new information related to the Category 1 environmental issues through:

- Environmental review team discussions with Vistra OpCo and CPNPP subject matter experts on the Category 1 issues as they relate to the plant;
- Review of permits and reference materials related to environmental issues at the plant, the environmental resource areas related to Category 1 issues, and information collected for regulatory compliance status;
- Review of recent publicly available information, or information held by Vistra OpCo, particularly data or reports from the past five years, related to the resource area and each applicable Category 1 impact issue, as summarized in the appropriate section of the LR ER in Chapter 3.0, Affected Environment;
- Review of environmental monitoring and reporting required by regulations related to the CPNPP site and operations;
- Review of Vistra OpCo environmental programs and procedures related to the CPNPP site and operations;
- Review of correspondence and permitting documentation related to oversight of CPNPP facilities and operations by state and federal regulatory agencies (activities that would bring significant issues to the plant's attention), to identify site-specific environmental concerns; and

- Review of previous initial and subsequent license renewal applications for issues relevant to CPNPP Units 1 and 2 LR application.

In addition, Vistra OpCo is made aware of and stays abreast of new and emerging environmental issues and concerns on an ongoing basis through:

- Review of nuclear industry publications, operational experience, and participation in nuclear industry organizations;
- Contact with state and federal resource agencies with regulatory jurisdiction over environmental regulation; and
- Information resulting from the information-seeking process was assessed to determine if it is new, and significant, applying the following considerations:
    - Was the information included in or available for the GEIS analysis of the Category 1 issue?
    - Does the information identify an environmental issue not generically considered in the GEIS, and consequently not codified in 10 CFR 51, Appendix B, Table B-1?
    - Does the information present a seriously different picture of the environmental consequences of the action than previously considered, leading to an impact finding different from that included in the GEIS or codified in regulation?
    - Does the information involve a new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity (MODERATE or LARGE) and/or scope (context) not previously recognized?

5.3 New and Significant Information Review Results

As a result of this review, Vistra OpCo is aware of no new and significant information regarding the environmental impacts of LR associated with CPNPP. The findings in NUREG-1437, Revision 1, for the applicable Category 1 issues are therefore incorporated by reference. New and significant information review methodology and results applicable to the issue of severe accidents, which is the functional equivalent of a Category 1 issue for CPNPP (NRC 2013f) is addressed separately in Section 4.15.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

Chapter 4 incorporates by reference NRC findings and analysis for the 52 Category 1 issues that apply to CPNPP, all of which have SMALL environmental impacts. In addition, Chapter 4 presents site-specific analysis of the 17 Category 2 issues, 11 of which are applicable to CPNPP. Table 6.1-1 identifies the environmental impacts that renewal of the CPNPP OL would have on resources associated with the Category 2 issues.

Vistra OpCo has reviewed the environmental impacts of renewing the CPNPP OLs and concluded that further mitigation measures beyond those presented in Section 6.2 and listed in Table 6.1-1 of this ER to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for Vistra OpCo's conclusion.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 1 of 4)

Resource Issue	ER Section	Environmental Impact
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.5.1	No impact. Issue is not applicable (NA) because CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gpm) [10 CFR 51.53(c)(3)(ii)(C)]	4.5.3	No impact. Issue is NA because CPNPP does not withdraw more than 100 gpm.
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.5.2	No impact. Issue is NA because CPNPP utilizes a once-through cooling system and does not utilize a closed-cycle cooling system.
Groundwater quality degradation (plants with cooling ponds at inland sites) [10 CFR 51.53(c)(3)(ii)(D)]	4.5.4	No impact. Issue is NA because CPNPP uses a once through cooling system and does not utilize cooling ponds.
Radionuclides released to groundwater [10 CFR 51.53(c)(3)(ii)(P)]	4.5.5	SMALL impact. Water for station uses continues to be processed and monitored in compliance with licensing and permitting resulting in SMALL impacts and do not warrant additional mitigation measures.
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts) [10 CFR 51.53(c)(3)(ii)(E)]	4.6.5	SMALL impact. No refurbishment or other license-renewal-related construction activities have been identified; adequate management programs and regulatory controls in place to prevent impacts outside of previously disturbed areas.
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.6.4	No impact. Issue is NA because CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 2 of 4)

Resource Issue	ER Section	Environmental Impact
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	4.6.1	SMALL impact. Because the plant complies with the current TPDES permit, will comply with the future renewal of the permit, and will implement any best available technology requirement to minimize impacts of impingement and entrainment, the impacts would be SMALL during the proposed LR operating term.
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	4.6.2	SMALL impact. Because there are no planned operational changes during the proposed LR operating term that would increase the temperature of CPNPP's existing thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted.
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	4.6.3	No impact. Issue is NA because CPNPP utilizes a once-through cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat [10 CFR 51.53(c)(3)(ii)(E)]	4.6.6	NOT LIKELY ADVERSELY AFFECT. No LR-related refurbishment activities have been identified. The continued operation of the site would NOT LIKELY ADVERSELY AFFECT any federally protected or state-listed species. Therefore, Vistra OpCo concludes that the impacts from the proposed LR are not likely to affect threatened, endangered, and protected species in the vicinity of CPNPP and mitigation measures beyond Vistra OpCo's current management programs and existing regulatory controls are not warranted.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 3 of 4)

Resource Issue	ER Section	Environmental Impact
Historic and Cultural Resources		
Historic and cultural resources [10 CFR 51.53(c)(3)(ii)(K)]	4.7	No adverse effects on historic properties. No refurbishment or other license-renewal related construction activities have been identified; administrative procedure ensures protection of these type resources in the event of excavation activities.
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river) [10 CFR 51.53(c)(3)(ii)(G)]	4.9.1	SMALL impact. Conditions necessary for optimal growth of pathogens and human interaction are limited by the depth of the discharge, water movement, the type of recreational activities allowed on the lake, and the discharge area's location away from public access.
Electric shock hazards [10 CFR 51.53(c)(3)(ii)(H)]	4.9.2	SMALL impact. The NRC determined electric shock potential is of small significance for transmission lines that are operated in adherence with the NESC. All in-scope transmission lines are located completely within the CPNPP site and are NESC compliant.
Postulated Accidents		
Severe accidents [10 CFR 51.53(c)(3)(ii)(L)]	4.15.1	SMALL Impact: Utilizing appropriate qualitative screening criteria many of the industry SAMAs were eliminated from consideration. The remaining SAMAs were evaluated, and none would reduce the CPNPP maximum benefit by fifty percent. Therefore, it is concluded that there is no new and significant information that would alter the conclusions of the original SAMDA analysis for CPNPP.

Table 6.1-1 Environmental Impacts Related to License Renewal at CPNPP (Sheet 4 of 4)

Resource Issue	ER Section	Environmental Impact
Environmental Justice		
Minority and low-income populations [10 CFR 51.53(c)(3)(ii)(N)]	4.10.1	No disproportionately high and adverse impacts or effects on minority and low-income populations identified.
Cumulative Impacts		
Cumulative Impacts [10 CFR 51.53(c)(3)(ii)(O)]	4.12	SMALL adverse to SMALL beneficial impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, surface water, ground water, ecological resources, and waste management. SMALL adverse to SMALL beneficial for socioeconomics and climate change. No effect on aquatic resources, historic and cultural resources, and human health.

6.2 Mitigation

6.2.1 Requirements [10 CFR 51.45(c) and 10 CFR 51.53(c)(3)(iii)]

The environmental report must include an analysis that considers and balances . . . alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

6.2.2 Response

NRC Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications*, specifies that the applicant should identify any ongoing mitigation and should discuss the potential need for additional mitigation. However, applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC 2013a)

As discussed in Section 6.1, impacts associated with CPNPP license renewal do not require the implementation of additional mitigation measures. The permits and programs discussed in Chapter 9 (i.e., TPDES permit; stormwater program; air permit; SPCC program; hazardous waste management program; cultural resource protection plan; and environmental review programs) that currently mitigate the operational environmental impacts of CPNPP are adequate. Therefore, additional mitigation measures are not sufficiently beneficial as to be warranted.

6.3 Unavoidable Adverse Impacts

6.3.1 Requirement [10 CFR 51.45(b)(2)]

The environmental report shall . . . discuss . . . any adverse environmental effects which cannot be avoided should the proposal be implemented . . . . [10 CFR 51.45(b)(2)]

6.3.2 Response

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit, because the facility is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. As previously discussed in Chapter 4, no LR-related refurbishment or construction activities have been identified. Therefore, the environmental impacts to be evaluated for license renewal are those associated with continued operation during the renewal term.

Vistra OpCo adopts by reference the NRC findings for the 52 Category 1 issues (NRC 2013b) applicable to CPNPP, including discussions of any unavoidable adverse impacts. In addition,

Vistra OpCo identified the following site-specific unavoidable adverse impacts associated with license renewal:

- The majority of land use at CPNPP would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of CPNPP). Uranium mining associated with the nuclear fuel cycle also has offsite land use implications.
- Aquatic organisms would continue to be impinged and entrained at the intake structure, but as discussed in Section 4.6.1, these impacts were determined to be SMALL.
- Normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to the SCR at or below TCEQ approved concentrations. Compliance with the TPDES permit would ensure that impacts remain SMALL.
- Operation of CPNPP results in the generation of SNF and waste material, including low-level radioactive waste, hazardous waste, and nonhazardous waste. However, specific plant design features in conjunction with a waste minimization program; employee safety training programs and work procedures; and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.
- Operation of CPNPP results in a very small increase in radioactivity in the air. The incremental radiation dose to the local population resulting from CPNPP operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to the members of the public from CPNPP's gaseous releases would be well within the allowable limits of 10 CFR Part 20 and 10 CFR Part 50, Appendix I. Operation of CPNPP also creates a very low probability of accidental radiation exposure to inhabitants of the area.

6.4 Irreversible or Irretrievable Resource Commitments

6.4.1 Requirement [10 CFR 51.45(b)(5)]

The environmental report shall . . . discuss . . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. [10 CFR 51.45(b)(5)]

6.4.2 Response

The term “irreversible” applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term “irretrievable” applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

The continued operation of CPNPP for the period of extended operation will result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of SNF, low-level radioactive wastes generated as a result of plant operations, and sanitary wastes generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of CPNPP that cannot be recovered or recycled, or that are consumed or reduced to unrecoverable forms.

Other than the above, no LR-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

However, if CPNPP ceases operations on or before the expiration of the current OLs, the likely power generation alternatives would require a commitment of resources for construction of the replacement plant as well as for fuel to run the plant. Significant resource commitments would also be required if transmission lines are needed to connect the plant to the electrical grid.

6.5 Short-Term Use Versus Long-Term Productivity of the Environment

6.5.1 Requirement [10 CFR 51.45(b)(4)]

The environmental report shall . . . discuss . . . the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity . . . . [10 CFR 51.45(b)(4)]

6.5.2 Response

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since CPNPP began operations in 1990. The CPNPP FEIS for Units 3 and 4 evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of CPNPP (NRC 2011, Section 10.3). The period of extended operation will not alter the short-term uses of the environment from the uses previously evaluated in the CPNPP FEIS. The period of extended operation will postpone the availability of the site resources (land, air, water) for other uses. Denial of the application to renew the CPNPP OLs would lead to the shutdown of the plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the site area occupied by CPNPP into a park or an industrial facility after decommissioning are quite different. However, extending CPNPP operations would not alter, but only postpone, the potential long-term uses of the site that are currently possible.

In summary, no LR-related refurbishment activities have been identified that would alter the evaluation of the CPNPP FEIS for the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity of these resources.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

The environmental report shall . . . discuss . . . alternatives to the proposed action . . . . [10 CFR 51.45(b)(3)]

The applicant shall discuss in this report the environmental impacts of alternatives and any other matters . . . . The report is not required to include discussion of need for power or economic costs and benefits of . . . alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation . . . . [10 CFR 51.53(c)(2)]

A reasonable alternative must be commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license . . . . The amount of replacement power generated must equal the base-load capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor. (NRC 2013b GEIS, Section 2.3)

7.1 No Action Alternative

As described in Section 2.1, the proposed action is to renew the OLs for CPNPP Units 1 and 2 for an additional 20-year period. The only other alternative under consideration is the no-action alternative, which would be the decision not to renew the CPNPP OLs. If the CPNPP OLs are not renewed, the 2,460 MWe (net) of baseload power would not be available for distribution in Texas during the proposed LR operating term from 2030–2050 for CPNPP Unit 1 and from 2033–2053 for CPNPP Unit 2. The no-action alternative will identify replacement power sources for the loss of CPNPP generation.

In accordance with 10 CFR 51.53(b)(3), this ER will discuss a no-action alternative to the proposed license renewal and a range of alternatives for replacement baseload power sources. A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs (NRC 2013b). The replacement power alternative generation must also equal the baseload capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor.

The replacement power sources being considered under the no-action alternative are presented in Section 7.2.1. Section 7.2.2 will identify the no-action alternative power sources evaluated that were not considered reasonable power sources for the replacement of the CPNPP generation.

7.1.1 Decommissioning Impacts

The NRC's definition of decommissioning as stated in 10 CFR 20.1003 is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits the following:

- Release of the property for unrestricted use and termination of the license; or
- Release of the property under restricted conditions and termination of the license.

The NRC-evaluated decommissioning options include the following:

- Immediate dismantling soon after the facility closes (DECON).
- Safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination (SAFSTOR).
- Permanent entombment on the site in structurally sound material such as concrete that is maintained and monitored (ENTOMB).

All the decommissioning options must be completed within a 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, Vistra OpCo would continue operating CPNPP until the existing OLs expire. Upon expiration of the OLs, CPNPP would cease operations and initiate decommissioning procedures in accordance with NRC requirements. The NRC GEIS evaluated decommissioning environmental impacts for land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management and P2. Vistra OpCo considers the GEIS description of decommissioning impacts as representing the actions it would perform for the CPNPP decommissioning. Therefore, Vistra OpCo relies on the NRC's conclusions regarding the environmental impacts of decommissioning CPNPP. In NUREG-0586, NRC also reviewed the potential for significant adverse socioeconomic impacts on communities that host nuclear power plants from workforce reductions and tax revenue losses when plants cease operations. Should CPNPP's OLs not be renewed, significant adverse socioeconomic impacts to Somervell County would be likely given that CPNPP is a major employer and taxpayer in the County.

Decommissioning and its associated impacts are not considered evaluation criteria used to proceed with the proposed action or select the no-action alternative. CPNPP will have to be decommissioned eventually, regardless of the NRC decision on license renewal. License renewal will only postpone decommissioning for another 20 years. The GEIS states the timing of decommissioning does not change the environmental impacts associated with this activity. The NRC findings as described in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 state that delaying decommissioning until after the license renewal term would result in SMALL environmental impacts. Vistra OpCo relies on the NRC's findings.

The primary criteria used to evaluate the proposed action and the no-action alternative are the power options available for replacement of CPNPP generation. Vistra OpCo concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal as identified in the GEIS. Decommissioning impacts would be SMALL and could overlap with operation of a CPNPP replacement.

7.2 Energy Alternatives that Meet System Generating Needs

In accordance with 10 CFR 51.53(c)(2), Vistra OpCo considered a range of alternatives to replace generation if the CPNPP OLs are not renewed. Vistra OpCo considered each of the replacement alternatives identified in the NRC GEIS for license renewal (NRC 2013b, Section 2.3). These alternatives were evaluated based on their ability to provide reliable baseload power and capacity and to be operational prior to the expiration of the current OLs.

7.2.1 Energy Alternatives Considered as Reasonable

A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs. The replacement power alternative generation must also provide baseload capacity previously supplied by the nuclear plant. The alternatives analysis identified the following power sources as meeting the NRC criteria for reasonableness in the replacement of CPNPP generation during the proposed LR operating term. These energy alternatives considered reasonable are further discussed in Section 7.2.3.

- Advanced light-water reactors (ALWRs) utilizing approved design with mechanical draft cooling towers (MDCTs) located at the CPNPP site.
- Small modular nuclear reactors with MDCTs located at the CPNPP site.
- Natural gas combined cycle units with MDCTs located at the CPNPP site.
- Combination of natural gas combined cycle units with MDCTs at the CPNPP site and offsite solar and wind installations.

7.2.2 Energy Alternatives Not Considered Reasonable

The full range of energy alternatives as described in the GEIS include power sources that will require development of new generation and power alternatives that will not require new generation, such as purchased power (NRC 2013b, Section 2.3). Vistra OpCo considered all the alternatives described in the GEIS for replacement of the CPNPP generation. This section will address the energy alternatives not considered reasonable for additional evaluation.

7.2.2.1 Purchased Power

CPNPP is a merchant plant and provides power for distribution to Texas customers. The Electric Reliability Council of Texas (ERCOT) manages the electric grid. The loss of CPNPP's

generating capacity could introduce uncertainties in electricity reliability within the ERCOT territory. To replace CPNPP's generation on a long-term basis through purchased power would likely require the development of new generation facilities.

Potential environmental impacts associated with purchased power could be substantial and exceed the impacts associated with the continued operation of CPNPP. Potential environmental impacts associated with purchased power would include those associated with the source of the generation and the transmission of the power into the regional grid. Fossil generation results in air emissions, water use and quality issues, and land use impacts associated with the plant footprint. Renewable energy generation can have a large development footprint that can convert natural habitats to an industrial site. The conversion of forest and even agricultural lands to an industrial site can result in impacts to habitat that may adversely impact wildlife and plant species. Additional transmission capacity may be required to distribute electricity from renewable or fossil generation and this may result in impacts to communities and lands within and adjacent to the corridor. These impacts could include loss of sensitive habitat, visual and view shed impairment, and degradation of wetlands and stream crossings.

Given the uncertainties of purchasing baseload power at the scale of CPNPP's generation capacity on a long-term basis and the environmental impacts for developing new generation purchased power was not considered a reasonable replacement alternative.

7.2.2.2 Plant Reactivation or Extended Service Life

In recent years, Vistra OpCo has closed coal-fired plants in Texas (i.e., Sandow, Big Brown, and Monticello) (Luminant 2017b; Luminant 2017c). Both Big Brown and Monticello were subsequently sold (FC Times 2020). The Sandow (1,137 MWe; Luminant 2011) and Trinidad (244 MWe; Luminant 2021c) plants could potentially be reactivated, and the service life of other plants could be extended, such as the 2,250 MWe coal-fired Martin Lake power plant originally commissioned in 1977 (Luminant 2015). Vistra OpCo also owns several natural gas-fired plants in Texas (Luminant 2021c), some of which could potentially continue to be operated past their expected service life. Reactivating or continuing to operate fossil fuel-fired plants would result in much higher air pollutant emissions than those from nuclear power plants. In addition, continuing to operate fossil fuel-fired generation sources is counter to Vistra OpCo GHG emission targets. Vistra OpCo established a goal to achieve a 60 percent reduction in CO_2 equivalent emissions by 2030, as compared to the 2010 baseline, and has a long-term objective to achieve net zero carbon emissions by 2050 (Vistra 2020). Therefore, plant reactivation and extended service life is not considered a reasonable alternative because of the environmental impacts with continued use of fossil fuel-fired generation sources.

7.2.2.3 Conservation and Energy Efficiency Measures (Demand-Side Management)

Demand side management (DSM) includes demand response that shifts electricity from a peak-use period to times of lower demand, and energy efficiency or conservation programs that reduce the amount of electricity required for existing activities and processes. A DSM alternative would be required to reduce the baseload demand within the ERCOT territory by 2,460 MWe to

be considered a reasonable alternative. Reliance on DSM as a reasonable alternative to CPNPP is uncertain because it relies on voluntary participation rather than mandatory energy efficiency from compliance with codes and standards (e.g., building codes and appliance energy use ratings) and realized savings of energy needed to replace CPNPP's large capacity. Vistra OpCo is a merchant generator and does not have a service territory with a customer base for which it is responsible for meeting their power needs; therefore, there are no state policy or law requirements to implement DSM programs. As such, DSM is not a reasonable replacement alternative for CPNPP.

7.2.2.4 Wind

The combination alternative includes a wind component of two or three utility scale (200–500 MWe) wind farms. However, replacing CPNPP's generating capacity with a discrete wind alternative would require 10 or more utility scale wind farms, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. Wind is intermittent, typically cycles significantly over a 24-hour period, is not dispatchable and low-capacity factors can be experienced for several days at a time due to variable wind patterns. Therefore, wind generation by itself is not capable of providing baseload power. For a wind farm to replace a baseload energy source, capacity significantly in excess of CPNPP generation coupled with large amounts of energy storage would have to be included for the facility. Due to the amount of wind generating capacity needed to replace the entire CPNPP baseload generation and the lower efficiencies in producing electricity from wind power (a maximum of 50 percent; ERCOT 2018) versus nuclear power (approximately 92 percent; EIA 2021c), the land acreage required for a discrete wind alternative is larger than other alternatives being considered in this ER. The land needs for wind generation include land parcel(s) that can host a wind farm where turbines are spaced for operation and linked with other turbines and with power converters and connections with transmission infrastructure. Within the wind farm acreage, land would be permanently disturbed for wind turbine bases and power infrastructure as well as temporary construction areas such as laydown and worker support areas. The DOE (2015) developed three land use metrics for these acreage considerations-- 85 acres per MW for wind farm boundaries, 2.47 acres per MW for construction footprint, and 0.74 acres per MW for permanent structures. To replace 2,460 MWe from CPNPP with wind power would require about 5,000 MWe to account for the much lower generating capacity of wind versus nuclear. Based on the DOE metrics, the acreage requirements are about 430,000 acres for wind farms, 12,000 acres for construction footprint, and 3,700 acres for permanent structures. Furthermore, additional MWs would have to be installed to charge batteries to provide firm power, compensating for wind's intermittent nature, further increasing acreage requirements. The wind farm acreage would require many installations to bring together enough available land parcels, each with the potential to significantly impact land use even with the spaced wind turbines allowing for compatible uses such as crop cultivation and livestock grazing. Other impacts from wind generation include impacts to terrestrial ecology from land disturbance and avian mortality from operations. Therefore, discrete wind would not be a superior alternative to continued operation of CPNPP.

Installation and siting of offshore wind farms require careful consideration to bathymetry and offshore construction concerns. Siting is further complicated by shipping lanes, fishing rights, wildlife migration patterns, military operations, and other environmental concerns. Wind installations also pose aesthetic impact concerns, and the larger turbines require greater offshore distances to minimize aesthetic impacts. Environmental impacts associated with the construction and operation of a large utility-scale offshore wind facility could range from MODERATE to LARGE and would require multiple installations.

7.2.2.5 Solar

The combination alternative includes a solar component of three 200-MWe solar installations with battery storage. However, replacing CPNPP's generating capacity with a discrete solar alternative would require more solar installations with energy storage, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. Larger capacity solar installations would reduce the number of installations, but not the overall acreage needed. Samson Solar Energy Center, a 1,310-MW solar farm, is planned for 18,000 acres spanning three counties in northeastern Texas (Invenergy 2020; Energy Capital Media 2021). To replace CPNPP's generation, two solar farms similar in size to the Samson Solar Energy Center providing storage would be required.

Solar generation is intermittent by nature, typically cycles significantly over a 24-hour period, is not dispatchable and low-capacity factors can be experienced for several days at a time due to cloud cover. This type of generation volatility on a large scale can create distribution and/or transmission instability. For solar power to be viable as a discrete source of large amounts of energy that is reliably available for the regional grid at all hours of the day, capacity significantly in excess of the CPNPP generation coupled with large amounts of battery storage or additional generation capacity would be needed to produce energy for storage.

Due to the amount of solar generating capacity needed to replace the entire CPNPP baseload generation and the lower efficiencies in producing electricity from solar power versus nuclear power, the land acreage required for a discrete solar alternative is larger than other alternatives being considered in this ER. Using a capacity factor of 25 percent, replacing the 2,460 MW CPNPP would require about 9,800 MW. Using the Samson Solar Energy Center mentioned above as a guide, such a facility(ies) would require 135,000 acres. Furthermore, additional MWs would have to be installed to charge batteries to provide firm power, compensating for solar's intermittent nature, further increasing acreage requirements. To acquire this much acreage through purchase or lease would require many installations, each with the potential to significantly impact land use Depending on the location of the solar facilities, the land use disturbances could result in moderate to large impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, discrete solar would not be a superior alternative to continued operation of CPNPP.

7.2.2.6 Hydropower

The DOE's Oak Ridge National Laboratory assessed the ability of existing non-powered dams across the country to generate electricity. The non-powered dams in Texas do not provide the scale of power generation capacity needed to replace CPNPP's generation capacity (ORNL 2012). The study assessed the dam with the greatest generation potential in Texas to be approximately 152 MWe with the second greatest potential dropping sharply to 42.2 MWe.

Construction of a new large-scale hydropower facility would require significant siting considerations, such as the area that would be inundated to provide water storage for generation, as well as the overall environmental impacts associated with the development of the facility. The environmental impacts would be large for land use, water resources, socioeconomics, ecology, and cultural resources.

The lack of potential for large hydroelectric power facilities at existing dams in Texas and the environmental constraints associated with the development of a new hydropower facility make hydropower an unreasonable alternative to replace the CPNPP generation.

7.2.2.7 Geothermal

The National Renewable Energy Laboratory graded the geothermal resources of the United States. Most of Texas is graded as having the least or next to the least potential for geothermal energy and none of Texas was graded as having the most potential (NREL 2018). Therefore, geothermal energy is not considered a reasonable power source for the replacement of the CPNPP generation.

7.2.2.8 Biomass

Biomass includes wood waste, municipal waste, manure, certain crops, and other types of waste residues used to create electricity. Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources.

Biomass plants tend to be much smaller than nuclear or fossil fuel plants. To replace the CPNPP baseload generation, it would take the construction of many biomass plants located near reliable fuel sources that continuously produce enough biomass to fuel the plants. Large biomass plants are generally 50 MWe, with the largest ones being slightly more than 100 MWe (NRC 2019). Replacing the generating capacity of CPNPP using only biomass would require the construction of 25 large facilities.

Biomass plants require storage facilities for the fuel products and for waste ash/residue for the wood, crop, and agriculture waste types. Wood waste plants require a large land area for storage and processing, and, like coal generation, they produce ash that must be disposed of in a manner that does not pollute waterways and air. Therefore, environmental impacts associated with construction of a wood waste plant could be significant, with the impact intensity level being dependent on the siting and proximity to a source of wood waste.

Utilizing municipal solid waste for electricity is also dependent on being close to large population centers that generate large amounts of waste. Air emissions are also an issue with biomass plants, and construction of a plant would require installation of maximum achievable control technology to comply with the CAA. The combustion of the fuel also results in air emissions that must be controlled to meet air quality regulations.

Overall, the construction and operation of biomass plants of the size necessary to act as an alternative to CPNPP would result in MODERATE environmental impacts to land use, water quality, ecological resources, and air quality.

Baseload generation from biomass sources is limited because of the need to site facilities near substantial fuel sources and impacts to land from constructing and operating the facility. In addition, without the construction of multiple smaller facilities, biomass plants are unable to produce the large baseloads of electricity that nuclear and fossil fuel plants generate. Therefore, biomass is not considered a reasonable alternative to CPNPP's baseload generation.

7.2.2.9 Fuel Cells

Current fuel cell installations for large-scale stationary power are significantly smaller scale than what is needed as a reasonable replacement of CPNPP's generating capacity with much of the systems installed for individual customers. Larger applications generally provide from hundreds of kilowatts to tens of MW of power (DOE 2017; Duke Energy 2019). Fuel cells as a utility-scale generation alternative are not presently competitive with other alternatives. Therefore, fuel cells are not considered a reasonable alternative to CPNPP's baseload generation.

7.2.2.10 Ocean Wave and Current Energy

The technology to harness hydrokinetic energy is in development with many demonstration projects deployed around the world (DOE 2019). The Federal Energy Regulatory Commission (FERC) has licensing authority over hydrokinetic energy projects deployed in the United States. Currently, there are three licensed pilot projects and four projects seeking permits or holding a preliminary permit. The largest project is a 20-MWe marine project. The largest inland project is a 6-MWe project proposed for the Mississippi River. (83 FR 11192; FERC 2020).

Given hydrokinetic technology is in the early stages of commercial application and projects have low generation capacities, ocean wave and current energy is not considered a reasonable alternative in the time frame necessary to be an alternative to CPNPP's baseload generation.

7.2.2.11 Oil-fired

Oil-fired generation emits large amounts of CO_2 and HAPs, making it undesirable for utilities looking to reduce air pollutants and comply with regulations. Also, as presented in Section 7.2.2.2, Vistra OpCo's long-term sustainability strategy involves closing fossil fuel-fired units to assist in achieving the goal of a 60 percent reduction in CO_2 equivalent emissions by 2030 (Vistra 2020). Based on the greater environmental impacts and cleaner energy source policies and regulations, oil-fired generation is not a reasonable alternative.

7.2.2.12 Coal-fired

Coal-fired plants are being retired throughout the United States. As discussed in Section 7.2.2.2, Vistra OpCo is similarly closing coal-fired plants to reduce GHG emissions. The NRC recently considered a supercritical pulverized coal facility as an alternative to renewing the River Bend Station Unit 1 OL but found license renewal to be the preferred alternative. The supercritical pulverized coal facility alternative had operating impacts greater than license renewal, in addition to the environmental impacts inherent with new construction projects. (NRC 2018) Based on the greater potential environmental impacts, coal-fired generation is not a reasonable alternative.

7.2.3 Environmental Impacts of Alternatives

7.2.3.1 Advanced Light-Water Reactors Nuclear Alternative

The ALWR nuclear alternative consists of construction and operation of ALWRs on the CPNPP site and assumes no additional transmission corridors would need to be developed to support the plant. The NRC issued a FEIS in 2011 for the construction and operation of two ALWRs on the CPNPP site CPNPP Units 3 and 4). The design of the proposed ALWRs was the US-APWR, each with a rated and design net output of approximately 1,600 MWe (NRC 2011, Section 3.2.1.1). The review of the US-APWR has since been suspended indefinitely (NRC 2020e). NRC's FEIS conclusions for construction impacts of the reactors form the basis for the ALWR alternative's impacts; however, this ALWR alternative is not specific to any specific reactor design.

7.2.3.1.1 Land Use

Based on the assessment of CPNPP Units 3 and 4 (NRC 2011), the construction would occur on approximately 275 acres of the existing CPNPP site (123 acres for the reactors and 152 acres for the MDCTs) and approximately 400 acres adjacent to the south border for the blowdown treatment facility (BDTF), which includes the treatment and evaporation ponds. Of these 675 acres, permanent structures would occupy approximately 550 acres, requiring conversion of seven acres of prime farmland on the CPNPP site to industrial use and 154 acres of prime farmland adjacent to the south border to industrial use. This acreage is not under cultivation and is owned by Vistra OpCo. The prime farmland conversion was determined to represent only 0.1 percent of the prime farmland in the 6-mile vicinity in the 2011 assessment. The NRC also considered offsite land use impacts from the influx of construction workers, concluding limited offsite land-use changes in the vicinity primarily for short-term housing would be expected. (NRC 2011)

Use of the CPNPP site for development of replacement generating units would not change the use of the CPNPP from its current use of power generation. Use of the 400 acres owned by Vistra OpCo outside of the existing CPNPP site would be a change in land use and would involve a conversion of 154 acres of prime farmland to industrial use. However, as stated above, the conversion would only impact a fraction of the prime farmland in the vicinity. (NRC 2011)

Using the CPNPP Units 3 and 4 construction footprint for the ALWR alternative has the ALWR plant located in unincorporated Somervell County and within the extraterritorial jurisdiction area of the city of Glen Rose (CGR 2021a). There are no zoning or land development regulations in place for unincorporated areas of Somervell County and because the footprint falls outside of the corporate city limits of Glen Rose, the city's zoning regulations do not apply to the ALWR footprint (Section 3.2.1). Therefore, development of an ALWR would not be subject to zoning or land development regulations and there would be no impact on land use from a zoning standpoint.

Therefore, with changes in land use affecting only 400 acres and a small percentage of prime farmland, and with limited land use conversion in the vicinity for housing, the land use from development of an ALWR plant would be SMALL. For comparison, the NRC determined the land use construction impact for CPNPP Units 3 and 4 to be SMALL (NRC 2011, Section 4.1.1)

In addition, the discharge pipeline from the BDTF to Lake Granbury would extend beyond the 400-acre area where the BDTF would be located. The pipeline would largely be installed within the existing pipeline ROW for supplying Units 1 and 2 with water from Lake Granbury, which would be used for the ALWR's supply. Installation of the discharge piping in the existing ROW would temporarily impact another 64 acres for construction. The discharge pipeline would diverge from the existing ROW for 1.4 miles to connect to a proposed discharge structure in Lake Granbury. For a temporary construction 100-foot ROW, the acreage impacted would be 17 acres, which would decrease to 8.5 acres for a permanent ROW 50 feet in width. This small acreage for construction and permanent ROWs would not increase the land use impact destinations presented above. (NRC 2011, Section 4.1.2)

During operations, the above-mentioned acreage would continue to be used as an industrial site. Operation of the blowdown facility sited on the 400 acres along the southern property boundary would result in salt deposition on surrounding land. With effective mitigation measures, the affected area could be confined to the CPNPP site plus the 400-acre area. However, the effectiveness of the mitigation measures (directional sprayers and fencing) is uncertain and the potential for impacting up to an estimated 44 offsite properties within an adjacent rural residential area remains (NRC 2011, Section 5.1.1). Waste from operations would also consume capacity within offsite landfills; however, landfill capacity is expected to be expanded to meet future demand and with compliance with state siting regulations have only a small impact on land use. Given that the impact to offsite land due to salt deposition could be noticeable, the impact of operations on land use would be SMALL to MODERATE. The NRC's 2011 assessment concluded the same anticipated impact level regarding operations (NRC 2011, Section 5.1.1).

7.2.3.1.2 Visual Resources

The ALWR structures and other structures close to the nuclear power block would be constructed west of and in close proximity to the existing CPNPP structures and largely be constructed on developed land. This portion of the ALWR plant would blend with the industrial character of the existing plant. The MDCTs would be constructed on the adjacent peninsula

north of the existing plant in an area of Ashe juniper woodland-savanna and mixed hardwood forest (NRC 2011, Section 4.3.1.1), expanding the industrial appearance of the plant. The MDCTs would have a low profile compared to natural draft parabolic cooling towers and would not be expected to extend the distance at which the plant would be visible. The BDTF area, approximately 400 acres along the southern site boundary, is primarily covered by Ashe juniper woodland-savanna (NRC 2011, Section 4.3.1.1). As shown in Figure 3.2-1, these areas continue as described in 2011. The visual resources impact for the reactor and MDCTs would be similar to that of the existing generating units, SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area and fall within the residences view of SCR. However, the hilly topography of the area would reduce the visibility of the plant features for the nearby residents. Overall, visual impact of this alternative would be SMALL. NRC's 2011 assessment also concluded that visual impacts of construction and operations would be small (NRC 2011, Sections 4.4.1.4 and 5.4.1.4).

7.2.3.1.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, wind erosion, and other general construction activities and managed in accordance with regulatory requirements and application of BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) to minimize potential impacts. Vistra OpCo would be required to modify the existing CPNPP air permit to address construction as well as obtain a permit for a concrete batch plant to support construction. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for excavation and earthmoving, would create pollutants. All equipment is anticipated to be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be intermittent for the duration of construction activities with localized effects. As discussed in Section 3.3, Somervell County is in attainment for all criteria pollutants. With implementation of mitigation measures and properly serviced equipment, the anticipated impacts would be SMALL.

Air quality impacts from operation would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions. Air quality impacts would also result from vehicular emissions associated with plant operations. Potential emissions of criteria pollutants and CO_2 emissions would be minimal and similar to CPNPP (see Section 3.3). The NRC estimated CO_2 equivalent emissions at about 16,000 metric tons annually for CPNPP Units 3 and 4, with about 60 percent coming from periodic testing of diesel generators and with workforce transportation accounting for most of the rest (NRC 2011, Section 5.7.1). Under this ALWR alternative scenario, these emissions would be offset by CPNPP Units 1 and 2 ceasing operations. Implementation of the ALWR nuclear alternative would result in a beneficial air quality impact when compared with fossil-fuel fired alternatives (see Table 7.2-1).

The MDCTs would have air emissions and atmospheric effects from drift and plumes. Cooling tower drift consists of the liquid droplets entrained in the exhaust air stream. A plume forms when the saturated water vapor that leaves the top of the tower encounters cooler air and very small water droplets condense out of the air. Drift that leaves the top of the tower will reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled by Vistra OpCo and would be in accordance with any applicable limits and restrictions for use of water treatment chemicals and discharge limits.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. This has the effect of introducing fine particulate matter into the atmosphere. Particulate matter emissions (e.g., PM_{10} and $PM_{2.5}$) are regulated air emissions. The dissolved solids from both drift and plumes could also be deposited on the surrounding land. However, impacts on vegetation due to the deposition would be expected to be localized and primarily onsite. Atmospheric effects of plumes could include fogging and shadowing. Cooling tower impact modeling was conducted for Units 3 and 4. The NRC's review of the modeling results concluded that the atmospheric impacts of the cooling tower operation would be minimal (NRC 2011, Section 5.7.2).

Overall, air quality impacts of operations and the effects of drift to offsite areas would be expected to be SMALL. NRC's 2011 assessment characterized air quality impacts for construction of Unit 3 and 4 as resulting in temporary impacts to local air quality, similar to any large-scale building project and the air quality impacts of operation as not noticeable (i.e., small) (NRC 2011, Sections 4.4.1.6 and 5.7.1).

7.2.3.1.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by HUD. Construction activities resulting in offsite sound levels above this range would be temporary. Locations near the CPNPP site with potential sensitivity to noise, include residences, churches, and a children's home. The nearest residence is 0.8 miles southwest of the site (CPNPP 2021). Noise at the nearest residence was estimated to be comparable to background levels (50 to 55 dBA) (NRC 2011, Section 4.4.1.5). The NRC concluded the impacts of noise from building activities at the CPNPP site for CPNPP Units 3 and 4 would be minimal and would not warrant mitigation (NRC 2011, Section 4.4.1.5).

Noise sources associated with the operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. Many of these noise sources are confined indoors or would be infrequent. The operating ALWR plant would have noise sources and levels not unlike those of the existing operating units with the exception of the

MDCTs. The sound would be attenuated by the surrounding buildings and structures and distance to the site border.

Noise from a cooling tower generally consists of sounds created by the motors, the speed reduction or power transmission units, the fans, and the cascading water. The Units 3 and 4 MDCTs were estimated to have noise levels of 55 decibels adjusted 1,000 feet from the towers, while the receptors of concern are more than 4,400 feet away (NRC 2011, Section 5.4.1.5).

Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, noise impacts from construction and operations would be SMALL. The NRC's 2011 assessment also concluded that noise impacts of construction and operations would be small (NRC 2011, Sections 4.4.1.5 and 5.4.1.5).

7.2.3.1.5 Geology and Soils

The NRC assessed site preparation and construction of Units 3 and 4 for hydrological alterations. Site preparation and construction would require the removal and redistribution of several hundred cubic yards of rock and overburden soil material, including the removal of an existing structure, an existing Class II landfill, a foundation, and paved areas and the relocation of an onsite rail line. Potential erosion and sedimentation from these activities would be controlled using appropriate BMPs included in a SWPPP such as vegetative buffer zones, silt fencing, straw bales, slope breakers, and other soil-erosion-prevention measures, as well as diversionary channels to sedimentation basins. The excavations would be expected to require minimal dewatering based on the construction of the existing units. Water from the excavations would be directed to a sedimentation basin. Final site grading would be designed to ensure that runoff would drain away from safety-related structures via drainage channels or sheet flow and subsequently to SCR through catch basins or as unobstructed overland flow. (NRC 2011, Section 4.2.1)

Through compliance with permit conditions, adherence to stormwater regulations, and applying erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.1.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of an ALWR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water needs and are anticipated to be met by surface water sources. The excavations would be expected to require minimal dewatering based on the construction of the existing units and no other groundwater withdrawals are expected for construction. Impacts due to groundwater usage would be SMALL.

The NRC assessed the surface water usage for constructing Units 3 and 4 (NRC 2011, Section 4.2.2.1). Potable water needs for human consumption, sanitary needs, fire protection, and concrete batch plant operations would be met by municipal supply and estimated to be less than the volume allocated by the SCWD for the plants. Impacts of the withdrawal on stream flow in the Paluxy River (which supplies Wheeler Branch Reservoir and from which the SCWD makes withdrawals) would be minimal. The NRC's 2011 estimate was the withdrawal volume would be equivalent to 0.3 percent of the mean annual flow and 5 percent of lowest recorded annual flow in the Paluxy River at Glen Rose. Water for dust suppression and general cleanup would be withdrawn from the SCR and would have a negligible impact on the SCR supply. The NRC concluded that the surface water use impacts of construction and pre-construction activities for Units 3 and 4 would be small. Likewise, construction of an ALWR alternative would be expected to be SMALL.

Operations water demand for potable water, service water, and fire protection would also be met by available municipal supply. Cooling water needs would be meet by withdrawals from Lake Granbury piped into the SCR. However, because the ALWR plant would use closed-cycle cooling, water consumption would be greater than the existing units. Withdrawals for Units 3 and 4 were estimated at approximately 63,000 gpm (140 cfs) and consumption was estimated at approximately 38,200 gpm (85 cfs) (NRC 2011). The NRC concluded that water use for operation of CPNPP Units 3 and 4 would have a moderate impact on surface water resources. This impact level was based on modelling that indicated 1) decreases in the time that both Lake Granbury and Possum Kingdom Lake is at full pool; and 2) changes to the flow of the Brazos River downstream of Lake Granbury and Possum Kingdom Lake. These pool level changes would have a noticeable effect but not destabilize potential water uses on the reservoirs. The NRC's impact conclusion for CPNPP Units 3 and 4 would be bounding for operation for the ALWR plant (i.e., no greater than MODERATE). No groundwater use is expected.

Construction of the ALWR plant could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. CPNPP operates under a general permit for industrial stormwater, TPDES general permit No. TXR050000. CPNPP maintains and implements an SWPPP that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies BMPs used to prevent or reduce the pollutants in stormwater discharges. Through compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs, construction-related impacts on groundwater and surface water quality would be SMALL.

Vistra OpCo assumes the same treatment and discharge to Lake Granbury as assessed for Units 3 and 4 would serve the ALWR units. The BDTF would allow the blowdown to Lake Granbury to comply with Texas surface water quality standards for Lake Granbury. The discharge's dissolved solids concentration in compliance with standards would be higher than the average total dissolved solids concentration in the reservoir, resulting in a small net increase in the total dissolved solids concentration in Lake Granbury and downstream. Under low-flow

conditions, elevated concentrations of dissolved solids would temporarily reduce the suitability of the water for various uses. (NRC 2011, Section 5.2.3.1).

The ALWR plant would operate in compliance with a TPDES permit and an industrial stormwater permit, minimizing impacts to surface water quality. The NRC considered the potential impacts to ambient water conditions and downstream users from increased dissolved solids, particularly during low flow conditions as a moderate impact, with the overall impact to surface water being small to moderate (NRC 2011, Section 5.2.3.1). This previous assessment would be bounding for the ALWR plant.

7.2.3.1.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

Based on the CPNPP Unit's 3 and 4 assessment (NRC 2011), the construction would occur on approximately 275 acres of the existing CPNPP site (123 acres for the reactors and 152 acres for the MDCTs) and approximately 400 acres adjacent to the southern boundary for the BDTF. The development areas contain no old growth timber, unique or sensitive plants, or unique or sensitive plant communities. After the proposed facilities are built, approximately 125 of the disturbed acres would be revegetated. Much of the 123 acres for the reactors was previously disturbed for construction of the existing units and is of relatively low-quality wildlife habitat. The MDCTs would be located on a largely undeveloped peninsula that extends into SCR immediately northwest of the existing units. About 152 acres on the peninsula would be disturbed. The peninsula is covered primarily by Ashe juniper woodland-savanna and to a lesser extent by mixed hardwood forest. Construction of the BDTF would clear 313 acres of Ashe juniper woodland-savanna, 34 acres of grassland, 45 acres of mixed hardwood, and 8 acres of developed and previously disturbed land. The vegetation communities are common throughout Somervell and Hood counties, the affected terrestrial habitats would be a small percentage of the total acreage of these cover types in the vicinity (less than 2 percent of any cover type in the vicinity). The NRC's 2011 CPNPP Unit's 3 and 4 assessment determined that the net permanent loss of 445 acres of natural terrestrial habitat (without a history of past disturbance from building Units 1 and 2) would affect only about 10 percent of the natural habitat available on the CPNPP site plus the BDTF site. (NRC 2011, Section 4.3.1.1, 4.3.1.3)

As mentioned in Section 7.2.3.1.1, the discharge piping from the BDTF to Lake Granbury would extend offsite and disturb approximately 81 acres (64 acres construction ROW along the existing pipeline corridor, plus 17 acres for divergent portions of the discharge pipeline). Most of the disturbance is along the existing ROW, and as described in the 2011 Units 3 and 4 EIS, would transect low-density residential areas. The small acreage that would diverge from the existing pipeline would include construction along the Lake Granbury shoreline. (NRC 2011, Section 4.1.2)

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys with a focus on threatened and endangered species. The endangered golden-cheeked warbler has been documented in the nearby Dinosaur Valley State Park. The species is dependent on mature

Ashe juniper habitat and various species of oak. The 2007 and 2009 surveys for the species did not find favorable habitat; however, the further maturing of the onsite Ashe juniper could present favorable habitat at the time of development for an ALWR alternative. Input from TPWD's predictive habitat model indicates the potential for suitable golden-cheeked warbler habitat at the CPNPP site (see the golden-cheeked warbler predictive habitat model results included as an attachment to the TPWD response letter included in Attachment C). Other than the potential for suitable habitat to support the endangered golden-cheeked warbler, construction of the ALWR alternative would have small impact on terrestrial resources; however, given the potential for permanent removal of suitable golden-cheeked warbler habitat, the impact would be SMALL to MODERATE. The NRC concluded that construction activities would not noticeably reduce the local diversity of plants or plant communities or associated wildlife (i.e., small impacts). (NRC 2011, Section 4.3.1.1, 4.3.1.3)

No additional habitat removal would be expected to occur during operations. If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures are included in site procedures and programs to minimize impacts to the species. As mentioned in Section 7.2.3.1.1, operation of the BDTF would result in salt deposition on surrounding land. The deposition area would be on previously developed land. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts attributable to operations would be SMALL.

<u>Aquatic</u>

A new intake structure for the ALWR plant would be constructed on SCR, but the existing intake at Lake Granbury would be used for the ALWR plant. Discharge would be routed to Lake Granbury. Based on the CPNPP Unit's 3 and 4 assessment (NRC 2011, Section 4.3.2.1), construction of a ALWR alternative would not result in the loss of aquatic habitat in SCR, although impacts on the aquatic resources of SCR could potentially result from soil erosion and other runoff from building activities. Construction of the intake and discharge would be conducted under the appropriate stormwater permit, employing BMPs to minimize sedimentation to surface water. The construction footprint also encompasses several small aquatic resources and would result in their filling. However, based on the small sizes of the potentially affected intermittent streams, wetlands, and stock pond and the minimal aquatic communities they support, the NRC concluded that the impacts of construction and pre-construction activities on these aquatic resources would be minimal for Units 3 and 4. Impacts from construction of a ALWR plant would be similar and SMALL.

As a replacement alternative, the ALWR plant would not require new intake at Lake Granbury; however, the blowdown to Lake Granbury would require a new discharge structure on Lake Granbury. Construction conducted under the appropriate permits employing BMPs to minimize sedimentation to surface water and minimizing the construction footprint would result in minimal impacts to aquatic resources.

Water withdrawal volume would be similar to that of Units 3 and 4 and therefore, the impacts of water withdrawals, namely impingement and entrainment, for an ALWR alternative would be

bounded by that of the assessment for the proposed CPNPP Units 3 and 4. The NRC concluded that the impacts of impingement and entrainment would be minimal (NRC 2011, Section 5.3.2.1). The use of MDCTs and the BDTF evaporation ponds would increase water consumption of an ALWR alternative over that of the existing units, but would be bounded by the water consumption assessed for Units 3 and 4. The impact of water consumption from Units 3 and 4 operation was modelled cumulatively with the continued operation of Units 1 and 2. With Units 3 and 4 operating, Lake Granbury's average water level would be reduced by 0.6 feet and would be expected to be 2 feet or more below full pool an additional 15 percent of the time (NRC 2011, Section 5.3.2.1). Based on this modelling, the NRC concluded that adverse effects on aquatic biota and habitat may range from negligible to noticeable due to the potential for the lower water level during spawning season to allow desiccation of shallow habitats where fish nest or otherwise deposit their eggs. The potential for noticeable adverse effects would be less for a replacement alternative that would not have water consumption by the existing once-through units. Given that consumption by once-through plants is minimal and the potential for low water levels disrupting spawning, impacts to aquatic resources would be SMALL to MODERATE.

<u>Special Status Species</u>

As mentioned above, the loss of habitat could affect protected terrestrial species, including the golden-cheeked warbler. Section 3.7.8 discusses the protected species identified for Hood and Somervell counties. The state-listed white-faced ibis has been observed onsite at the SCR and suitable habitat exists along the SCR (see Section 3.7.8.2.3). Suitable onsite habitat also exists for the bald eagle, and the species has been observed within the vicinity (see Section 3.7.8.3). The state-listed THL has the potential to occur onsite; however, none were observed during 2007 surveys (NRC 2011). The whooping crane and interior least tern have the potential to occur onsite because of the presence of suitable habitat, but none have been observed in the vicinity.

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to determine the presence or absence of protected species which would bring past surveys up to date. Suitable habitat for the species identified above also occurs elsewhere onsite and within the vicinity. Construction of the ALWR alternative would require permanent removal of about 13 percent of the Ashe juniper woodland-savanna onsite, potentially suitable habitat for the golden-cheeked warbler (see the golden-cheeked warbler predictive habitat model results included as an attachment to the TWPD response letter included in Attachment C). However, as stated above, the vegetation communities affected by construction are common throughout Somervell and Hood counties and are a small percentage of the total acreage of these cover types in the vicinity (less than 2 percent of any cover type in the vicinity). If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures would be included in site procedures and programs to minimize impacts to the species. No additional habitat removal would be expected to occur during operations. Given the potential for permanent removal of suitable habitat that is abundant in the vicinity, the ALWR alternative MAY AFFECT, but is NOT LIKELY to ADVERSELY AFFECT, federally listed species.

7.2.3.1.8 Historic and Cultural Resources

The NRC determined that the APE for CPNPP Units 3 and 4 was the area at the proposed CPNPP Units 3 and 4 site and the immediate environs that may be impacted by land-disturbing activities associated with building and operating the proposed CPNPP Units 3 and 4 (NRC 2011, Section 2.7). Therefore, the extent of the APE was the construction footprint and adjacent areas, the offsite water lines installation area, and the salt deposition area around the BDTF. The ALWR alternative would use a similar construction footprint as evaluated for CPNPP Units 3 and 4 and the area of salt deposition would also be similar. Therefore, the APE for impacts to historic and cultural resources would be the same. There were no NRHP-listed or eligible archaeological sites, NRHP-listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. At the time, the license for Units 3 and 4 was reviewed, NRHP-listed or eligible historic sites in the surrounding area were located at least 5 miles from the APE. (Luminant 2013b, Section 4.1.3.1). Since issuance of the CPNPP Units 3 and 4 FEIS, two additional properties in the surrounding area have been listed on the NRHP, with both being more than 4.5 miles from CPNPP (Table 3.8-4). Further, as indicated for Units 3 and 4, Vistra OpCo would monitor land-disturbing activities during construction to identify potential cultural resources not previously recorded and in the event of an inadvertent find, stop work and notify the SHPO. Because no cultural or historic sites were within the APE and Vistra OpCo planned to monitor land disturbance activities, the NRC concluded for Units 3 and 4, that construction impacts would be small. Given that cultural resources are outside of the APE, historic properties are at least 4.5 miles away from the APE, and the potential visual impact to the traditional cultural properties would be similar to the existing units, there would be NO EFFECT to historic and cultural resources.

7.2.3.1.9 Socioeconomics

<u>Socioeconomic Issues other than Transportation</u>

The NRC reviewed the socioeconomic impacts of construction and operating Units 3 and 4. The assessment was based on peak employment of 4,953 workers during construction (NRC 2011, Section 4.4.2) and 494 operations workers (NRC 2011, Section 5.4.2). Construction of CPNPP Units 3 and 4 would have economic impacts in the area by creating direct and indirect jobs and incomes, increasing purchases of goods and services, and generating tax revenues. The NRC's assessment of the economic and tax revenue impact of construction was a LARGE impact for Somervell and Hood counties (NRC 2011, Section 4.4.3). The NRC's assessment was that in terms of employment and income, the long-term economic benefits of operating CPNPP Units 3 and 4 are likely to be MODERATE to LARGE in Somervell and Hood counties. With regard to tax revenues, the long-term economic benefits of operating CPNPP Units 3 and 4 are likely to be LARGE in Somervell County. (NRC 2011, Section 5.4.3.3) The scale of the ALWR alternative project would be similar and would be expected to have similar beneficial impacts as those of Units 3 and 4.

The large workforce would also result in additional pressure on local housing, community services, and infrastructure. Not all of the construction workforce would relocate with families,

and the in-migrating workforce is anticipated to reside in Somervell and Hood counties as well as other surrounding counties. Based on assumptions for population increases and residence patterns, the NRC assessed the adverse impacts to housing, community services, and infrastructure from construction of CPNPP Units 3 and 4 to generally be SMALL. Similar impacts would be expected from construction of the ALWR plant. The operations workforce would be offset by the loss of the existing Units 1 and 2 operational workforce and any adverse impacts to housing, community services, and infrastructure would be SMALL.

Transportation

The NRC considered the traffic impact of the large construction workforce projected for CPNPP Units 3 and 4 to be SMALL to MODERATE (NRC 2011, Section 4.4.4.1). The operations workforce would be much smaller and would have a SMALL impact (NRC 2011, Section 5.4.4.1). The size of the construction and operational workforces for the ALWR alternative would be similar and would be expected to have similar traffic impacts.

7.2.3.1.10 Human Health

Impacts on human health from construction of an ALWR plant would be similar to those associated with a large industrial facility construction project. Compliance with OSHA worker protection rules would minimize occupational injuries. The NRC evaluated impacts on public and construction worker health from fugitive dust, occupational injuries, noise, and transport of materials and personnel to and from the site for construction and operation of Units 3 and 4, concluding that impacts would be SMALL, with the exception of noise, which could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF (NRC 2011, Sections 4.8.4 and 5.8). The NRC also determined that public and occupational radiological exposure would be well within exposure limits (NRC 2011, Sections 4.9.4, 5.9.3, and 5.9.4). The scale of the ALWR nuclear alternative would be similar and would be expected to have similar impacts to Units 3 and 4. Overall, the human health impacts of construction and operation would be SMALL.

7.2.3.1.11 Environmental Justice

Section 3.11.2 presents the minority and low-income population in the region surrounding the CPNPP site.

The NRC conducted an environmental justice review for Units 3 and 4. The review team found no evidence that the construction and pre-construction activities for CPNPP Units 3 and 4 or operation of the units would have any disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air. Section 3.11.2 of this ER presents that no block groups within a 6-mile radius meet the criteria for a minority population and the closest low-income block group that meets the guidance criteria for families is located 4.6 miles southeast of the CPNPP center point. Given the distance to the closest block group, onsite activities with impacts to soil, water, and air conducted under environmental permits that limit emissions and establish conditions that minimize impacts would not be expected to have disproportionate impacts. NRC also found the

impacts of construction and pre-construction activities and operations of Units 3 and 4 on most socioeconomic resources would not have disproportionately high and adverse effects on minority or low-income populations. (NRC 2011, Sections 4.5.4 and 5.5.4). Adverse socioeconomic impacts from additional pressure on local housing, community services, and infrastructure from a large workforce would be dispersed through the region rather than concentrated in specific locales. As discussed in Section 7.2.3.1.9, these adverse impacts would be small. Therefore, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of an ALWR alternative.

7.2.3.1.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the ALWR plant would be handled according to county, state, and federal regulations. and disposed at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the ALWR plant would result in nonhazardous, hazardous, SNF, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Vistra OpCo would continue the waste management, recycling, and waste minimization programs in place for the existing units. The nonradiological waste impacts from operations would be SMALL given Vistra OpCo's compliance with regulations, use of permitted facilities, and implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in permitted facilities in accordance with NRC, DOT, and state regulations. SNF would be managed onsite in accordance with NRC regulations. The NRC-licensed design and operation of SNF storage either in spent fuel pools or an ISFSI ensures that onsite storage would have small environmental effects. Therefore, environmental impacts associated with radioactive waste for the ALWR alternative is anticipated to be SMALL. Likewise, the NRC's assessment of CPNPP Units 3 and 4 also found waste management impacts to be small (NRC 2011, Sections 4.10, 5.10, and 6.1.6)

7.2.3.2 Small Modular Reactors Nuclear Alternative

This alternative consists of 44 small modular reactor (SMR) units (four clusters of units under a single control room) based on the 60-MWe gross size of the NuScale design and a 95 percent capacity factor (NuScale 2019a). The SMR plant would be sited within the CPNPP site using the same construction footprint considered for CPNPP Units 3 and 4. Like CPNPP Units 3 and 4, the SMR plant would have a closed-cycle cooling system using MDCTs with blowdown treated at in a BDTF to remove salt from the discharge. The source water for the cooling system would be the same as the existing units, SCR with makeup water from Lake Granbury. The discharge from the BDTF is assumed to be routed to Lake Granbury. Also, Vistra OpCo assumes no additional transmission corridors would need to be developed to support the SMR plant.

7.2.3.2.1 Land Use

As noted above, the SMR plant would be sited within the CPNPP site using the same construction footprint considered for CPNPP Units 3 and 4. The construction footprint for CPNPP Units 3 and 4 was 123 acres for the reactors west of the existing units, 152 acres for the MDCTs on the peninsula north of the existing units, and approximately 400 acres adjacent to the southern border for the BDTF with additional acreage for the discharge pipeline. This footprint is further described in Section 7.2.3.1.1 for the ALWR plant.

The land requirement for the SMR plant would be less than that of a conventional nuclear power plant (e.g., ALWR plant). One of the SMR design developers, NuScale, indicates that the land requirement of an SMR facility of 1,000 MWe is less than 20 percent of that required for a 1,000 MWe conventional nuclear plant (NuScale 2019b). The land required for the reactors would be expected to be less than that of the ALWR plant, potentially allowing some of the MDCTs to be located within the 123-acre area which was previously a large parking area supporting construction of the existing units. This would reduce the acreage that would be converted for industrial use. An SMR plant's reactors would not be assembled onsite, requiring a smaller construction workforce than that of a conventional nuclear power plant. A smaller workforce would have fewer offsite land use impacts for housing.

The land use impacts for an SMR plant would be similar to and bounded by those of the ALWR plant presented in Section 7.2.3.1.1, SMALL for construction and SMALL to MODERATE for operations.

7.2.3.2.2 Visual Resources

Containment structures for SMR units are not as tall as conventional nuclear containment structures. The NuScale design's containment structure is 76 feet in height (NuScale 2019a). The MDCTs would be constructed on the adjacent peninsula north of the existing plant in an area of Ashe juniper woodland-savanna and mixed hardwood forest (NRC 2011, Section 4.3.1.1), expanding the industrial appearance of the plant. The MDCTs would have a low profile compared to natural draft parabolic cooling towers and would not be expected to extend the distance at which the plant would be visible. The visual resources impact for the reactors and MDCTs would be similar to that of the existing generating units and SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area. However, the hilly topography of the area would reduce the visibility of the plant features. Overall, visual impact of this alternative would be SMALL.

7.2.3.2.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and managed in accordance with regulatory requirements and BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) which would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for excavation and

earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

Air quality impacts from operation would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions.

As discussed in Section 7.2.3.1.3, the MDCTs would have air emission and atmospheric effects from drift and plumes. These emissions would be similar to those of the ALWR plant.

Air quality impacts would be similar to and bounded by those of the ALWR plant described in Section 7.2.3.1.3, SMALL.

7.2.3.2.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. Projected noise levels from most construction activities at the site boundary would have levels below the 60 to 65 dBA range of acceptable Ldn noise levels set by HUD. The sound would be attenuated by the surrounding buildings and structures and distance to the site border. Construction activities resulting in offsite sound levels above this range would be temporary. The level of onsite construction and the duration of construction activities would be less for an SMR plant than a conventional nuclear power plant. The NRC concluded the impacts of noise from building activities at the CPNPP site for CPNPP Units 3 and 4 would be minimal and would not warrant mitigation (NRC 2011, Section 4.4.1.5).

Noise sources associated with operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. The operating SMR facility would have noise sources and levels not unlike those of the existing operating units and they would attenuate over the distance to the site boundary. Many of these noise sources are confined indoors or would be infrequent. Noise from a cooling tower is generally from motors, fans, and cascading water. The Units 3 and 4 MDCTs were estimated to have noise levels of 55 decibels adjusted 1,000 feet from the towers, while the receptors of concern are more than 4,400 feet away (NRC 2011, Section 5.4.1.5). Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, construction and operations-related noise impacts would be SMALL.

7.2.3.2.5 Geology and Soils

The impacts to geology and soils from construction of a conventional nuclear power plant is described in the FEIS for CPNPP Units 3 and 4 (NRC 2011) and summarized in Section 7.2.3.1.5 for the ALWR plant. Site preparation and construction would require the removal and

redistribution of several hundred cubic yards of rock and overburden soil material. Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not damage geologic formations at the site. Through compliance with permit conditions, adherence to stormwater regulations, and application of erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from the SMR units would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.2.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of an SMR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water. In addition, construction would require minimal dewatering of excavations. The water demand for construction of an SMR plant would be bounded by that of the ALWR plant given that the SMR plant would require less onsite construction. Potable water needs for human consumption, sanitary needs, fire protection, and concrete batch plant operations would be meet by municipal supply. The excavations would be expected to require minimal dewatering based on the construction of the existing units and no other groundwater withdrawals are expected for construction. Groundwater and surface water use impacts from construction would be SMALL.

Operations water use would primarily be for cooling water makeup. Cooling water would be drawn from the SCR with the reservoir's intake being on Lake Granbury as for the existing units. The cooling water withdrawals as well as the makeup water demand would be similar to that of the ALWR plant. Like during construction, potable water demand would be met by municipal supply. Cooling water withdrawals and water consumption impacts would be similar to the ALWR plant and impacts would be similar to that presented in Section 7.2.3.1.6, SMALL to MODERATE. No groundwater use is expected.

Construction of the SMR nuclear plant, cooling towers, and connections with existing infrastructure could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Through compliance with permit conditions, adherence to stormwater regulations, and application of SWPPP mitigation and BMPs, construction-related impacts on surface water quality would be SMALL.

The SMR plant would treat blowdown from the MDCTs in the BDTF and discharge would be routed to Lake Granbury. The effluent would comply with Texas surface water quality standards. The discharge's dissolved solids concentration in compliance with standards would be higher than the average total dissolved solids concentration in Lake Granbury, resulting in a small net increase in the total dissolved solids concentration in the reservoir and downstream. Under low-flow conditions, elevated concentrations of dissolved solids would temporarily reduce the suitability of the water for various uses.

The SMR plant would operate in compliance with a TPDES permit, an industrial stormwater permit, and have spill prevention and response procedures in place, minimizing impacts to groundwater and surface water quality. The potential impacts to ambient water conditions and downstream users from increased dissolved solids, particularly during low-flow conditions would be noticeable. The overall impact to surface water would be SMALL to MODERATE.

7.2.3.2.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The ecological setting at CPNPP is presented in Section 3.7 and the NRC's previous assessment of ecological impacts from construction and operation of CPNPP Units 3 and 4 is summarized in Section 7.2.3.1.7. The SMR alternative would require less acreage for the reactor units, which could result in less clearing of Ashe juniper woodland-savanna on the peninsula for the MDCTs if one or two banks of cooling towers could be located next to the reactors. Therefore, the terrestrial ecology impact of the SMR could be less than that of the ALWR plant, but nevertheless bounded by the ALWR plant's impacts. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to develop any mitigation plans, with a focus on threatened and endangered species. The impact of the SMR alternative to terrestrial ecology would be SMALL to MODERATE for construction. The SMR plant would be supported with the BDTF, which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts of the SMR alternative attributable to operations would be SMALL.

Aquatic

Like for the ALWR plant, a new intake structure for the SMR plant would be constructed on SCR, but the existing intake at Lake Granbury would be used for the SMR plant. For discharge from the BDTF, new piping would be installed including along the Lake Granbury shore and construction of a new discharge structure in Lake Granbury. As mentioned above, in Section 7.2.3.2.6, the surface water demand and consumption would be similar to the ALWR plant. Given the use of the same source water and use of the BDTF for both the ALWR and SMR plants, the discharge effluent characteristics would be similar as well. Therefore, the aquatic resource impacts would be similar for both alternatives, SMALL for construction and SMALL to MODERATE for operations, and are described in Section 7.2.3.1.7.

Special Status Species

As presented in Section 3.7.8, no protected aquatic species are found in SCR. Protected terrestrial species have been observed onsite at the SCR. The state-listed white-faced ibis has been observed onsite at the SCR and suitable habitat exists along the SCR. Suitable onsite habitat also exists for the bald eagle, and the species has been observed within the vicinity. The federally and state-listed golden-cheeked warbler and the state-listed THL have the potential to occur onsite; however, none were observed during previous surveys undertaken for Units 3 and

4. The whooping crane and interior least tern have the potential to occur onsite because of the presence of suitable habitat, but none have been observed in the vicinity.

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to determine the presence or absence of protected species. Construction of the SMR alternative would require permanent removal of Ashe juniper woodland-savanna onsite, potentially suitable habitat for the golden-cheeked warbler and the THL. If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures would be included in site procedures and programs to minimize impacts to the species. No additional habitat removal would be expected to occur during operations. Given the potential for permanent removal of suitable habitat that is abundant in the vicinity, the SMR alternative MAY AFFECT, but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

7.2.3.2.8 Historic and Cultural Resources

The SMR plant would be located within the same construction footprint evaluated for CPNPP Units 3 and 4. Therefore, the APE for impacts to historic and cultural resources would be the same. There were no NRHP-listed or eligible archaeological sites, NRHP-listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. At the time, the license for Units 3 and 4 was reviewed, NRHP-listed or eligible historic sites in the surrounding area were located at least 5 miles from the APE. (Luminant 2013b, Section 4.1.3.1) Since issuance of the CPNPP Units 3 and 4 FEIS, two additional properties in the surrounding area were subsequently listed on the NRHP, with both being more than 4.5 miles from CPNPP (Table 3.8-4). Further, as indicated for Units 3 and 4, Vistra OpCo would monitor land-disturbing activities during construction to identify potential cultural resources not previously recorded, and in the event of an inadvertent find, stop work and notify the SHPO. Because no cultural or historic sites were within the APE and Vistra OpCo planned to monitor land disturbance activities, the NRC concluded for Units 3 and 4 that construction impacts would be small. Given that cultural resources are outside of the APE, historic properties are at least 4.5 miles away from the APE, and the potential visual impact to the traditional cultural properties would be similar to the existing units, there would be NO EFFECT to historic and cultural resources.

7.2.3.2.9 Socioeconomics

Socioeconomic Issues other than Transportation

As discussed in Section 7.2.3.1.9, the NRC reviewed the socioeconomic impacts of construction and operating CPNPP Units 3 and 4 and the impacts for construction and operating an SMR alternative would be similar. The construction workforce for a SMR plant would be smaller because the reactors are modular units and not constructed onsite. The operations workforce would be similar to the ALWR plant. Therefore, the socioeconomic impacts would be similar to those of the ALWR plant described in Section 7.2.3.1.9, MODERATE to LARGE in Somervell and Hood counties and beneficial with adverse socioeconomic impacts from increased use and demand for community services and infrastructure being SMALL.

Transportation

The construction workforce for an SMR plant would be smaller than that for an ALWR plant and the operations workforce would be similar. Therefore, the socioeconomic impacts would be bounded by those of the ALWR plant described in Section 7.2.3.1.9, SMALL to MODERATE for construction and SMALL for operations.

7.2.3.2.10 Human Health

Impacts on human health from construction of an SMR plant would be similar to those associated with a large industrial facility construction project, including an ALWR plant. Worker safety would be addressed by following the OSHA worker protection standards. Operation of a SMR plant would also have similar impacts to that of an ALWR plant. Therefore, the human health impacts described for the ALWR plant in Section 7.2.3.1.10, SMALL, are applicable to the SMR alternative.

7.2.3.2.11 Environmental Justice

The NRC conducted an environmental justice review for Units 3 and 4. The review team found no evidence that the construction and pre-construction activities for CPNPP Units 3 and 4 or operation of the units would have any disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air. Similarly, the impacts of construction and pre-construction activities and operations on most socioeconomic resources would not have disproportionately high and adverse effects on minority or low-income populations. (NRC 2011, Sections 4.5.4 and 5.5.4). Likewise, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a SMR plant.

Impacts on minority or low-income populations from construction and operation of a SMR plant would be similar to and bounded by those of the ALWR alternative as discussed in Section 7.2.3.1.11. No disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a SMR plant.

7.2.3.2.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the SMR plant would be handled according to county, state, and federal regulations, and disposed of at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the SMR plant would result in nonhazardous, hazardous, SNF, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Vistra OpCo would implement recycling and waste minimization programs that would reduce waste volumes. The nonradiological waste impacts from operations would be SMALL given Vistra OpCo's compliance with regulations, use of permitted facilities, implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in permitted facilities in accordance with NRC, DOT, and state regulations. SNF would be managed onsite in

accordance with NRC regulations. Therefore, environmental impacts for the SMR alternative associated with radioactive waste would be SMALL.

7.2.3.3 Natural Gas-Fired Generation

A NGCC plant would consist of multiple combustion turbines, a heat recovery steam generator, and a steam turbine generator. Based on a capacity factor of 87 percent (EIA 2021a), the NGCC plant would have a design capacity of 2,828 MWe (gross) of generation to replace the current 2,460 MWe provided by CPNPP. The NGCC plant would use the same construction footprint considered for CPNPP Units 3 and 4. Like CPNPP Units 3 and 4 and the ALWR and SMR alternatives, the NGCC plant would have a closed-cycle cooling system using MDCTs with blowdown treated in a BDTF to remove salt from the discharge. The source water for the cooling system would be the same as the existing units, SCR with makeup water from Lake Granbury. The discharge from the BDTF would be routed to Lake Granbury. Also, Vistra OpCo assumes no additional transmission corridors would need to be developed to support the NGCC plant. An existing natural gas transmission line transverses north-south on the CPNPP site and is located along the transmission corridor along CPNPP's EAB (USDOT 2021). Another natural gas pipeline transverses the CPNPP site east-west in Hood County (USDOT 2021). This east-west natural gas pipeline potentially could also supply the NGCC alternative and utilize the existing north-south corridor to connect to the NGCC alternative plant. Therefore, it is assumed that a short natural gas pipeline would have to be installed utilizing existing pipelines and/or corridors to supply the NGCC alternative plant.

7.2.3.3.1 Land Use

As mentioned above, the NGCC plant would be within the same construction footprint considered for CPNPP Units 3 and 4. The CPNPP Units 3 and 4 construction footprint was 123 acres for the reactors west of the existing units, 152 acres for the MDCTs on the peninsula north of the existing units, and approximately 400 acres adjacent to the southern border for the BDTF with additional acreage for the discharge pipeline. The footprint is further described in Section 7.2.3.1.1 for the ALWR plant.

The land requirement for the NGCC plant would be less than that of a conventional nuclear power plant (e.g., ALWR plant). Based on a land need factor of 0.02 m2/MWh (NETL 2010a), the NGCC plant would require approximately 122 acres, potentially allowing the MDCTs to be located within the 123-acre area which was previously a large parking area supporting construction of the existing units. This would reduce the acreage that would be converted for industrial use. The NGCC would also require land for a BDTF, but the cooling water demand for a NGCC plant would be less than a nuclear power plant; thus, the acreage needed for the BDTF's evaporation ponds would be less. The workforce required to construct the NGCC would be less than that required for a nuclear power plant and the construction duration would be shorter as well. Thus, the offsite land use impacts for housing would be less.

As discussed in Section 7.2.3.1.1, the use of this land would not be affected by zoning regulations. The development of the BDTF would convert land including prime farmland to

industrial use. Given the land needed for the NGCC would be less than an ALWR plant, the land use impact would be bounded by the ALWR presented in Section 7.2.3.1.1, SMALL for construction. The BDTF would deposit salt on the surrounding acreage, but because less cooling water would be needed for a NGCC than a nuclear power plant, it is assumed that the equipment and location of sprayers and evaporation could be optimized to eliminate deposition on the adjacent residential property, allowing the overall impact to land use for operations to be SMALL.

7.2.3.3.2 Visual Resources

The NGCC plant would alter the visual landscape. The tallest structures would be the 150-foot-high auxiliary boiler and two heat recovery steam generator stacks, as well as the 100-foot-high steam turbine building. Some portion of these structures would likely be visible for 1 mile or more. There would be more lighting visible across the night landscape. The gas pipeline compressors also would be visible. (NRC 2011, Section 9.2.3.2.3.2). The MDCTs would also have a lower profile than a natural draft parabolic cooling tower. The visual resources impact for the NGCC units and MDCTs would be similar to that of the existing generating units, SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area. However, the hilly topography of the area would reduce the visibility of the plant features. Overall, visual impact of this alternative would be SMALL.

7.2.3.3.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and managed in accordance with regulatory requirements and BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for excavation and earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

The operational NGCC plant would be equipped with air pollution controls to ensure compliance with air quality regulations. Emission estimates for the NGCC plant based on EPA AP-42 10 emission factors are shown in Table 7.2-1.

The NGCC plant would qualify as a new major source of criteria pollutants and would be subject to the CAA prevention of significant deterioration air quality review. Therefore, the plant would have to comply with the new source performance standard for NGCC plants set forth in 40 CFR Part 60 Subpart KKKK and 40 CFR Part 60 Subpart TTTT. The plant would also qualify as a

major source because of its potential to emit more than 100 tons per year of criteria pollutants. The plant would be required to obtain a Title V operating permit.

The NGCC plant would be subject to the national emission standards for HAPs for stationary combustion turbines if the plant was a major source of HAPs, having the potential to emit 10 tons per year or more of any single HAP or 25 tons per year or more of any combination of HAPs [40 CFR 63.6085(b)].

A new NGCC plant would also have to comply with Title IV of CAA [42 USC 7651] reduction requirements for SO_2 and NO_x, which are the main precursors of acid rain and the major causes of reduced visibility. As discussed in Section 7.2.3.1.3, the MDCTs would have air emission and atmospheric effects from drift and plumes. These emissions would be similar to those of the ALWR plant. A new NGCC plant would be a major source of criteria pollutants and GHGs. Compliance with existing air quality regulations would ensure air quality impacts are minimized. Therefore, the operations-related impacts on air quality under the NGCC plant alternative would be MODERATE.

7.2.3.3.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. As mentioned above, the NGCC plant would be within the same construction footprint considered for CPNPP Units 3 and 4. For CPNPP Units 3 and 4, the NRC projected noise levels from most construction activities at the site boundary below the 60 to 65 dBA range of acceptable Ldn noise levels set by HUD, and the sound would be attenuated by the surrounding buildings and structures and distance to the site border. Construction activities resulting in offsite sound levels above this range would be temporary. The noise sources would be similar for construction of a NGCC plant, but the duration of construction activities would be shorter and, as presented in Section 7.2.3.3.1, the acreage that would need to be cleared for the NGCC alternative would also be less. The NRC concluded the impacts of noise from building activities at the CPNPP site for CPNPP Units 3 and 4 would be minimal and would not warrant mitigation (NRC 2011, Section 4.4.1.5).

Noise impacts associated with plant operations would include noise from transformers, turbines, pumps, compressors, exhaust stack, combustion inlet filter house, condenser fans, the mechanical draft cooling towers, high-pressure steam piping, and loudspeakers. The sound would attenuate over the distance to the site border. Noise from a cooling tower is generally from motors, fans, and cascading water. The Units 3 and 4 MDCTs were estimated to have noise levels of 55 decibels adjusted 1,000 feet from the towers, while the receptors of concern are more than 4,400 feet away (NRC 2011, Section 5.4.1.5). Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, construction and operations-related noise impacts would be SMALL.

7.2.3.3.5 Geology and Soils

The impacts to geology and soils from construction of a conventional nuclear power plant is described in the FEIS for CPNPP Units 3 and 4 (NRC 2011) and summarized in Section 7.2.3.1.5 for the ALWR plant. Site preparation and construction of NGCC plant would require the removal and redistribution of several hundred cubic yards of rock and overburden soil material. Construction-related impacts to geology would be minimal as the excavation associated with plant installation should not damage geologic formations at the site. Through compliance with permit conditions, adherence to stormwater regulations, and application of erosion control and stormwater management SWPPP mitigation and BMPs, construction-related impacts on geology and soils would be SMALL.

Operations-related impacts on geology and soils from the NGCC plant would be minimized by adherence to the industrial site SWPPP. Operations-related impacts would be SMALL.

7.2.3.3.6 Hydrology (Surface Water and Groundwater)

Water needs for construction of NGCC plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water. In addition, construction would require minimal dewatering of excavations. The water demand for construction of a NGCC plant would be bounded by that of the ALWR plant given that the NGCC plant would require less onsite construction, have a shorter construction duration, and require less land clearing. Potable water needs for human consumption, sanitary needs, fire protection, and other construction activities would be met by municipal supply. The excavations would be expected to require minimal dewatering based on the construction of the existing units, and no other groundwater withdrawals are expected for construction. Groundwater and surface water use impacts from construction would be SMALL.

Operations water use would be primarily for cooling water makeup. Cooling water would be drawn from the SCR with the reservoir's intake being on Lake Granbury as for the existing units. The cooling water withdrawals as well as the makeup water demand would be bounded by that of the ALWR plant. Cooling water demand for NGCC plants is lower than for conventional nuclear power plants. The NGCC plant would have water withdrawals of approximately 7,100 gpm and consume approximately 6,100 gpm based on the water use factors developed by the National Energy Technology Laboratory (NETL) of 0.15 gallons per kilowatt hour (gal/kWh) for withdrawals and 0.13 gal/kWh for consumption (NETL 2010b, Appendix D). Withdrawals for Units 3 and 4 were estimated at approximately 63,000 gpm and consumption was estimated at approximately 38,200 gpm (NRC 2011) and concluded by the NRC to be a moderate impact. The NETL set water usage factors for conventional recirculating nuclear power plants at 1.101 gal/kWh and 0.624 gal/kWh for withdrawals and consumption, respectively (NETL 2010b). As during construction, potable water demand during operation would be met by municipal supply. Given the much lower estimated water consumption for the NGCC alternative, the surface water impact would be SMALL. No groundwater use is expected.

Construction of the NGCC plant, cooling towers, and connections with existing infrastructure could result in erosion and sediment. A construction stormwater permit would be obtained for the construction activities and adherence to the permit conditions and required BMPs would mitigate impacts to surface water resources. Through compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs, construction-related impacts on surface water quality would be SMALL.

The NGCC plant would treat blowdown from the MDCTs in the BDTF and would be routed to Lake Granbury. The effluent would comply with Texas surface water quality standards. The discharge's dissolved solids concentration in compliance with standards would be higher than the average total dissolved solids concentration in Lake Granbury, resulting in a small net increase in the total dissolved solids concentration in the reservoir and downstream. Under low-flow conditions, elevated concentrations of dissolved solids would temporarily reduce the suitability of the water for various uses.

The NGCC plant would operate in compliance with a TPDES permit, an industrial stormwater permit, and have spill prevention and response procedures in place, minimizing impacts to groundwater and surface water quality. The potential impacts to ambient water conditions and downstream users from increased dissolved solids, particularly during low-flow conditions was determined to be moderate for Units 3 and 4 (NRC 2011); given the NGCC would require less cooling water, the amount of dissolved solids discharged would be less, but the concentration could be similar and thus the impact could still be noticeable. The overall impact to surface water would be SMALL to MODERATE.

7.2.3.3.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The ecological setting at CPNPP is presented in Section 3.7 and the NRC's previous assessment of ecological impacts from construction and operation of CPNPP Units 3 and 4 is summarized in Section 7.2.3.1.7 regarding the ALWR plant. The NGCC plant would require less acreage, resulting in less clearing of Ashe juniper woodland-savanna. Therefore, the terrestrial ecology impact of the NGCC could be less than that of the ALWR plant, but nevertheless bounded by the ALWR plant's impacts. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys to develop any mitigation plans, with a focus on threatened and endangered species. The impact to terrestrial ecology would be SMALL to MODERATE for construction. The NGCC plant would be supported with the BDTF, which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat. With the impacts to terrestrial ecology being nearly all attributable to land clearing and habitat removal during construction, the impacts attributable to operations would be SMALL.

Aquatic

Like for the ALWR plant, a new intake structure for the NGCC plant would be constructed on SCR, but the existing intake at Lake Granbury would be used for the NGCC plant. Discharge

from the BDTF would be to Lake Granbury. As noted in Section 7.2.3.3.6, the surface water demand and consumption would be much less than a conventional nuclear power plant. Given the use of the same source water and use of the BDTF for both the ALWR and NGCC plants, the discharge effluent characteristics would be similar as well, but with overall less flow. Therefore, the aquatic resource impacts would be similar for both alternatives, SMALL for construction and SMALL to MODERATE for operations, and are bounded by those described in Section 7.2.3.1.7 for the ALWR alternative.

Special Status Species

As presented in Section 3.7.8, no protected aquatic species are found in SCR. Protected terrestrial species have been observed onsite at the SCR. The state-listed white-faced ibis has been observed onsite at the SCR and suitable habitat exists along the SCR. Suitable onsite habitat also exists for the bald eagle, and the species has been observed within the vicinity. The federally and state-listed golden-cheeked warbler and the state-listed THL have the potential to occur onsite; however, none were observed during previous surveys undertaken for Units 3 and 4. The whooping crane and interior least tern have the potential to occur onsite because of the presence of suitable habitat, but none have been observed in the vicinity.

Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species. Construction of the NGCC alternative would require permanent removal of Ashe juniper woodland-savanna onsite, potentially suitable habitat for the golden-cheeked warbler and the THL. If golden-cheeked warblers or suitable habitat were found onsite, the appropriate management measures would be included in site procedures and programs to minimize impacts to the species. No additional habitat removal would be expected to occur during operations. Given the potential for permanent removal of suitable habitat that is abundant in the vicinity, the NGCC alternative MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

7.2.3.3.8 Historic and Cultural Resources

The NGCC plant would be located within the same construction footprint as evaluated for CPNPP Units 3 and 4. Therefore, the APE for impacts to historic and cultural resources would be the same. There were no NRHP-listed or eligible archaeological sites, NRHP-listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. At the time, the license for Units 3 and 4 was reviewed, NRHP-listed or eligible historic sites in the surrounding area were located at least 5 miles from the APE. (Luminant 2013b, Section 4.1.3.1). Since issuance of the CPNPP Units 3 and 4 FEIS, two additional properties in the surrounding area were subsequently listed on the NRHP, with both being more than 4.5 miles from CPNPP (Table 3.8-4). Further, as indicated for Units 3 and 4, Vistra OpCo would monitor land-disturbing activities during construction to identify potential cultural resources not previously recorded and in the event of an inadvertent find, stop work and notify the SHPO. Because no cultural or historic sites were within the APE and Vistra OpCo planned to monitor land disturbance activities, the NRC concluded for Units 3 and 4 that construction impacts would be small. Given that cultural resources are outside of the APE, historic properties are at least

4.5 miles away from the APE, and the potential visual impact to the traditional cultural properties would be similar to the existing units, there would be NO EFFECT to historic and cultural resources.

7.2.3.3.9 Socioeconomics

Socioeconomic Issues other than Transportation

As discussed in Section 7.2.3.1.9, the NRC reviewed the socioeconomic impacts of construction and operating CPNPP Units 3 and 4 and concluded that the impacts for construction and operating would be MODERATE to LARGE in Somervell and Hood counties and beneficial with adverse socioeconomic impacts from increased use and demand for community services and infrastructure being SMALL. The impact of construction of a NGCC plant would be less because the construction workforce and construction duration would be less. The beneficial socioeconomic impact of construction is likely to be noticeable (i.e., MODERATE) in Somervell and Hood counties with impacts on community services and infrastructure being SMALL. The operating NGCC plant would have similar beneficial socioeconomic impacts to Somervell and Hood counties from tax payments as the current units and projected for CPNPP Units 3 and 4 MODERATE to LARGE.

Transportation

The construction and operations workforce for an NGCC plant would be smaller than an ALWR plant. Therefore, the socioeconomic impacts of the NGCC alternative would be bounded by those of the ALWR plant described in Section 7.2.3.1.9, SMALL to MODERATE for construction and SMALL for operations.

7.2.3.3.10 Human Health

Impacts on human health from construction of an NGCC plant would be similar to those associated with a large industrial facility construction project, including an ALWR plant. Worker safety would be addressed by following the OSHA worker protection standards. Operation of an NGCC plant would also have similar impacts to that of an ALWR plant. Therefore, the human health impacts described for the ALWR plant in Section 7.2.3.1.10, SMALL, are applicable to the NGCC alternative.

Impacts resulting from the operation of the NGCC plant would primarily be from air pollutant emissions. The NGCC plant would emit criteria air pollutants (Table 7.2-1). Some pollutants, such as NO_x, contribute to ozone formation, which can create health problems. These criteria pollutants are regulated, and technology will be installed in the plant to limit the criteria air pollutant releases. Plant operation human health impacts would also be avoided and minimized from adherence to safety standards. The NGCC plant required to replace CPNPP would be larger than the typical NGCC plant (Leidos 2016); therefore, with application of pollutant controls and compliance with air quality standards, operations-related impacts to human health under the NGCC alternative would be SMALL to MODERATE.

7.2.3.3.11 Environmental Justice

The NRC conducted an environmental justice review for Units 3 and 4. The review team found no evidence that the construction and pre-construction activities for CPNPP Units 3 and 4 or operation of the units would have any disproportionately high and adverse human health or environmental effects on minority or low-income populations through the pathways of soil, water, and air. Similarly, the impacts of construction and pre-construction activities and operations on most socioeconomic resources would not have disproportionately high and adverse effects on minority or low-income populations. (NRC 2011, Sections 4.5.4 and 5.5.4). Likewise, no disproportionately high and adverse effect on minority or low-income populations would be expected from the construction and operation of a NGCC plant. The activities associated with an operating NGCC plant would be similar to those occurring at CPNPP with the exception of air emissions, which would be subject to permit and regulatory restrictions.

7.2.3.3.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the NGCC plant would be handled according to county, state, and federal regulations. and disposed of at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

Operation of the NGCC plant would result in waste from spent catalytic reduction catalysts used to control nitrous oxide emissions. This waste stream is considered hazardous and would be disposed of at a facility that handles hazardous materials. Other waste generated at the site would be characterized as hazardous or nonhazardous. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Vistra OpCo would implement recycling and waste minimization programs that would reduce waste volumes. The nonradiological waste impacts from operations would be SMALL given Vistra OpCo's compliance with regulations, use of permitted facilities, and implementation of effective practices for waste minimization.

7.2.3.4 Combination Alternative

The combination alternative relies on renewables for approximately one-third of the generation with the remaining generation coming from natural gas. Renewables in current use by utilities (wind, solar, hydropower, biomass) require vast amounts of land for generation or fuel sources (Section 7.2.2). To replace the full 2,460 MWs provided by CPNPP with just renewables would require acreages far beyond that of a nuclear or natural gas alternative. The land use requirement of an all renewables alternative would make it an inappropriate comparative alternative to the proposed action, detracting from the purpose of this chapter of the ER as providing input to support NEPA decision-making Including natural gas generation in the combination minimizes land use conversion because: (1) the plant can be located at the CPNPP site, (2) existing natural gas pipelines in the proximity minimizes land conversion for pipelines, and (3) the abundant natural gas supply in Texas eliminates the need for more acreage to be converted for new natural gas wells. Continuing to use the CPNPP site for natural gas-fired generation continues to provide tax revenue and employment for Somervell County. Further, natural gas is a cleaner burning fuel than biomass fuels and would operate under strict emission

regulations in an attainment area (Section 3.3.3.1). The balanced combination alternative includes an NGCC plant at the CPNPP site, solar photovoltaic (PV) installations, and onshore wind installations. This combination of alternatives would provide the following generation:

- Configuration of NGCC units to provide approximately 1,600 MWe net (1,839 MWe gross) with MDCTs located at the CPNPP site.
- Three approximately 200-MWe solar installations located offsite in the ERCOT region with battery storage to make it baseload.
- Approximately 600 MWe supplied by wind development within the ERCOT region or imported into the ERCOT region.

To yield approximately 1,600 MWe net, the size of the NGCC plant component would be 1,839 MWe based on an EIA capacity factor of 0.87 (EIA 2021a). Like the NGCC in the discrete alternative, the combination alternative's NGCC plant would be within the same construction footprint considered for CPNPP Units 3 and 4. Like the ALWR, SMR, and NGCC alternatives, the combination alternative's NGCC plant would have a closed-cycle cooling system using MDCTs with blowdown treated at in a BDTF to remove salt from the discharge. The source water for the cooling system would be the same as the existing units, SCR with makeup water from Lake Granbury. The discharge from the BDTF is assumed to be routed to Lake Granbury. Also, Vistra OpCo assumes no additional transmission corridors would need to be developed to support the NGCC plant. A short natural gas pipeline would have to be installed to connect to the existing natural gas pipeline located along the CPNPP's EAB.

Each offsite solar installation would be supported with onsite lithium-ion battery storage to provide a firm 200 MWe. Each of the three installations would be located within the ERCOT region. The installations would require transmission connections to the regional grid.

The wind component would be in west Texas, where seasonal wind capacity factors exceed 80 percent (ERCOT 2018). An annual capacity factor of 50 percent is assumed based on annual wind capacity factors for 2018 (ERCOT 2018). No power storage would be provided. The wind installations would require transmission connections to the regional grid.

The approximately 900 MWe to be provided to the grid by wind and solar installations located offsite would require transmission connections to the regional grid and could require additional transmission lines in new corridors. Without identifying exact site locations for the solar and wind installations, the need for and potential alignment of transmission lines cannot be determined. The CPNPP Units 3 and 4 FEIS (NRC 2011, Section 4.1.2) considered an offsite transmission system of five 345-kV circuits, three using vacant circuit positions on existing lines, not requiring any additional ROW or tower construction, and development of two new transmission lines. The new transmission lines would require clearing and development of 160-foot-wide corridors, 17 and 45 miles in length. One of the new transmission lines considered was to be located in close proximity to Dinosaur Valley State Park and cross the Fossil Rim Wildlife Center. Given that the CPNPP Units 3 and 4 FEIS considered the development of 62

miles of new high voltage transmission lines and one with development that could impact conservation resources, for purposes of assessing impacts of the combination alterative, the transmission line impacts determined for CPNPP Units 3 and 4 are assumed to be bounding.

7.2.3.4.1 Land Use

The NGCC component of the combination alternative yielding approximately 1,600 MWe would require a NGCC plant about 60 percent the size of the NGCC alternative. The combination alternative NGCC plant and the supporting MDCTs and BDTF would be sited within the same footprint, requiring less overall acreage. The plant would require clearing of a smaller acreage, reducing the impact of terrestrial habitat removal and less acreage of prime farmland. Therefore, the land use impacts for the NGCC plant component would be bounded that of the NGCC alternative described in Section 7.2.3.3.1 and would be SMALL for construction and operation.

Utility-scale solar facilities use relatively large areas of land to generate electricity. Luminant developed a 180-MWe solar installation with battery storage, Upton 2, on nearly 1,900 acres in Upton County, Texas (Luminant 2018b). Based on Upton 2, it is assumed that each of three 200-MWe solar installations would require approximately 2,000 acres. The solar installation would result in land use conversion to power generation. Vistra OpCo would avoid prime and unique farmland.

The DOE developed land use metrics for wind generation of 2.47 acres per MW for disturbed area. A further breakdown of this disturbed area is 0.74 acres per MW hosting permanent structures and supporting facilities such as transformers and access roads and 1.73 acres per MW for temporary land use to support construction. (DOE 2015). Based on these metrics, development of 600 MWe of wind power would have a construction footprint of 1,482 acres and a permanent footprint of 444 acres. Wind turbines are spaced for operation, so the wind installation encompasses many acres between the linked turbines. The acreage between the linked turbines typically continues to be used for farmland and other compatible purposes and therefore, would not necessarily result in land use conversion to power generation. To minimize impacts, Vistra OpCo would avoid disturbing prime and unique farmland.

The total acreage needed for development of 600 MWe of wind generation would require multiple installations. The DOE also considered the overall acreage of wind farm boundaries. Based on a 2009 study, wind farm boundaries encompassed approximately 85 acres per MW (DOE 2015). Using this metric, the 600 MWe of wind development would encompass 51,144 acres. Depending on the selected location, a wind installation may impact existing land use; however, as stated above, wind turbines are compatible with many land use categories and can be co-located and not require a conversion of land use other than the turbine's footprint. However, the number of land parcels and landowners that are often required to site a wind installation provides uncertainty with impacts to land use.

As discussed in Section 7.2.3.4, the impacts of developing transmission lines to support the solar and wind installations are assumed to be bounded by that of CPNPP Units 3 and 4. The NRC concluded the land use impact of the transmission lines would be MODERATE. This

conclusion is based primarily on the fact that one of the proposed transmission line corridors may pass through or close to the edge of Dinosaur Valley State Park and because development of pipelines and transmission lines could sever tracts of public and private property, including Fossil Rim Wildlife Center, and permanently interfere with land uses on some of those tracts. Overall, the land use impacts from the construction and operation of the combination alternative at multiple locations, avoiding prime and unique farmland would be MODERATE.

7.2.3.4.2 Visual Resources

Visual impacts from the NGCC plant component of the combination alternative would be essentially the same as those described for the discrete NGCC alternative in Section 7.2.3.3.2.

The solar installations would require large land areas. The solar panels could be visible to the public from offsite locations, depending on buffer areas or screening. The solar installations would be sited to comply with land zoning and any required buffers or screening.

The wind turbines of each wind installation would be visible from all directions and could be a large impact on the viewshed depending on the site selected. In addition, the rotating blades of wind turbines cast moving shadows on the ground or on structures, causing the phenomenon of shadow flicker. Shadow flicker is considered a nuisance rather than a human health hazard and the potential impact of shadow flicker can be mitigated by setback distances from structures, vegetative buffers, or the curtailment of the turbine during times of highest impact (DOE 2015).

Site selection would seek to minimize visual impacts and would avoid impacting scenic areas such as U.S. Congress-designated areas for protection of unique natural, cultural, and recreational values (e.g., national scenic and historic trails, national historic landmarks, scenic areas, recreation areas, preserves, and monuments). Avoiding impacts on the most scenic viewsheds would reduce the most significant visual impacts, allowing the impact to be noticeable but not destabilizing.

The turbines would be marked and lighted according to Federal Aviation Administration (FAA) guidelines, which call for painting the turbines and towers white or light gray, while making them highly visible to pilots from the air. Aviation red flashing, strobe, or pulsed obstruction lights would be mounted atop selected turbines and at the end of each turbine string or within and around the perimeter such that the gap between lights is no greater than 0.5 miles, allowing the entire facility to be perceived as a single unit by pilots flying at night. The specific location of aviation lighting and the operation of the lighting system would be determined in consultation with FAA. (FAA 2018)

The visible impact of the transmission lines for the solar and wind installations would not appear any different than existing transmission lines. Site selection would avoid scenic views and impacts to cultural resources. Mitigation measures to reduce impacts of shadow flicker would be implemented as appropriate. Overall, the visual impacts from the construction and operation of the combination alternative would range from SMALL to MODERATE.

7.2.3.4.3 Air Quality

The impacts on air quality due to construction and operation of the NGCC plant would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.3 and would be SMALL for construction related impacts and MODERATE for operational impacts. The estimated criteria air pollutant and CO_2 emissions are presented in Table 7.2-1.

Construction activities associated with the solar PV and wind installations would generate fugitive dust. Mitigation would be implemented via wetting of cleared areas and dirt roads to minimize the fugitive dust. Construction equipment and vehicles would also emit exhaust emissions. These emissions would be temporary and mitigation such as curtailing idling of vehicles would be implemented to minimize short-term air quality impacts. Construction emissions associated with the solar and wind components of the combination alternative would be SMALL. The solar and wind components of the combination alternative would not release any air emissions during operation.

Overall, the air quality impacts from the construction of the combination alternative would be SMALL and operations would be MODERATE for the NGCC component.

7.2.3.4.4 Noise

The construction and operation of the NGCC plant component of the combination alternative would have noise impacts similar to those described in the discrete NGCC plant alternative presented in Section 7.2.3.3.4 and would be SMALL.

Construction of each solar and wind installation would likewise have noise impacts similar to those described in the discrete NGCC plant alternative presented in Section 7.2.3.3.4 with a shorter duration. No noise impacts would occur from operation of a solar installation.

However, given the acreage of the solar installations and the potential need for land clearing and the number of turbines that would need to be installed, noise impacts would range from SMALL to MODERATE and be temporary for the duration of construction of each facility.

During operations, the wind turbines would emit sound. Turbine sound is typically one of the greatest nuisance impacts associated with wind power. The DOE addressed this concern with a review of the available data and research on impacts to human health, concluding that as of 2013, global peer-reviewed scientific data and independent studies consistently concluded that sound from wind plants has no direct impact on physical human health. (DOE 2015)

Overall, construction-related noise impacts associated with combination alternative is dependent on the site selected and proximity to residents and other sensitive receptors and would range from SMALL to MODERATE. Operations-related noise impacts associated with the combination alternative would be SMALL.

7.2.3.4.5 Geology and Soils

The impact on geology and soils due to construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.5 and would be SMALL.

Construction impacts to geology and soils resulting from the construction of the solar and wind installations and supporting transmission lines would primarily be impacts to soils from clearing and grubbing. These temporary soil impacts would be minimized by implementation of BMPs. Geological impacts would be minor, as any gravel or stone used in the construction of roads and infrastructure would be sourced from local businesses that sell materials sourced from local quarries. During operations, the solar and wind installations would be required to have a TPDES construction stormwater permit and comply with TCEQ regulations to control stormwater runoff.

Overall, the geology and soil impacts from the construction and operation of the combination alternative would be SMALL.

7.2.3.4.6 Hydrology (Surface Water and Groundwater)

The impact on surface water and groundwater use and quality due to constructing and operating the NGCC plant component would be similar to that associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.6 and would be SMALL for construction and SMALL to MODERATE for operation due to the BDTF discharge.

Construction of the solar and wind installations and their supporting transmission lines would require water for dust suppression, equipment washing, and sanitary systems. The solar and wind installation would not have process water needs for operation, but water would be needed for periodically washing the solar panels. The water demand could be meet by municipal supply available at the site, trucked in portable water, or onsite or nearby surface or groundwater resources. Vistra OpCo would utilize the most practical supply and comply with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction of the solar and wind installations. These temporary soil impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Groundwater would be protected through the implementation of SWPPP and spill prevention measures. Once in operation, Vistra OpCo would operate the installations in compliance with stormwater regulations. The use and water quality impacts for both surface water and groundwater resources associated with the construction and operation of the solar and wind installations would be SMALL.

Overall, the impacts to surface water resources from the construction of the combination alternative would be SMALL and operations would be SMALL to MODERATE primarily for the potential for impacts from the NGCC component. Overall, the impacts to groundwater resources for the combination alternative would be SMALL.

7.2.3.4.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The NGCC plant component of the combination alternative would be constructed within the same footprint as the discrete NGCC alternative, requiring clearing of terrestrial habitat. The impact on terrestrial resources due to construction and operation of the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.7 and would be SMALL to MODERATE for construction and SMALL for operations.

Terrestrial ecology impacts resulting from the construction of three solar installations would result from the approximately 2,000 acres of land development required for each. This development could occur at three separate sites and by applying siting criteria would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. Therefore, terrestrial ecology impacts associated with the solar component of the combination alternative would be SMALL to MODERATE given the large land requirement. No operational impacts to terrestrial ecological resources would occur from the solar component of the combination alternative.

The site selection process that would be used to select sites for the wind installations would have criteria to avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. Vistra OpCo would also follow USFWS guidance for land-based wind energy development and eagle conservation (USFWS 2012; USFWS 2013). The guidance focuses on "species of concern" and addresses loss and degradation/fragmentation of habitat.

The operation of the wind turbines could affect avian and bat species. Following USFWS guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species. Mortality rates for birds at land-based wind plants average between three and five birds per MW per year, and no plant has reported an average greater than 14 birds per MW per year, with common songbirds accounting for approximately 60 percent of all bird collision mortality (DOE 2015). Those mortality levels for the 61 gigawatt of wind capacity installed in 2013 at the time of DOE's study constitute a very small percentage, typically <0.02 percent, of the total populations of those songbird species. (DOE 2015) Using the annual average of five bird deaths per MW, operation of the wind component of the combination alternative would result in an estimated 3,000 bird deaths per year of operation.

The NRC assessed terrestrial ecology impacts from development of new transmission lines for CPNPP Units 3 and 4 (NRC 2011, Section 4.3.1.2) and determined the impacts to be minor given the actual area of disturbance and land types. As discussed in Section 7.2.3.4, the CPNPP Units 3 and 4 assessment is assumed to be bounding for purposes of considering the impacts for the solar and wind installations.

Overall, the ecological impacts to terrestrial species from the construction and operation of the combination alternative would be SMALL to MODERATE.

Aquatic

The NGCC component would use the same cooling water intake and discharge configuration as the discrete NGCC alternative. The combination alternative NGCC plant would be about 60 percent the size of the discrete alternative and therefore use less cooling water. The impact on aquatic resources due to constructing and operating the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.1.7. Given the about 40 percent less intake and discharge volume to impact aquatic resources, both construction and operations impacts would be SMALL.

No impacts to aquatic resources would result from the construction of the solar and wind components of the combination alternative due to the implementation of BMPs to control erosion and run-off. No operations-related impacts are associated with the solar and wind components of the combination alternative.

Therefore, the ecological impacts to aquatic species from the construction and operation of the combination alternative would be SMALL.

Special Status Species

The NGCC plant component of the combination alternative would be constructed within the same footprint as the discrete NGCC alternative, requiring clearing of terrestrial habitat that is suitable for the federally listed golden-cheeked warbler and state-listed THL. The impact on special status species due to constructing the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.7 and would be, MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT.

The site selection process that would be used to select sites for the solar and wind installations would have criteria to avoid locations whose development would impact special status species. As discussed above, Vistra OpCo would also follow USFWS guidance for land-based wind energy development focused on "species of concern" and eagle conservation.

Given avoidance, minimization, and mitigation measures, and compliance with applicable permits, each solar and wind installation MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT special status species.

7.2.3.4.8 Historic and Cultural Resources

The impact on historic and cultural resources due to constructing the NGCC plant component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.8 and would be NO EFFECT.

Development of solar and wind installations and supporting transmission lines could impact cultural resources, depending on the siting location. Impacts to historic and cultural resources could range from NO EFFECT to ADVERSE EFFECT, depending on the site.

7.2.3.4.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The construction and operation of the NGCC component of combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.9 and would be MODERATE for construction and MODERATE to LARGE beneficial for operation in Somervell and Hood counties.

The construction and operation of the solar and wind components and supporting transmission lines of the combination alternative would create fewer construction jobs than the NGCC plant. Any boost to the local economies would be short in duration, and socioeconomic impacts related to the construction of combination alternative would be SMALL.

The number of workers required to maintain each solar and wind installation would be small, and it would not result in a quantifiable impact on the local economy. If Vistra OpCo leased the property for the solar and wind installations, lease payments would be made the to property owners. The solar installations and the property occupied by the wind turbines could be taxed at a higher industrial rate than agricultural land, providing a tax benefit. The beneficial impact would be dependent on the tax base of the county, but the impact would likely be small. Therefore, the operations-related socioeconomic impacts under the solar and wind components of combination alternative would be SMALL.

Overall, the socioeconomic impacts from the construction and operation of the combination alternative would be SMALL for all counties except Somervell and Hood counties, where the impact would range from MODERATE to LARGE.

Transportation

Transportation impacts during the construction and operation of the NGCC plant would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.9 and would be SMALL to MODERATE during construction and SMALL during operation.

Transportation impacts during the construction of the solar and wind components of the combination alternative would be less than the impacts for any of the other alternatives presented. The construction workforce and equipment transported to the individual sites would be less than the amount required for the other alternatives. Traffic impacts associated with the operation of each solar and wind facility would not be quantifiable. Once the facility is in operation, very few employees would be required for facility operations. Therefore, transportation impacts for construction and operation under the solar and wind components of the combination alternative would be SMALL.

Overall, the transportation impacts associated with construction of the combination alternative would be SMALL for the solar and wind components and range from SMALL to MODERATE for the NGCC component. The impacts during operation would be expected to be SMALL for all the components of the combination alternative.

7.2.3.4.10 Human Health

Impacts on human health from construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.10 and would be SMALL for construction and SMALL to MODERATE for operations.

During construction of the solar and wind installations, worker safety would be addressed by following the OSHA worker protection standards. Therefore, construction-related impacts on human health under the solar and wind components of the combination alternative would be SMALL. As mentioned in Section 7.2.3.3.4, regarding wind turbine noise, the DOE concluded that sound from wind plants has no direct impact on physical human health. (DOE 2015) The transmission lines for solar and wind installations would be designed in compliance with NESC clearance requirements to protect the public from electric shock.

Therefore, the human health impacts associated with the construction of the combination alternative would be SMALL and range from SMALL to MODERATE for operations.

7.2.3.4.11 Environmental Justice

Potential impacts on minority and low-income populations from construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative discussed in Section 7.2.3.3.12.

Potential impacts on minority and low-income populations from the construction of solar and wind components of the combination alternative would primarily result from socioeconomic effects. Some minor environmental impacts would result during construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population under the combination alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects. The temporary increase in traffic on roads would likely result in some small impacts to traffic that could affect local minority and low-income populations.

Overall, the construction and operation of the combination alternative would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

7.2.3.4.12 Waste Management

Impacts on waste management from construction and operation of the NGCC component of the combination alternative would be similar to those associated with the discrete NGCC plant alternative presented in Section 7.2.3.3.12 and would be SMALL.

The construction of the solar and wind installations would create sanitary, construction, and industrial waste, although it would be in smaller quantities compared to the NGCC plant. This waste would be recycled, disposed of onsite, or shipped to an offsite waste disposal facility. The operation of each solar and wind installation is expected to generate very minimal waste from daily operations. The battery storage system at each solar installation would have to be replaced after several years of operation; however, much of the components are recyclable, minimizing the waste generation. Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL 2020). Wind turbine manufacturers are generally indicating that current designs have a 30-year lifespan (LBNL 2019). There would be significant waste generation upon decommissioning as there would be for decommissioning of a nuclear power plant. As a good environmental steward, Vistra OpCo would implement waste management practices to recycle or dispose of at an offsite waste disposal facility all waste generated at the installations. Therefore, waste management impacts from daily operations of the solar and wind installations would be SMALL.

Overall, the waste management impacts from the construction and operation of the combination alternative would be SMALL.

Table 7.2-1 Air Emissions Estimated for NGCC and Combination Alternatives

Emission	NGCC Alternative (estimated tons/year)[b]	Combination Alternative NGCC plant (estimated tons/year)[b]
Sulfur dioxide	258	168
NO_x [a]	985	641
Carbon monoxide	2,273	1,479
Particulate matter 10 microns	500	325
Nitrous oxide	227	148
Volatile organic compounds	159	104
Carbon dioxide	8,336,104	5,421,856

a. Assumes 90 percent reduction in emissions due to operation of air pollution control equipment (selective catalytic reduction).

b. Estimates based on EPA AP-42 emission factors. See formulas below.

Formulas and Sources

Annual gas consumption (ft^3)	Plant size in MWe x heat rate x 1,000 x (1/ heat content) x hours in a year						
Heat rate = 6,119 Btu/kWh (FPL 2020) Heat content of natural gas 2020 = 1,033 Btu/ft^3 (EIA 2021b)							
Annual MMBtu = (annual gas consumption x heat content)/1,000,000							
Emission factor for processed natural gas (lbs/MMBtu)	CO_2	NO_X	CO	PM	SO_2	VOC	N_2O
	110	0.13	0.03	0.0066	0.0034	.0.0021	0.003
Annual emissions (tons) = (emission factor) x (annual MMBtu)/2000							
Air emission factors (EPA 2000, Tables 3.1-1 and 3.1-2a)							

7.3 Alternatives for Reducing Adverse Impacts

7.3.1 Alternatives Considered

As noted in 10 CFR 51.53(c)(3)(iii), "The report must contain a consideration of alternatives for reducing adverse impacts, as required by 51.45(c), for all Category 2 license renewal issues in Appendix B to Subpart A of this part." A review of the environmental impacts associated with the Category 2 issues in Chapter 4 identified no significant adverse effects that would require consideration of additional alternatives. Therefore, Vistra OpCo concludes that the impacts associated with renewal of the CPNPP OLs would not require consideration of alternatives for reducing adverse impacts as specified in NRC Regulatory Guide 4.2, Revision 1 (NRC 2013a, Section 7.2). This determination assumes the existing mitigation measures discussed in Section 6.2 adequately minimize and avoid environmental impacts associated with operating CPNPP.

7.3.2 Environmental Impacts of Alternatives for Reducing Adverse Impacts

As determined in Chapter 4, no additional alternatives were considered by Vistra OpCo to reduce impacts.

8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF LICENSE RENEWAL WITH THE ALTERNATIVES

To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form . . . . [10 CFR 51.45(b)(3)]

The proposed action is renewal of the CPNPP Units 1 and 2 OLs, which would preserve the option to continue to operate CPNPP to provide reliable baseload power and meet Texas's future system generating needs throughout the proposed 20-year LR operating term. Chapter 4 provides analyses of the environmental impacts for the proposed action. The proposed action is compared to the no-action alternative, which includes both the termination of operations and decommissioning of CPNPP and reasonably foreseeable replacement of its baseload generating capacity. The termination of operations and decommissioning impacts are presented in the GEIS (NRC 2013a), Section 14.2.2, and decommissioning impacts are analyzed in the GEIS on decommissioning, NUREG-0586, Supplement 1 (NRC 2002). The energy alternatives component of the no-action alternative is described, and its impacts analyzed in Chapter 7.

Table 8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable for comparison purposes. Tables 8.0-2 and 8.0-3 provide a more detailed comparison. The environmental impacts compared in Tables 8.0-1, 8.0-2, and 8.0-3 are Category 1 and 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in an alternatives analysis.

In conclusion, there is no reasonable alternative that is environmentally preferable to the continued operation of CPNPP. All alternatives capable of meeting the needs currently served by CPNPP entail impacts greater than or equal to the proposed action of CPNPP LR. The continued operation of CPNPP would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of CPNPP will have a superior positive economic impact on Somervell County through tax revenues paid by Vistra OpCo for CPNPP. Continued employment of plant workers will continue to provide economic benefits to the surrounding communities This positive economic impact to Somervell County from the proposed action would be greater than the other generation alternatives.

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 1 of 3)

Impact Area[a]	Proposed Action	No-Action Alternative					
		Termination of Operations and Decommissioning	ALWR	SMR	NGCC Plant	Combination
Land Use	SMALL	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL	MODERATE
Visual Resources	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	SMALL	SMALL	SMALL (construction) MODERATE (operations)	SMALL (construction) MODERATE (operations)
Noise	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)
Geology and Soils	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Surface Water	SMALL	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)
Groundwater	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 2 of 3)

Impact Area[a]	Proposed Action	No-Action Alternative				
		Termination of Operations and Decommissioning	ALWR	SMR	NGCC Plant	Combination
Terrestrial	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE
Aquatic	SMALL	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL (construction) SMALL to MODERATE (operations)	SMALL
Special Status Species	NO EFFECT	[b]	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT
Historic and Cultural	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO EFFECT	NO EFFECT	NO EFFECT	NO ADVERSE EFFECT
Socioeconomics	SMALL	MODERATE to LARGE (termination) SMALL (decommissioning)	MODERATE to LARGE beneficial	MODERATE to LARGE beneficial	MODERATE to LARGE beneficial	SMALL beneficial for all counties except Somervell and Hood counties where the impact would range from MODERATE to LARGE beneficial

Table 8.0-1 Environmental Impacts Comparison Summary (Sheet 3 of 3)

Impact Area[a]	Proposed Action	No-Action Alternative					
		Termination of Operations and Decommissioning	ALWR	SMR	NGCC Plant	Combination
Transportation	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)	SMALL to MODERATE (construction) SMALL (operations)
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL (construction) SMALL to MODERATE (operations)
Environmental Justice	No disproportionately high and adverse effects	[b]	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects
Waste Management	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

a. As defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3:
SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. NUREG-0586 Supplement 1 (NRC 2002), the decommissioning GEIS, identifies this resource area as requiring a site-specific analysis based on site conditions at the time of decommissioning, as well as the proposed decommissioning method and activities. Decommissioning CPNPP would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time and analysis of special status species and/or their habitat(s), a consideration of their presence or their habitats' presence, and an environmental justice analysis of the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by minority or low-income populations as determined by the most recent USCB decennial census data when the alternative is implemented. Thus, Vistra OpCo cannot forecast a level of impact for this resource area without unreasonable speculation.

Table 8.0-2 Alternatives Features Comparison Summary (Sheet 1 of 2)

	ALWR	SMR	NGCC Plant	Combination
Summary of Alternative	Two-unit nuclear plant to yield 2,460 MWe (net) (Section 7.2.3.1).	Four clusters of SMR units (total 44 units) with generation capacity comparable to CPNPP generation (Section 7.2.3.2).	Multiple combustion turbines assembled in appropriate power train configurations for a total of 2,828 MWe (gross) (Section 7.2.3.3).	Multiple combustion turbines assembled in appropriate power train configurations for a total of 1,839 MWe (gross).; three 200 MWe solar installations with battery storage; 600 MWe supplied by wind turbines (Section 7.2.3.4).
Location	CPNPP site plus 400 acres along the southern site boundary (Section 7.2.3.1.1).	CPNPP site plus 400 acres along the southern site boundary (Section 7.2.3.2.1).	CPNPP site plus <400 acres along the southern site boundary (Section 7.2.3.3.1).	NGCC: CPNPP site plus <400 acres along the southern site boundary. Solar: offsite within ERCOT region. Wind: offsite in west Texas (Section 7.2.3.4).
Cooling System	Closed-cycle cooling with mechanical draft cooling towers (Section 7.2.1).	Closed-cycle cooling with mechanical draft cooling towers (Section 7.2.1).	Closed-cycle cooling with mechanical draft cooling towers (Section 7.2.1).	NGCC: closed-cycle cooling with mechanical draft cooling towers) (Section 7.2.3.4). Solar and Wind: no cooling system required.
Land Requirements	275 acres of the existing CPNPP site (123 acres for the reactors and 152 acres for the MDCTs) and approximately 400 acres adjacent to the southern boundary for the BDTF (Section 7.2.3.1.1).	Bounded by that of the ALWR (Section 7.2.3.2.1).	122 acres on existing CPNPP site plus acreage adjacent to the southern boundary for the BDTF. (Section 7.2.3.3.1).	NGCC: bounded by NGCC alternative. Solar: three sites of 2,000 acres each. Wind: construction footprint of 1,482 acres and a permanent footprint of 444 acres. New transmission: assumed bounded by that considered for CPNPP Units 3 and 4 of two 160-feet wide corridors, 17 and 45 miles in length (Section 7.2.3.4.1).

Table 8.0-2 Alternatives Features Comparison Summary (Sheet 2 of 2)

	ALWR	SMR	NGCC Plant	Combination
Workforce	Peak employment of 4,953 workers during construction and 494 operations workers (Section 7.2.3.1.9).	Bounded by that of the ALWR (Section 7.2.3.2.9).	Bounded by that of the ALWR; smaller peak construction workforce and shorter construction duration; smaller workforce during operations (Section 7.2.3.3.9).	NGCC: bounded by that of the NGCC alternative (Section 7.2.3.4.9) Solar and Wind: construction workforce small for a short duration; operational workforce would not have a quantifiable impact on the local economy (Section 7.2.3.4.9).

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 1 of 22)

Land Use	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Onsite land use Offsite land use
Termination of Operations and Decommissioning	**SMALL:** Temporary onsite land use changes during decommissioning are anticipated to be comparable to changes that occur during construction and operations and would not require additional land. Temporary changes in onsite land use would not change the fundamental use of the reactor site. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL (construction):** Would be sited at CPNPP site with expansion to the existing CPNPP site along the southern property boundary for the BDTF. Expansion converts 400 acres including 154 acres of prime farmland (a small fraction of the prime farmland in the surrounding area). **SMALL to MODERATE (operations):** BDTF would deposit salt to the surrounding area, potentially affecting offsite residential properties.
SMR	**SMALL (construction):** Would be sited at CPNPP site with expansion to the existing CPNPP site along the southern property boundary for the BDTF. Conversion BDTF acreage including up to 154 acres of prime farmland (a small fraction of the prime farmland in the surrounding area). **SMALL to MODERATE (operations):** BDTF would deposit salt to the surrounding area, potentially affecting offsite residential properties.
NGCC Plant	**SMALL:** Would be sited at CPNPP site with expansion to the existing CPNPP site along the southern property boundary for the BDTF. The land requirement for the NGCC plant would be less than potentially allowing the plant and MDCTs to be located within the 123-acre area supporting construction of the existing units. A short natural gas pipeline would have to be installed onsite to connect to the existing natural gas transmission line located along the CPNPP's EAB. The development of the BDTF (smaller than for the ALWR alternative) would convert land including prime farmland to industrial use.
Combination	**MODERATE:** NGCC component bounded by NGCC plant alternative above. Solar land use would be approximately three 2,000-acre sites converted to power generation and wind would be a permanent footprint of 444 acres. Transmission connections would be additional acreage.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 2 of 22)

Visual Resources	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for aesthetic impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Termination of Operations and Decommissioning	**SMALL:** Terminating nuclear power plant operations would not change the visual appearance of the nuclear power plant until demolition of structures. Decommissioning activities would be localized and reduced with implementation of BMPs. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction and operations activities would appear similar to ongoing onsite industrial activities. Development of the BDTF along the southern boundary would be adjacent to an existing residential area; the hilly topography of the area would reduce the visibility of the plant features by the nearby residents.
SMR	**SMALL:** Construction and operations activities would appear similar to ongoing onsite industrial activities. Development of the BDTF along the southern boundary would be adjacent to an existing residential area; the hilly topography of the area would reduce the visibility of the plant features by the nearby residents.
NGCC Plant	**SMALL (plant):** The visual resources impact for the NGCC units and MDCTs would be similar to that of the existing generating units, SMALL for both construction and operation. Development of the BDTF along the southern boundary would be adjacent to an existing residential area, the hilly topography of the area would reduce the visibility of the plant features by the nearby residents.
Combination	**SMALL to MODERATE:** NGCC component same as for NGCC plant alternative above. Site selection would seek to minimize visual impacts and site selection would avoid impacting scenic areas for the solar and wind installations. PV panels could be visible to the public. The turbines would have obstruction lighting.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 3 of 22)

Air Quality	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Air quality impacts (all plants) Air quality effects of transmission lines
Termination of Operations and Decommissioning	**SMALL:** After termination of operations, air emissions from the nuclear power plant would continue, but at greatly reduced levels. The most likely impact of decommissioning on air quality is degradation by fugitive dust. Use of BMPs, such as seeding and wetting, can be used to minimize fugitive dust. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction impacts would be temporary; operational impacts and emissions being maintained within federal and state regulatory limits.
SMR	**SMALL:** Construction impacts would be temporary; operational impacts would be minor, and emissions being maintained within federal and state regulatory limits.
NGCC Plant	**SMALL** (construction): Construction impacts would be temporary. Emissions being maintained within state regulatory limits. **MODERATE** (operations): The NGCC plant would be a major source of criteria pollutants and GHGs. Annual emission estimates during the operations period based on EPA emission factors are presented in Table 7.2-1.
Combination	**SMALL** (construction): Construction impacts would be temporary. Emissions being maintained within state regulatory limits. **MODERATE** (operations): The NGCC plant would be a major source of criteria pollutants and GHGs. Annual emission estimates during the operations period based on EPA emission factors are presented in Table 7.2-1. The solar and wind installations would not release any air emissions during operation.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 4 of 22)

Noise	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for noise impacts in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Termination of Operations and Decommissioning	**SMALL:** During decommissioning, noise would generally be far enough away from sensitive receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable offsite. Noise abatement procedures could also be used during decommissioning to reduce noise. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with CPNPP with the exception of the MDCTs. Sound levels would attenuate and impacts to sensitive receptors is not expected.
SMR	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with CPNPP with the exception of the MDCTs. Sound levels would attenuate and impacts to sensitive receptors is not expected.
NGCC Plant	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with CPNPP with the exception of the MDCTs. Sound levels would attenuate and impacts to sensitive receptors is not expected.
Combination	**SMALL to MODERATE (construction):** NGCC component same as for NGCC plant alternative above. Noise impacts from land clearing for solar and the number of turbines that would need to be installed, would range from SMALL to MODERATE dependent on proximity to sensitive receptors. **SMALL (operations):** NGCC component same as for NGCC plant alternative above. During operations, the wind turbines would emit sound. No health impacts from the sound would occur from operation of the solar installations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 5 of 22)

Geology and Soils	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for geology and soils in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.
Termination of Operations and Decommissioning	**SMALL:** Termination of nuclear plant operations is not expected to impact geology and soils. Erosion problems could be mitigated by using BMPs during decommissioning. Site geologic resources would not be affected by decommissioning. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
SMR	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
NGCC Plant	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Combination	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 6 of 22)

Surface Water	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Surface water use and quality (non-cooling system impacts) Altered current patterns at intake and discharge structures Scouring caused by discharged cooling water Discharge of metals in cooling system effluent Discharge of biocides, sanitary waste, and minor chemical spills Surface water use conflicts (plants with once-through cooling systems) Temperature effects on sediment transport capacity
Termination of Operations and Decommissioning	**SMALL:** The NRC concluded that the impacts on water use and water quality from decommissioning would be SMALL for all plants. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL (construction):** Municipal supply would be used to support construction. Construction impacts would be minimized through adherence to permit requirements and implementation of BMPs. **SMALL to MODERATE (operations):** During operations, impacts to surface water would be related to use of Lake Granbury (via SCR) to supply makeup water. Modeling indicates decreases in the time that both Lake Granbury and Possum Kingdom Lake is at full pool and changes to flow of the Brazos River downstream of Lake Granbury and Possum Kingdom Lake. These pool level changes would have a noticeable effect but not destabilize potential water uses on the reservoirs. The potential impacts to ambient water conditions and downstream users from the plant's discharge of concentrated dissolved solids, particularly during low flow conditions could be noticeable. The ALWR plant would operate in compliance with a TPDES permit and an industrial stormwater permit, minimizing impacts to surface water quality.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 7 of 22)

Surface Water	
SMR	**SMALL (construction):** Municipal supply would be used to support construction. Construction impacts would be minimized through adherence to permit requirements and implementation of BMPs. **SMALL to MODERATE (operations):** During operations, impacts to surface water would be related to use of Lake Granbury (via SCR) to supply makeup water. Modeling indicates decreases the time that both Lake Granbury and Possum Kingdom Lake is at full pool and changes to flow of the Brazos River downstream of Lake Granbury and Possum Kingdom Lake. These pool level changes would have a noticeable effect but not destabilize potential water uses on the reservoirs. The potential impacts to ambient water conditions and downstream users from the plant's discharge of concentrated dissolved solids, particularly during low flow conditions could be noticeable. The SMR plant would operate in compliance with a TPDES permit and an industrial stormwater permit, minimizing impacts to surface water quality.
NGCC Plant	**SMALL (construction):** Municipal supply would be used to support construction. Construction impacts would be minimized through adherence to permit requirements and implementation of BMPs. **SMALL to MODERATE (operations):** During operations, impacts to surface water would be related to use of Lake Granbury (via SCR) to supply makeup water. The NGCC plant would consume approximately 6,100 gpm. The potential impacts to ambient water conditions and downstream users from the plant's discharge of concentrated dissolved solids, particularly during low flow conditions could be noticeable.
Combination	**SMALL (construction) and SMALL to MODERATE (operations) (NGCC):** NGCC component same as for NGCC plant alternative above. **SMALL (solar and wind)**: Water needs would be met in compliance with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction of the solar and wind installations. These temporary soil impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 8 of 22)

Groundwater	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue finding for groundwater contamination and use (non-cooling system impacts); groundwater use conflicts (plants that withdraw less than 100 gpm); and groundwater quality degradation resulting from water withdrawals in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. **SMALL** (radionuclides released to groundwater): Tritium has been detected in the groundwater monitoring wells with current measurements being well below the safe drinking water standard. No unplanned liquid or gaseous radioactive releases have occurred at CPNPP 2016–2020.
Termination of Operations and Decommissioning	**SMALL:** Decommissioning activities include some that may affect groundwater quality through the infiltration of water used for various purposes (e.g., cooling of cutting equipment, decontamination spray, and dust suppression). BMPs are expected to be employed as appropriate to collect and manage these waters. Groundwater chemistry may change as rainwater infiltrates through rubble. The increased pH could promote the subsurface transport of radionuclides and metals. However, this effect is expected to occur only over a short distance as a function of the buffering capacity of soil. Offsite transport of groundwater contaminants is not expected. (NRC 2013a)
ALWR	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
SMR	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
NGCC Plant	**SMALL:** Minimal dewatering expected. Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
Combination	**SMALL:** NGCC component same as for NGCC plant alternative above. Water needs for the solar and wind installations would be met in compliance with any required water withdrawal permits and applicable regulations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 9 of 22)

Terrestrial	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Exposure of terrestrial organisms to radionuclides Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds) Bird collisions with plant structures and transmission lines Transmission line ROW management impacts on terrestrial resources Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock) **SMALL** (effects on terrestrial resources, non-cooling system impacts): Adequate management programs and regulatory controls in place to protect onsite important terrestrial ecosystems.
Termination of Operations and Decommissioning	**SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect terrestrial biota, but at a reduced level of impact. Areas disturbed or used to support decommissioning are within the operational areas of the site and are also within the protected area. Decommissioning activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL to MODERATE:** Clearing of Ashe juniper woodland-savanna terrestrial habitat. Net permanent loss of 445 acres of natural terrestrial habitat, approximately 10 percent of the available natural habitat within the CPNPP site plus the BDTF acreage. **SMALL (operations):** No additional land clearing and habitat removal. The BDTF which would result in salt deposition on developed land.
SMR	**SMALL to MODERATE:** Clearing of Ashe juniper woodland-savanna terrestrial habitat. Net permanent loss of natural terrestrial habitat, less than 10 percent of the available natural habitat within the CPNPP site plus the BDTF acreage. **SMALL (operations):** No additional land clearing and habitat removal. The BDTF which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 10 of 22)

Terrestrial	
NGCC Plant	**SMALL to MODERATE (construction):** Clearing of Ashe juniper woodland-savanna terrestrial habitat. Net permanent loss of natural terrestrial habitat, less than 10 percent of the available natural habitat within the CPNPP site plus the BDTF acreage. **SMALL (operations):** No additional land clearing and habitat removal. The BDTF which would result in salt deposition on the surrounding land that was previously cleared and would offer low-quality terrestrial habitat.
Combination	**SMALL to MODERATE:** NGCC component bounded by the NGCC plant alternative above. The large land requirement for offsite solar and wind installations could impact terrestrial habitats; however, site selection would avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species and habitats identified as a priority for preservation. The operation of the wind turbines could affect avian and bat species. Following USFWS and guidance for siting would minimize impacts and compliance with any incidental take permits would minimize impacts to special status species.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 11 of 22)

Aquatic	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Entrainment of phytoplankton and zooplankton (all plants) Infrequently reported thermal impacts (all plants) Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication Effects of nonradiological contaminants on aquatic organisms Exposure of aquatic organisms to radionuclides Effects on aquatic resources (non-cooling system impacts) Impacts of transmission line ROW management on aquatic resources Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses **SMALL** (impingement and entrainment of aquatic organisms, plants with once-through cooling systems or cooling ponds): SCR was designated as a CCRS and considered the BTA for impingement determined by TCEQ. **SMALL** (thermal impacts on aquatic organisms, plants with once-through cooling systems or cooling ponds): The species present in the SCR are adapted to warmer water and continued stocking of sport fishes maintains the aquatic community near CPNPP. The thermal discharge likely has little long-term impact on the aquatic community of SCR. CPNPP is operating in conformance with its TPDES permit.
Termination of Operations and Decommissioning	**SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The NRC concluded that for facilities at which the decommissioning activities would be limited to existing operational areas, the potential impacts on aquatic resources would be SMALL. (NRC 2013a, Section 4.12.2.1)

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 12 of 22)

Aquatic	
ALWR	**SMALL (construction):** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. **SMALL to MODERATE (operations):** Water consumption would lower Lake Granbury average pool level and a lower water level during spawning season could have noticeable impacts. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
SMR	**SMALL (construction):** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. **SMALL to MODERATE (operations):** Water consumption would lower Lake Granbury average pool level and a lower water level during spawning season could have noticeable impacts. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
NGCC Plant	**SMALL (construction):** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. **SMALL to MODERATE (operations):** Water consumption would lower Lake Granbury average pool level and a lower water level during spawning season could have noticeable impacts. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
Combination	**SMALL:** NGCC plant component of the combination alternative would be similar to those associated with the NGCC plant alternative but requiring about 40 percent less intake and discharge volume. No impacts to aquatic resources would result from the construction of the solar and wind components of the combination alternative due to the implementation of BMPs to control erosion and run-off. No operations-related impacts are associated with the solar and wind components of the combination alternative.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 13 of 22)

Special Status Species	
Proposed Action	**NO EFFECT:** No LR-related refurbishment or other LR-related construction activities have been identified. Administrative controls are in place at CPNPP to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. The proposed LR would have no effect on protected species.
Termination of Operations and Decommissioning	**Site Specific:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The magnitude of impacts could vary widely based on site-specific conditions at the time of decommissioning and the presence or absence of special status species and habitats when the alternative is implemented. (NRC 2013a, Section 4.12.2.1)
ALWR	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Clearing of approximately 13 percent of the Ashe juniper woodland-savanna terrestrial habitat on the CPNPP site plus the BDTF site, which is potentially suitable habitat for the federally listed golden-cheeked warbler. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species.
SMR	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Clearing of Ashe juniper woodland-savanna terrestrial habitat which is potentially suitable habitat for the federally listed golden-cheeked warbler. Clearing would be less than 13 percent of the Ashe juniper woodland-savanna terrestrial habitat on the CPNPP site plus the BDTF site. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species.
NGCC Plant	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Clearing of Ashe juniper woodland-savanna terrestrial habitat which is potentially suitable habitat for the federally listed golden-cheeked warbler. Clearing would be less than 13 percent of the Ashe juniper woodland-savanna terrestrial habitat on the CPNPP site plus the BDTF site. Prior to construction, Vistra OpCo would conduct any necessary ecological surveys for determine the presence/absence of protected species.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 14 of 22)

Special Status Species	
Combination	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** NGCC component bounded by that of the NGCC plant alternative above; the site selection process that would be used to select sites for the solar and wind installations would have criteria to avoid locations whose development would adversely impact special status species.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 15 of 22)

Historic and Cultural Resources	
Proposed Action	**NO ADVERSE EFFECT:** No LR-related refurbishment or construction activities identified; administrative controls ensure protection of cultural resources in the event of excavation activities.
Termination of Operations and Decommissioning	**NO ADVERSE EFFECT:** The termination of nuclear plant operations would not affect historic or cultural resources. The NRC conducted an analysis of the potential effects of decommissioning on historic and archaeological (cultural) resources and found that the potential onsite impacts at sites where the disturbance of lands would not go beyond the operational areas would be SMALL. (NRC 2013a, Section 4.12.2.1)
ALWR	**NO EFFECT:** There are no archaeological sites, NRHP listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. The NRHP listed or eligible historic sites in the surrounding area are a few miles from the APE.
SMR	**NO EFFECT:** There are no archaeological sites, NRHP listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. The NRHP listed or eligible historic sites in the surrounding area are a few miles from the APE.
NGCC Plant	**NO EFFECT:** There are no archaeological sites, NRHP listed or eligible historic sites, historic cemeteries, or traditional cultural properties located in the APE. The NRHP listed or eligible historic sites in the surrounding area are a few miles from the APE.
Combination	**NO EFFECT to ADVERSE EFFECT:** NGCC component same as for NGCC plant alternative above. Historic and archeological resources could be impacted by offsite solar and wind installations, depending on the site selected.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 16 of 22)

Socioeconomics	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Employment and income, recreation and tourism Tax revenues Community services and education Population and housing Transportation
Termination of Operations and Decommissioning	When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process (NRC 2002, Section 4.3.12). **MODERATE to LARGE:** Terminating nuclear plant operations would have a noticeable adverse impact on socioeconomic conditions in the region around the nuclear power plant. There would be immediate socioeconomic impacts from the loss of jobs. The impacts from the loss or reduction of tax revenue due to the termination of plant operations on community and public education services could range from SMALL to LARGE. (NRC 2013a, Section 4.12.2.1) The tax payments attributable to CPNPP provide a significant beneficial economic impact to Somervell County and its taxing jurisdictions. Therefore, the loss of jobs would affect a small percentage of the population, but the tax revenue loss would have a noticeable and potentially destabilizing impact on Somervell County. **SMALL**: Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services. The impacts of decommissioning on socioeconomics are neither detectable nor destabilizing; therefore, the impacts on socioeconomics are SMALL. (NRC 2002, Section 4.3.12.3 and 4.3.12.4)
ALWR	**MODERATE to LARGE (beneficial)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). Economic impact of construction and operations employment would be MODERATE to LARGE in Somervell and Hood counties with the tax revenue impact to Somervell County being LARGE. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 17 of 22)

Socioeconomics	
SMR	**MODERATE to LARGE (beneficial)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). The size of the construction workforce and duration of construction could be less than that of the ALWR option. Economic impact of construction and operations employment would be MODERATE to LARGE in Somervell and Hood counties with the tax revenue impact to Somervell County being LARGE. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.
NGCC Plant	**MODERATE to LARGE (beneficial)**: The construction and operations employment would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). The size of the construction workforce and duration of construction could be less than that of the ALWR option. Economic impact of construction and operations employment would be MODERATE in Somervell and Hood counties with the tax revenue impact to Somervell County being MODERATE to LARGE. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.
Combination	**SMALL (other counties); MODERATE to LARGE (Somervell and Hood Counties):** NGCC component bounded by the NGCC plant alternative above. The jobs created to complete the construction of solar and wind installations would less than those needed for the NGCC plant. Construction could increase traffic on the roads but would be less than other alternatives. Very few employees are required for maintenance and operation of solar and wind installations.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 18 of 22)

Human Health	
Proposed Action	**SMALL**: Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Radiation exposures to the public Radiation exposures to plant workers Human health impact from chemicals Microbiological hazards to plant workers Physical occupational hazards **SMALL** (microbiological hazards to the public [plants with cooling ponds or canals or cooling towers that discharge to a river]): SCR recreational activities do not include swimming. CPNPP's deep, high velocity thermal discharge would not enhance the concentration of *N. fowleri* and lake conditions along with restricting access to the discharge area and not allowing swimming would further reduce the risk of *N. fowleri* infection. These conditions would also reduce the risk of infection from other human pathogens. **SMALL** (electric shock hazards): In-scope transmission lines are located entirely within CPNPP's OCA and comply with current NESC clearance standards. Vistra OpCo also has procedures in place to review and control proposed structural changes to maintain compliance with the NESC clearance standards. Procedures govern the use of equipment near transmission lines to maintain adequate distance to prevent electrical shock.
Termination of Operations and Decommissioning	**SMALL:** The human health impacts from physical, chemical, and microbiological hazards during the termination of plant operations and decommissioning would be SMALL for all plants. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.
SMR	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 19 of 22)

Human Health	
NGCC Plant	**SMALL (construction); SMALL to MODERATE (operations):** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF. The radiological human health impact on construction workers due to working in proximity to CPNPP would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NGCC plant would emit criteria air pollutants that can create health problems. Technology will be installed to limit the criteria air pollutant releases.
Combination	**SMALL (construction); SMALL to MODERATE (operations):** Compliance with OSHA worker protection rules would control impacts on workers from construction activities. Noise could range from SMALL to MODERATE for the residences in close proximity to the operational BDTF and wind turbines sound is considered a nuisance rather than harmful to human health. The radiological human health impact on construction workers due to working in proximity to CPNPP would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NGCC plant would emit criteria air pollutants that can create health problems. Technology will be installed to limit the criteria air pollutant releases. The transmission lines for solar and wind installations would be designed in compliance with NESC clearance requirements to protect the public from electric shock.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 20 of 22)

Environmental Justice	
Proposed Action	**No disproportionately high and adverse impacts to minority and low-income populations:** The closest low-income and minority populations are 4.6 and 12 miles, respectively, from the CPNPP center point (Section 3.11.2). Based on known pathways, there are no expected disproportionately high and adverse impacts on minority or low-income populations from the proposed action (Section 4.10.1).
Termination of Operations and Decommissioning	Termination of power plant operations and the resulting loss of jobs, income, and tax revenue could have a disproportionate effect on minority and low-income populations (NRC 2013a, Section 4.12.2). **Site Specific:** The determination of whether the minority or low-income populations are disproportionately highly and adversely impacted by facility decommissioning activities needs to be made on a site-by-site basis because their presence and their socioeconomic circumstances will be site specific (NRC 2002, Section 4.3.13.3).
ALWR	**No disproportionately high and adverse impacts to minority and low-income populations:** No evidence that the construction and operation would have any disproportionately high and adverse human health, environmental, or socioeconomic effects on minority or low-income populations.
SMR	**No disproportionately high and adverse impacts to minority and low-income populations:** No evidence that the construction and operation would have any disproportionately high and adverse human health, environmental, or socioeconomic effects on minority or low-income populations.
NGCC Plant	**No disproportionately high and adverse impacts to minority and low-income populations:** No evidence that the construction and operation would have any disproportionately high and adverse human health, environmental, or socioeconomic effects on minority or low-income populations. The activities associated with an operating NGCC plant would be similar to those occurring at CPNPP with the exception of air emissions, which would be subject to permit and regulatory restrictions.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 21 of 22)

Environmental Justice	
Combination	**No disproportionately high and adverse impacts to minority and low-income populations:** NGCC component same as for NGCC plant alternative above. Impacts during construction of and wind installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Potential impacts on minority and low-income populations from the construction of solar and wind components of the combination alternative would primarily result from socioeconomic effects. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population under the combination alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects.

Table 8.0-3 Environmental Impacts Comparison Detail (Sheet 22 of 22)

Waste Management	
Proposed Action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 for the following: Low-level waste storage and disposal Onsite storage of spent nuclear fuel Offsite radiological impacts of spent nuclear fuel and high-level waste disposal Mixed waste storage and disposal Nonradioactive waste storage and disposal
Termination of Operations and Decommissioning	**SMALL:** After termination of nuclear plant operations, there would be a period before the beginning of decommissioning when the reactor would be placed in a cold shutdown condition and maintained. The quantities of waste generated would be smaller than the quantities generated during either operations or decommissioning. The impacts associated with the management of low-level radioactive waste (LLRW), hazardous waste, mixed waste, and nonradioactive and nonhazardous waste during operations and decommissioning would be SMALL. (NRC 2013a, Section 4.12.2.1)
ALWR	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
SMR	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
NGCC Plant	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; spent selective catalytic reduction catalysts would make up the majority of the waste during operations; operations-related waste would be managed and recycled or disposed of at permitted offsite facilities.
Combination	**SMALL:** NGCC component same as for NGCC plant alternative above. Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.

9.0 STATUS OF COMPLIANCE

The environmental report shall list all federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by federal, state, regional, and local agencies having responsibilities for environmental protection [10 CFR 51.45 (d)].

9.1 CPNPP Authorizations

Table 9.1-1 provides a summary of the authorizations held by CPNPP for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, through the proposed LR operating term given their respective renewal schedules. Table 9.1-2 lists additional environmental authorizations and consultations related to the renewal of CPNPP Units 1 and 2 OLs.

Table 9.1-1 Environmental Permits for Current CPNPP Operations (Sheet 1 of 3)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
NRC	Atomic Energy Act [10 CFR Part 50]	CPNPP License to Operate Unit 1	NPF-87	Issued: 4/17/1990 Expires: 2/8/2030	Operation of CPNPP Unit 1.
NRC	Atomic Energy Act [10 CFR Part 50]	CPNPP License to Operate Unit 2	NPF-89	Issued: 4/6/1993 Expires: 2/2/2033	Operation of CPNPP Unit 2.
NRC	Atomic Energy Act [10 CFR Part 72]	General license for storage of spent fuel at power reactor sites	General Permit	N/A	Storage of power reactor spent fuel and other associated radioactive materials in an ISFSI.
DOT	[49 CFR Part 107, Subpart G]; 49 USC 5108	Registration	060921550098D	Issued: 7/1/2021 Expires: 6/30/2022 (Renewed annually)	Hazardous material shipments.
EPA	Federal Resource Conservation and Recovery Act [42 USC 6912]	Hazardous waste generator number	TXD020332078	N/A	Hazardous waste generator registration is managed under TCEQ Permit 33306.
EPA/TCEQ	Clean Water Act, Section 401	Certification of water quality standards	N/A	N/A (Valid through the extended licensing period)	Discharge into waters of the U.S.
Texas General Land Office (TGLO)	Coastal Management Zone Act [16 USC 1456 Section 307(c)3(A)]	Consistency determination with the TX Coastal Management Program	N/A	N/A	CPNPP is not located in the TX coastal zone.
TCEQ	30 TAC 335	Industrial and hazardous solid waste generators registration	33306	Initial Registration: 2/14/1986 Last Amendment: 9/25/2019	Industrial waste and hazardous waste generators state registration.

Table 9.1-1 Environmental Permits for Current CPNPP Operations (Sheet 2 of 3)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
TCEQ	30 TAC 116	Air quality permit/Stationary Source permit to operate	19225	Issued: 9/26/2014 Expires: 9/26/2024	Operation of emergency diesel generators, auxiliary boiler, and diesel fire water pumps.
TCEQ	Section 402 CWA; Texas Water Code Chapter 26; 40 CFR Part 423	Industrial wastewater facility permit (TPDES)	WQ0001854000	Issued: 10/7/2019 Expires: 10/7/2024	Wastewater treatment and effluent disposal. State implementation of NPDES.
TCEQ	Texas Water Code Chapter 26	Industrial stormwater permit	TXR05DA67	Issued: 11/10/2016 Expires: 8/14/2026	Permit for stormwater discharge associated with industrial activity.
TCEQ	Section 402 CWA; Texas Water Code Chapter 26	TPDES general permit	TXR050000	Effective: 8/14/2021 Expires: 8/14/2026	Multi-sector industrial general permit for stormwater
TCEQ	Section 402 CWA; Texas Water Code Section 26.050	Construction stormwater general permit	TXR150000	Effective: 3/5/2018 Expires: 3/5/2023	General permit under the TPDES for stormwater discharges associated with construction.
TCEQ	40 CFR 280; 30 TAC 334	Underground storage tank registration	No registration numbers required	N/A – Exempt under TAC 334.3(a)(9)	Operation of underground storage tanks.
TCEQ	30 TAC 334	Aboveground storage tank registration	No registration numbers required	N/A – Exempt under TAC 334.123(a)(9)	Operation of aboveground storage tanks.

Table 9.1-1 Environmental Permits for Current CPNPP Operations (Sheet 3 of 3)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
TCEQ	Texas Health and Safety Code Chapter 361; Texas Water Code Chapter 26	Industrial and hazardous waste permit	50356	Originally issued: 2/14/1997 Renewal/Minor Amendment: 9/25/2019 10-year permit renewal date: 9/25/2029	Post-closure care of onsite hazardous or industrial waste landfills.
Texas Water Commission (TWC)	Water rights in the Brazos II River segment of the Brazos River	Certificate of adjudication of water rights	12-4097	Issued: 2/28/1986	Authority to appropriate waters of the State of Texas in the Brazos II River basin.
BRA	Contract water	Contract	-	Renewal Agreement 08-26-2016 (Term 9-1-2016 through 8-31-2066)	BRA Renewal Agreement

Table 9.1-2 Environmental Authorizations for Consultation for CPNPP License Renewal[(a)] (Sheet 1 of 3)

Agency	Authority	Requirement	Remarks
NRC	Atomic Energy Act [42 USC 2011 *et seq*.]	License renewal	Applicant for federal license must submit an ER in support of a license renewal application.
USFWS	Endangered Species Act, Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, regarding federally protected species.
TPWD	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Applicant may consult with state agency to support a timely and thorough review of potential impacts to threatened and endangered species and important habitats.
TCEQ	Clean Water Act, Section 401 [33 USC 1341]	Certification	Requires state certification that proposed action would comply with CWA standards.
TX Department of State Health Services	10 CFR 51, Subpart A; Regulatory Guide 4.2, Revision 1, Supplement 1, Section 3.9	Consultation	Applicant should consult the State agency responsible for environmental health regarding the potential existence and concentration of microorganisms in the receiving waters for plant cooling water discharge.
TX Historical Commission	National Historic Preservation Act, Section 106 [54 USC 306108]	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO.
Apache Tribe of Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with tribal historic preservation officer (THPO).
Comanche Nation, Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Coushatta Tribe of Louisiana	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Delaware Nation, Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.

Table 9.1-2 Environmental Authorizations for Consultation for CPNPP License Renewal[a] (Sheet 2 of 3)

Agency	Authority	Requirement	Remarks
Tonkawa Tribe of Indians of Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Wichita and Affiliated Tribes (Wichita, Keechi, Waco, and Tawakoni), Oklahoma	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Alabama-Coushatta Tribe of Texas[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Alabama-Quassarte Tribal Town	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Caddo Nation[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Cherokee Nation of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Kialegee Tribal Town[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Kickapoo Tribe of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Kiowa Tribe of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Mescalero Apache Tribe[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Quapaw Tribe of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Seminole Nation of Oklahoma[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.

Table 9.1-2 Environmental Authorizations for Consultation for CPNPP License Renewal[a] (Sheet 3 of 3)

Agency	Authority	Requirement	Remarks
Thlopthlocco Tribal Town[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
Tunica-Biloxi Tribe[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.
United Keetoowah Band of Cherokee Indians[b]	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with THPO.

a. Vistra OpCo also reached out to various local agencies not listed in this table.

b. THC notes that this list of tribes has known interests in Texas, but an area of interest map is not available at this time. The THC recommends contacting these tribes directly for areas of interest.

9.2 Status of Compliance

CPNPP has established control measures to ensure compliance with the authorizations listed in Table 9.1-1, including monitoring, reporting, and operating within specified limits. CPNPP environmental compliance coordinators are primarily responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with environmental programs are submitted to appropriate agencies as specified in the permits and/or governing regulations.

9.3 Notices of Violations

Based on a review of records of various environmental programs and permits that CPNPP is subject to and complies with over the 5-year period from 2016–2020, there have been two NOVs issued to the facility by federal (i.e., agencies other than the NRC), state, or local regulatory agencies. As discussed in Section 3.6.1.6, both NOVs were issued by the TCEQ and associated with CPNPP wastewater discharge to receiving surface waters.

The first NOV was for not running duplicate analysis each day an *Escherichia coli* (*E. coli*) sample was analyzed for Outfall 3 in October 2018 and July 2020 per 30 TAC 319.6. A revised *E. coli* analysis data sheet was provided that included duplicated analysis. The collected *E. coli* samples were not being diluted and therefore didn't require blank analysis at the time. The NOV was resolved in January 2021 and no further action was required.

The second NOV was for the failure to calibrate the Onsite Sanitary Wastewater Treatment Facility flow meter at least annually to ensure accuracy per 30 TAC 305.125(1). The flow meter was last calibrated on April 10, 2019. The violation was resolved by calibrating the flow meter on June 2, 2020. The NOV was resolved in January 2021 and no further action was required.

9.4 Remediation Activities

No unplanned radioactive liquid or gaseous releases were reported between 2016 and 2020. However, a courtesy notification was made to the TCEQ on November 29, 2021, for an inadvertent release of tritium which occurred November 6, 2021. As discussed in Section 3.6.4.2.1, over 100 gallons of a demineralized water/resin mixture containing tritium was released, but the amount of tritium within the mixture was established to be below reportable quantities. The released material was excavated and disposed via normal processes to a Class I landfill, and the resin/water mixture that was recoverable was collected and placed in the dewatering area that discharges to Outfall 004.

Prior to 2016, a tritium release occurred in 2013 from a leaking LVW line, and again in 2015 when treated SCR water containing tritium leaked through the FWST lining. As discussed in Section 3.6.4.2.1, these leaks were repaired in 2016 and 2017 respectively, and there was no requirement for notification to the NRC or local officials and no requirement for remediation.

CPNPP Landfills 1 and 2 were used during construction and found to have contained RCRA-listed chemicals. Landfill 1 was closed on March 23, 1993, and Landfill 2 on December 22, 1992. In accordance with post-closure care and remediation procedures described in CPNPP's hazardous waste permit No. 50356, a post-closure detection monitoring program was put in place to assess the potential impact to groundwater from the landfills and wells were subsequently installed as part of the closure. CPNPP is in the 27th year of the 30-year post-closure care period for Landfill 1, and the 28th year for Landfill 2. Annual groundwater reports are submitted in accordance with the reporting requirements set forth in Provision II.B.10 and VI.G of the permit.

9.5 Federal, State, and Local Regulatory Standards: Discussion of Compliance

This section contains information regarding environmental programs identified in the 2013 GEIS that may or may not be applicable to the site, and current status of compliance with each program.

9.5.1 Atomic Energy Act

9.5.1.1 Radioactive Waste

As discussed in Section 2.2.6, CPNPP has radioactive waste stream handling and shipping procedures. As a generator of both LLRW and spent fuel, CPNPP is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Amendment Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

9.5.2 Clean Air Act

9.5.2.1 Air Permit

CPNPP has a permit to operate an auxiliary boiler, emergency diesel generators, and diesel fire water pumps (Table 9.1-1). Operation of these air emission sources is maintained within the emission, opacity, fuel sulfur content, volatile organic compounds, and fuel usage (as applicable) limits established in the station air permit issued by the TCEQ. As required by the air permit, records of compliance are kept and available to the TCEQ and EPA upon request and sampling is conducted as required. All other emission-generating equipment not detailed in the air permit comply with Permit by Rule (PBR) per 30 TAC 106. Based on review of the previous 5-year period (2016–2020), CPNPP has had no NOVs and is in compliance with this permit.

9.5.2.2 Chemical Accident Prevention Provisions [40 CFR Part 68]

CPNPP is subject to the risk management plan requirements described in 40 CFR Part 68 because the amount of regulated chemicals (chlorine and hydrogen) present onsite are equal to or exceed the threshold quantities specified in 40 CFR 68.130. CPNPP has a hazardous waste contingency and emergency procedures plan in place that supplements the existing SPCC plan and addresses required contingency planning and emergency procedures for hazardous waste.

9.5.2.3 Stratospheric Ozone [40 CFR Part 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR Part 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Section 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. CPNPP is in compliance with Section 608 of the CAA as amended in 1990 and the implementing regulations codified in the regulations. Vistra OpCo tracks refrigerant usage to comply with 40 CFR 82.166. Because motor vehicle air conditioners are not serviced onsite, Section 609 of the CAA is not applicable.

9.5.3 Clean Water Act

9.5.3.1 Water Quality (401) Certification

Federal CWA Section 401 requires applicants for a federal license to conduct an activity that might result in discharge into navigable waters to provide the licensing agency with either a waiver from the state or a certification from the state that the discharge will comply with applicable CWA requirements [33 USC 1341]. The Texas Water Quality Board (TCEQ predecessor agency) issued a 401 certification to CPNPP on March 1, 1974. CPNPP initiated consultation with the TCEQ concerning the existing certification and received confirmation on March 12, 2021, that the 401 certification remains valid for the extended licensing period. (Attachment B)

9.5.3.2 TPDES Permit

CPNPP permit No. WQ0001854000 (Table 9.1-1), issued by the TCEQ, authorizes the discharge of once-through cooling water, process water, and stormwater into state waters. As discussed in Section 3.6.1.2, the TPDES permit authorizes discharge from five outfalls (three internal and two external) and requires monitoring of water quality and effluent limits. Plant effluent is discharged to the SCR.

9.5.3.3 Industrial Stormwater Discharge

As discussed in Section 3.6.1.3, stormwater discharges associated with CPNPP industrial activities are regulated and controlled through the terms and conditions imposed by TPDES stormwater multi-sector general permit No. TXR050000, authorization number TXR05DA67. CPNPP implements and maintains a SWPPP. The SWPPP identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharge. CPNPP is in compliance with the terms and conditions of the TPDES permit as it relates to the stormwater program. (TCEQ 2021c)

9.5.3.4 Sanitary Wastewater

As presented in Section 3.6.1.4, sanitary waste is managed at an onsite sanitary wastewater treatment facility prior to discharging to the SCR through Outfall 003. Discharge of treated wastewater from CPNPP is regulated by TPDES permit No. WQ0001854000. CPNPP operates in compliance with the permit's requirements (TCEQ 2021c).

9.5.3.5 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112, and facilities subject to the rule must prepare and implement a SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. CPNPP is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities utilized at the station to minimize the frequency and severity of oil spills to meet the requirements of this rule. CPNPP also has nonradioactive spill response procedures as part of the station instruction and station administration manuals that identifies site personnel responsibilities and response protocols for spills or releases of regulated materials.

9.5.3.6 Reportable Spills [40 CFR Part 110]

CPNPP is subject to the reporting provision of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the federal Water Pollution and Control Act. Any discharge of oil in such quantities that may be harmful to the public health or welfare, or the environment must be reported to the EPA's national response center. Based on a review of site records over the previous 5 years (2016–2020), there have been no releases at CPNPP that triggered this notification requirement.

9.5.3.7 Reportable Spills [30 TAC 327]

CPNPP is subject to the reporting provision of Texas Administrative Code 30 TAC 327. This reporting provision requires that any release of oil, petroleum product, used oil, hazardous substances, industrial solid waste, or other substances into the environment in a quantity equal to or greater than reportable quantity listed in Section 327.4 is to be reported within 24 hours to the TCEQ regional office, the state emergency response center, and the State of Texas 24-hour spill reporting hotline, followed by cleanup and remediation. (TCEQ 2021d) Based on review of records over the previous 5 years (2016–2020), there have been no releases at CPNPP that triggered this notification requirement.

As discussed in Section 3.6.4.2.2, there was a courtesy notification made to the TCEQ for a mineral oil release from a Unit 2 transformer fire on June 7, 2021. The spill cleanup was completed by June 11, 2021. The TCEQ confirmed that the amount of oil spilled was below reportable limits and noted appreciation for CPNPP's notification and compliance efforts to ensure protection of the State's environment.

9.5.3.8 Facility Response Plan

CPNPP is not subject to the facility response plan risk requirements described in 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than 1 MG.

9.5.3.9 Section 404 Permit

Currently, CPNPP does not have any Section 404 permits in place because, as discussed in Section 3.6.1.5, CPNPP does not have any dredge and fill activities, and none are anticipated. However, CPNPP would comply with regulatory requirements imposed by the USACE under Section 404 of the CWA as it relates to performing future activities in federal jurisdictional waters when appropriate.

9.5.4 Safe Drinking Water Act

As discussed in Section 2.2.3.4, potable water for the plant and associated support structures and buildings for Units 1 and 2 is supplied by the SCWD PWS. CPNPP had one active groundwater well registered with the TCEQ that was used for potable and sanitary purposes at the recreation training facility (TCEQ 2021e). However, as discussed in Section 3.6.3.2, that well was deactivated on August 24, 2021. CPNPP no longer operates a non-transient non-community waterworks and is therefore no longer subject to the requirements of the Safe Drinking Water Act.

9.5.5 Endangered Species Act

Potential impacts on federally and state-listed species were considered in CPNPP's review and analysis in Section 4.6, and it was concluded that none would be affected as a result of LR.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered, or threatened. Depending on the action involved, the ESA requires consultation with the USFWS and with the NOAA Fisheries if marine or anadromous species could be affected. CPNPP has invited comment from the USFWS during the development of this ER, and the consultation letter submitted to the USFWS, and their response is provided in Attachment C. A more structured process with this agency may be initiated by the NRC per Section 7 of the ESA.

9.5.6 Migratory Bird Treaty Act

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed, and grants protection to any bird parts, including feathers, eggs, and nests. CPNPP adheres to the MBTA but does not currently hold any MBTA-related permits.

9.5.7 Bald and Golden Eagle Protection Act

The BGEPA prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. As discussed in Section 3.7.8.3, bald eagles are not known to nest on the CPNPP site; however, activities on the CPNPP site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted. There are currently no BGEPA permitting requirements associated with CPNPP operation.

9.5.8 Magnuson-Stevens Fishery Conservation and Management Act

As discussed in Section 3.7.8.5, there was no EFH identified during the review of NOAA's EFH data. Though CPNPP sits on the SCR, enclosed freshwater habitats are not considered EFH areas by NOAA. Subsequently, no HAPC or EFH areas protected from fishing are located on or adjacent to CPNPP. Therefore, there are no Magnuson-Stevenson Fishery Conservation and Management Act restrictions applicable to CPNPP operations.

9.5.9 Marine Mammal Protection Act

The Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens in high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no Marine Mammal Protection Act permitting requirements associated with CPNPP.

9.5.10 Coastal Zone Management Act

The federal Coastal Zone Management Act (CZMA) [16 USC 1451 et seq.] imposes requirements on an applicant for a federal license to conduct an activity that could affect a state's coastal zone. The act requires an applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal management program [16 USC 1456(c)(3)(A)] and provide a copy to the state for concurrence. NOAA has promulgated implementation regulations indicating the requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.541(b)(1)]. The regulation requires that the license applicant provides its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC's Office of Nuclear Reactor Regulation has issued guidance to staff regarding compliance with the CZMA. This guidance acknowledges that Texas has an approved coastal zone management program. The Texas coastal zone is composed of all or portions of 18 coastal counties and does not include Hood or Somervell counties. (NRC 2013g) CPNPP received a letter from the TGLO confirming that the facility is located outside of the Texas zone and is not required to provide a Coastal Management Program consistency certification. (Attachment F).

9.5.11 National Historic Preservation Act

Section 106 of the NHPA [54 USC 300101 et seq.] requires federal agencies having the authority to license any undertaking, prior to issuing the license, to consider the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any SHPO to substitute state review for council review [35 CFR 800.7]. Although not required of an applicant by federal law or NRC regulation, to provide early consultation for the Section 106 process, Vistra OpCo contacted the THC for informal consultation concerning CPNPP LR and potential effects on cultural resources within the approximate 7,700-acre site and on historic properties within a 6-mile radius of CPNPP. The THC issued a letter on May 27, 2021, confirming that there are no historic resources present or affected by the proposed license renewal, and that there are no anticipated changes to use or construction plans that may alter these resources. Therefore, the THC's determination of "no historic properties affected" will continue to apply (Attachment D). Native American groups recognized as potential stakeholders were also consulted by Vistra OpCo with the opportunity for comment (Attachment D). Furthermore, as discussed in Section 4.7.4.2, although no license renewal-related ground-disturbing activities have been identified, Vistra OpCo has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant.

9.5.12 Resource Conservation and Recovery Act

9.5.12.1 Nonradioactive Wastes

As a generator of hazardous wastes, CPNPP is subject to and complies with RCRA and specific TCEQ regulation contained in 30 TAC Chapter 335. CPNPP is classified as a small quantity generator of hazardous waste; therefore, hazardous waste routinely makes up only a small percentage of the total waste generated. As a generator of hazardous waste, CPNPP also maintains a hazardous waste generator identification number (Table 9.1-1).

As described in Section 9.4, there is a 30-year post closure care permit (#50356) and associated programs in place to monitor for potential impacts to groundwater from two landfills that were closed in 1992 and 1993. CPNPP received two notices of deficiency (NODs) from the TCEQ for the years 2016 through 2020. The first NOD was received June 28, 2017, for reporting deficiencies in the annual groundwater report, and the second was received October 17, 2018, for administrative deficiencies found in the permit renewal/minor amendment application. CPNPP provided responses to the TCEQ for both NODs, which satisfactorily resolved the deficiencies.

9.5.12.2 Reportable Spills [40 CFR Part 262]

CPNPP is subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(c) as it relates to a fire, explosion, or other release of hazardous waste which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached surface water. Any such events must be reported to the EPA's national response center. Based on a review of

records over the previous 5 years (2016–2020), there have been no releases at CPNPP that triggered this notification requirement.

9.5.12.3 Mixed Wastes

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous wastes are regulated by the EPA under the RCRA of 1976. Management of radioactive waste at CPNPP is discussed in Section 2.2.6. CPNPP's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any NOVs for the 2016–2020 timeframe. CPNPP will continue to store and dispose of hazardous and non-hazardous wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed LR operating term.

9.5.12.4 Underground and Aboveground Storage Tanks [30 TAC Chapter 334]

CPNPP has four 102,000-gallon diesel storage tanks. The tanks do not meet the requirement to be registered as aboveground or underground storage tanks and are exempt from registration with the TCEQ based on 30 TAC 334.3. However, CPNPP does perform inspections and testing of USTs and ASTs as required by 40 CFR Part 112 to comply with SPCC requirements.

9.5.13 Pollution Prevention Act

In accordance with RCRA Section 2002(b) and 40 CFR 262.27, a small or large quantity generator must certify that there is a waste minimization program in place to reduce the volume and toxicity of the waste generated to the degree determined to be economically practical. CPNPP, per the Waste Reduction Policy Act of 1991, complies with 30 TAC 335.473 requirement to have a current P2 plan and has a P2 plan in place to minimize hazardous waste generated to specified parameters detailed.

9.5.14 Federal Insecticide, Fungicide, and Rodenticide Act

Commercially approved herbicides may be applied by a licensed contractor on an as-needed basis to control vegetation. Pesticides may also be applied inside buildings by a licensed contractor. Because only contractors who have obtained a license as specified in Texas statute 76.105 and Texas Administrative Code 4 TAC Chapter 7, Section 7.22 can conduct herbicide/pesticide applications onsite, CPNPP is in compliance with the requirements of these regulations.

9.5.15 Toxic Substances Control Act

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which may be present at CPNPP. CPNPP has been PCB-free since 1999 and is no longer required to maintain a PCB inventory or procedures. CPNPP's procedure STI-211.02 provides guidance for asbestos removal to ensure compliance with state and federal regulations. CPNPP is in compliance with the PCB and asbestos regulations applicable to the facility.

9.5.16 Hazardous Materials Transportation Act

Because CPNPP ships hazardous materials regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in 49 CFR, including the requirement to possess a current hazardous materials certificate of registration (Table 9.1-1).

9.5.17 Emergency Planning and Community Right-to-Know Act

CPNPP is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act, which requires the submission of an emergency and hazardous chemical inventory report (Tier II) to the local emergency planning commission, the state emergency response commission, and the local fire department. This report, which typically includes, but is not limited to, chemicals such as argon, ammonium molybdate, caustic soda, diesel fuel, battery fluid, liquid nitrogen, phosphoric acid, hydrazine, sodium hypochlorite, sulfuric acid, sodium hydroxide, and unleaded gasoline, is submitted to these agencies annually. CPNPP is in compliance with this regulation.

9.5.18 Comprehensive Environmental Response, Compensation, and Liability Act

CPNPP is subject to the hazardous substance release reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the EPA's national response center, TCEQ, and the state emergency response center as appropriate and subsequent written follow-up. Based on a review of records over the 5-year period, 2016–2020, there have been no releases at CPNPP that have triggered this notification requirement.

9.5.19 Farmland Protection Policy Act

The FPPA only applies to federal programs. The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and CPNPP is located on non-federal lands, the FPPA is not applicable.

9.5.20 Federal Aviation Act

Coordination with the FAA is required when it becomes necessary to ensure that the highest structures associated with a project do not impair the safety of aviation. Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exits or recommending project changes and/or the installation of warning devices such as lighting.

As presented in Section 3.2.3, the CPNPP site elevation is dominated by the approximately 266-foot-high reactor containment buildings. No LR-related construction activities have been identified; therefore, no new notifications to the FAA are required.

9.5.21 Occupational Safety and Health Act

The Occupational Safety and Health Act governs the occupational safety and health of the construction workers and operations staff. CPNPP and its contractors comply with OSHA's requirements, as these are incorporated in the site's occupational health and safety practices and governed through site policies and procedures.

9.5.22 State Water Use Program

As shown in Table 9.1-1, CPNPP has a Certificate of Adjudication (12-4097) approved by the TCEQ for water rights in the Brazos II River segment of the Brazos River basin. The certificate authorizes CPNPP to appropriate waters of the State of Texas in the Brazos River basin for use in cooling and auxiliary water systems from impoundments on Squaw Creek and Panther Creek. As discussed in Section 3.6.3.1, CPNPP also has an agreement with the BRA to withdraw supplemental water from Lake Granbury and/or Possum Kingdom Lake which are impoundments on the Brazos River.

9.5.23 County Zoning Requirements

CPNPP is located in unincorporated portions of Hood and Somervell counties, Texas. As discussed in Section 3.2.2, counties do not have the authority to pass ordinances or zoning regulations as such authority is retained by municipalities. The cities of Glen Rose (Somervell County) and Granbury (Hood County) have zoning laws in place to govern existing and future land uses and development. There are no land use or development regulations in place for unincorporated areas of Hood and Somervell counties. CPNPP is located outside the municipal boundary of the two cities, and therefore is not subject to zoning or development regulations.

9.6 <u>Environmental Reviews</u>

CPNPP has procedural controls in place to ensure all environmentally sensitive areas at CPNPP, if present, are adequately protected during site operation and project planning. These controls, which encompass nonradiological environmental resource areas such as land use, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, and waste management and P2, consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified, as necessary.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species; BMPs are implemented to minimize impacts to these species.

- Appropriate agencies are consulted on matters involving cultural resources and to ensure BMPs are implemented to minimize impacts to this resource.

In summary, CPNPP's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed, as necessary.

9.7 Alternatives

The discussion of alternatives in the environmental report shall include a discussion of whether alternatives will comply with such applicable environmental quality standards and requirements [10 CFR 51.45(d)].

No-action alternatives are discussed in Chapter 7. If the NRC does not issue a license renewal for CPNPP and one of the no-action alternatives were implemented, the alternate generating facilities could be constructed and operated to comply with applicable environmental quality standards and regulations. Continued compliant operation of CPNPP would avert the additional impacts from these alternate generating facilities.

10.0 REFERENCES CITED

61 FR 28467. Environmental Review for Renewal of Nuclear Power Plant Operating Licenses; Final Rule. *Federal Register* Volume 61:28467-28497 (June 5, 1996).

78 FR 37282. Revisions to Environmental Review for Renewal of Nuclear Power Plant Operating Licenses. Final rule. *Federal Register* 78:37282 (June 20, 2013).

83 FR 11192. Pioneer Valley Renewables: Notice of Preliminary Permit Application Accepted for Filing and Soliciting Comments, Motions to Intervene, and Competing Applications. Federal Register 83:11192 (March 14, 2018).

AAB (All About Birds). 2021a. Harris's Sparrow Life History. The Cornell Lab. Retrieved from <https://www.allaboutbirds.org/guide/Harriss_Sparrow/lifehistory> (accessed on May 28, 2021).

AAB. 2021b. Lesser Yellowlegs Life History. The Cornell Lab. Retrieved from <https://www.allaboutbirds.org/guide/Lesser_Yellowlegs> (accessed May 28, 2021).

AAB. 2021c. Semipalmated Sandpiper Life History. The Cornell Lab. Retrieved from <https://www.allaboutbirds.org/guide/Semipalmated_Sandpiper/lifehistory> (accessed May 28, 2021).

AAB. 2021d. Red-headed Woodpecker Life History. Retrieved from <https://www.allaboutbirds.org/guide/Red-headed_Woodpecker> (accessed May 28, 2021).

AirNav. 2021. Texas Airports. Retrieved from <https://www.airnav.com/airports/search.html> (accessed February 15, 2021).

AISC (Alberta Invasive Species Council). 2020. Feral Pig. Retrieved from <https://abinvasives.ca/wp-content/uploads/2020/04/200420-FS-FeralPig.pdf> (accessed November 30, 2020).

Amtrak. 2021. Routes and Stations. Retrieved from <https://www.amtrak.com/train-routes> (accessed February 15, 2021).

AMUD (Acton Municipal Utility District). 2021a. Hood County Utilities. Retrieved from <https://www.amud.com/forms-and-reports-1> (accessed June 1, 2021).

AMUD. 2021b. About AMUD. Retrieved from <https://www.amud.com/about-us> (accessed June 1, 2021).

AMUD. 2021c. Water Conservation. Retrieved from <https://www.amud.com/water-conservation> (accessed June 1, 2021).

Audubon (The Audubon Society). 2021a. Guide to North American Birds: Whooping Crane (*Grus americana*). Retrieved from <https://www.audubon.org/field-guide/bird/whooping-crane> (accessed May 3, 2021).

Audubon. 2021b. Guide to North American Birds: Black Rail (*Laterallus jamaicensis*). Retrieved from <https://www.audubon.org/field-guide/bird/black-rail> (accessed May 27, 2021).

Baird, Michael S. and Tibbs, John. 2018. Lake Granbury 2017 Fisheries Management Survey Report. Inland Fisheries Division. Waco District, Waco, Texas. July 31, 2018. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/lake_survey/pwd_rp_t3200_1300/> (accessed May 26, 2021.)

Baird, Michael S. and Tibbs, John. 2019. Squaw Creek Reservoir 2018 Fisheries Management Survey Report. Inland Fisheries Division. Waco District, Waco, Texas. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/lake_survey/pwd_rp_t3200_1696/> (accessed May 19, 2021.)

BEA (U.S. Bureau of Economic Analysis). 2022. Hood, Somervell, and Tarrant Counties, economy. Retrieved from <https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1> (accessed February 11, 2022).

Benson, A.J., D. Raikow, J. Larson, A. Fusaro, A.K. Bogdanoff, and A. Elgin. 2020a. Dreissena polymorpha (Pallas, 1771): U.S. Geological Survey, Nonindigenous Aquatic Species Database. Retrieved from <https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=5> (accessed November 23, 2020).

Benson, A., E. Maynard, D. Raikow, J. Larson, T.H. Makled, and A. Fusaro. 2020b. Daphnia lumholtzi (G.O. Sars, 1885): U.S. Geological Survey, Nonindigenous Aquatic Species Database. Retrieved from <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=164> (accessed November 24, 2020).

BLS (U.S. Bureau of Labor Statistics). 2022. Hood, Somervell and Tarrant Counties, unemployment rate. Retrieved from <https://data.bls.gov/cgi-bin/dsrv?la> (accessed February 16, 2022).

BMNA (Butterflies and Moths of North America). 2020. Regional Species Checklists. Butterflies and Moths of Hood County, Texas, United States. Retrieved from <https://www.butterfliesandmoths.org/checklists?species_type=All&tid=47778> (accessed November 13, 2020).

BRA (Brazos River Authority). 2021. Brazos Water Snake. Retrieved from <https://brazos.org/About-Us/Environmental/Species/Species-of-Interest/Threatened-Species/Brazos-Water-Snake> (accessed on May 37, 2021).

BWI (Bio-West, Inc.). 2008. Squaw Creek Reservoir Characterization Study. Retrieved from <https://www.nrc.gov/docs/ML0921/ML092180087.pdf> (accessed November 23, 2020).

Callaway, Rhonda L. 2006. The Handbook of Texas Online. Hood County. The Texas State Historical Association. Retrieved from <http//www.tsha.utexas.edu/handbook/online/articles> (accessed March 24, 2021).

CDC (U.S. Centers for Disease Control and Prevention). 2017. National Outbreak Reporting System: Waterborne. Retrieved from <https://wwwn.cdc.gov/norsdashboard/> (accessed February 18, 2021).

CDC. 2020. Parasites – *Naegleria fowleri* – Primary Amebic Meningoencephalitis (PAM) – Amebic Encephalitis, General Information. Retrieved from <https://www.cdc.gov/parasites/naegleria/general.html> (accessed December 15, 2020).

CGR (City of Glen Rose). 2021a. City of Glen Rose Zoning Map, November 2019. Retrieved from <https://www.glenrosetexas.org/services/departments-2/planning-and-zoning/city-maps/> (accessed February 19, 2021).

CGR 2021b. City of Glen Rose Code of Ordinances "Article 14.02 Zoning Ordinance." Retrieved from <https://www.glenrosetexas.org/government/> (accessed February 19, 2021).

CPNPP. 2014. *Comanche Peak Steam Electric Station Offsite Dose Calculation Manual Unit 1 and Unit 2.* Enclosure 2. Revision 32. April 2014. ADAMS Accession No. ML14190A281.

CPNPP. 2021. Comanche Peak Nuclear Power Plant 2020 Annual Radiological Environmental Operating Report. April 29, 2021. ADAMS Accession No. ML21127A164.

Collins, Michael B. Wilson-Leonard. 1998. *An 11,000 Year Archeological Record of Hunter-Gatherers in Central Texas*. Volume I: Introduction, Background and Synthesis. Studies in Archaeology 31. Texas Archeological Research Laboratory, The University of Texas at Austin. Retrieved from <https://scholarworks.sfasu.edu/cgi/viewcontent.cgi?article=1663&context=ita> (accessed March 15, 2021).

Crise, Allen. 2009. Fly Fishing the Paluxy River. Retrieved from <https://www.twff.net/Fly%20Fishing%20Resources/resource%20pages/Fishing%20on%20the%20Paluxy%20River%20by%20Al%20Crise.htm> (accessed May 2, 2021).

DOE (U.S. Department of Energy). 2015. Wind Vision: A New Era for Wind Power in the United States. Retrieved from <https://www.nrel.gov/docs/fy15osti/63197-2.pdf> (accessed March 17, 2020).

DOE. 2017. Fuel Cell Technologies Market Report 2016. Retrieved from <https://www.energy.gov/eere/fuelcells/market-analysis-reports#mkt_business> (accessed December 23, 2020).

DOE. 2019. Marine and Hydrokinetic Technology Database. Retrieved from <https://www.energy.gov/eere/water/marine-and-hydrokinetic-technology-resources> (accessed July 8, 2019).

Duke Energy. 2019. Duke Energy to Offer Bloom Energy Distributed Fuel Cell Technology to Customers. July 1, 2019. Retrieved from <https://www.bloomenergy.com/newsroom/press-releases/duke-energy-offer-bloom-energy-distributed-fuel-cell-technology-customers#:~:text=Duke%20Energy%20to%20offer%20Bloom%20Energy%20distributed%20fuel,and%20industrial%20customers%20in%20California%20and%20Northeast%20region> (accessed June 2, 2021).

eBird. 2021. Species Maps. Retrieved from <http:/ebird.org/map> (accessed May 2, 2021).

ECM (Energy Capital Media). 2021. *The Women Behind America’s Largest Solar Energy Center*. Retrieved from <https://energycapitalmedia.com/2021/03/10/samson-solar-women/> (accessed September 13, 2021).

Eddleman. 1994. Birds of the World, Black Rail. Retrieved from <https://birdsoftheworld.org/bow/species/blkrai/cur/introduction> (accessed November 24, 2020).

EIA (U.S. Energy Information Administration). 2021a. Levelized Cost of New Generation Resources in the Annual Energy Outlook 2021. Retrieved from <https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf> (accessed May 12, 2021).

EIA. 2021b. April 2021 Monthly Energy Review. Table A4. Retrieved from <https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf> (accessed May 12, 2021).

EIA. 2021c. Electric Power Annual Data Tables, Table 4.08B. Capacity Factors for Utility Scale Generators Primarily Using Non-Fossil Fuels. Retrieved from <https://www.eia.gov/electricity/annual/> (accessed September 13, 2021).

Elam, Richard. 2006. Somervell County. The Handbook of Texas Online. The Texas State Historical Association. Retrieved from <http://www.tsha.utexas.edu/handbook/online/articles> (accessed March 20, 2021).

Elliot, Lee. 2014. Descriptions of Systems, Mapping Subsystems, and Vegetation Types for Texas. Texas Parks and Wildlife Department. Retrieved from <https://tpwd.texas.gov/gis/programs/landscape-ecology/supporting-documents/all-systems-descriptions/at_download/file> (accessed May 18, 2021).

Elliott-Smith, E., and S.M. Haig. 2004. Piping Plover (*Charadrius melodus*). Retrieved from <https://birdsna.org/SpeciesAccount//bna/spcies/pipplo/> (accessed November 12, 2020).

EMST (Ecological Mapping System of Texas). N.d. Edwards Plateau Limestone Shrubland. Texas Parks and Wildlife Department. Retrieved from <https://tpwd.texas.gov/landwater/land/programs/landscape ecology/ems/emst/shrublands/edwards-plateau-limestone-shrubland> (accessed April 30, 2021).

EPA (U.S. Environmental Protection Agency). 2000. Air Pollutant EmissionFactors.Vol.1, Stationary Point Sources and Area Sources, Section 3.1, Stationary Gas Turbines for Electricity Generation, AP-42. Sept 2000. Retrieved from <https://www.epa.gov/air-emissions-factors-and-quantification> (accessed July 17, 2019 and July 9, 2021).

EPA. 2016. What Climate Change Means for Texas. Retrieved from <https://www.epa.gov/sites/production/files/2016-09/documents/climate-change-tx.pdf> (accessed June 23, 2021).

EPA. 2021a. Enforcement and Compliance Assurance in Texas. Retrieved from <https://www.epa.gov/tx/enforcement-and-compliance-assurance-texas> (accessed May 20, 2021).

EPA. 2021b. Nonattainment Areas for Criteria Pollutants (Green Book). Retrieved from <https://www.epa.gov/green-book> (accessed March 4, 2021).

EPA. 2021c. Greenhouse Gas Equivalencies Calculator. Retrieved from <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator?unit=vehicles&amount=1105> (accessed March 4, 2021).

EPA. 2021d. Map of Sole Source Aquifer Locations. Retrieved from <https://www.epa.gov/dwssa/map-sole-source-aquifer-locations> (accessed March 9, 2021).

ERCOT (Electric Reliability Council of Texas). 2018. Wind Integration in ERCOT, EIA Conference Presentation by B. Garza, Director ERCOT IMM, June 4, 2018. Retrieved from <https://www.eia.gov/conference/2018/pdf/presentations/beth_garza.pdf> (accessed October 5, 2020).

Exelon. 2014. Exelon (Exelon Generation Company, LLC.). Response to Request for Additional Information. Kennett Square, PA: Exelon. March 12, 2014. 17 p. ADAMS No. ML14071A378.

FAA (Federal Aviation Administration). 2018. Administrative Circular 70/7460-1L, Change 2, Chapter 14. August 17, 2018. Retrieved from <https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_-_Obstuction_Marking_and_Lighting_-_Change_2.pdf> (accessed June 1, 2021).

FC Times (The Freestone County Times). 2020. Freestone County's Big Brown Plant Purchased by CLP. Retrieved from <https://freestonecountytimesonline.com/freestone-countys-big-brown-plant-purchased-by-clp/> (accessed March 23, 2021).

FEMA (Federal Emergency Management Agency). 2020. FEMA Flood Map Service Center. Retrieved from <https://msc.fema.gov/portal/home> (accessed December 9, 2020).

FERC (U.S. Federal Energy Resource Commission). 2020. Marine & Hydrokinetic Projects as February 19, 2020. Retrieved from <https://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics/hydrokinetics-projects.pdf> (accessed February 28, 2020).

FireDepartment.net. 2021. Somervell County Volunteer Fire Department. Retrieved from <https://www.firedepartment.net/directory/texas/somervell-county/glen-rose/somervell-county-volunteer-fire-department> (accessed February 11, 2021).

Fofonoff, P.W., G.M. Ruiz, B. Steves, C. Simkanin, and J.T. Carlton. 2018. Smithsonian Institution National Exotic Marine and Estuarine Species Information System, *Rhithropanopeus harrisii*. Retrieved from <https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=98790> (accessed December 1, 2020).

Foster, A.M., P. Fuller, A. Benson, S. Constant, D. Raikow, J. Larson, and A. Fusaro. 2020. Corbicula fluminea (O.F. Müller, 1774): U.S. Geological Survey Nonindigenous Aquatic Species Database. Retrieved from: <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=92> (accessed November 23, 2020).

FPL (Florida Power and Light). 2020. Ten Year Power Plant Site Plan 2020 – 2029, FPL and Gulf Power Submitted to Florida Public Service Commission. April 2020. Retrieved from <https://www.fpl.com/content/dam/fpl/us/en/about/pdf/10-year-site-plan.pdf> (accessed August 14, 2020).

GCOC (Granbury Chamber of Commerce). 2020. Hood County top employers. Retrieved from <https://www.granburychamber.com/economic-development/> (accessed December 21, 2020).

GR (Glen Rose). 2021. Glen Rose Public Safety. Retrieved from <https://www.glenrosetexas.org/services/publicsafety/> (accessed February 11, 2021).

Granbury (City of Granbury). 2021a. City of Granbury Zoning Ordinance, revised November 3, 2020. Retrieved from <http://granbury.org/685/Ordinances> (accessed April 19, 2021).

Granbury. 2021b. "Comprehensive Plan." Retrieved from <http://www.granbury.org/555/Comprehensive-Plan> (accessed June 1, 2021).

Granbury. 2021c. Water Conservation and Drought Contingency Plan 2019. Retrieved from <http://www.granbury.org/DocumentCenter/View/2062/City-of-Granbury---Drought-Contingency-and-Water-Conservation-Plan> (accessed June 1, 2021).

Granbury. 2021d. Public Works Department, Water and Wastewater. Retrieved from <https://www.granbury.org/25/Public-Works> (accessed December 2, 2021).

Griffith, G.E., S.A. Bryce, J.M. Omernik, J.A. Comstock, A.C. Rogers, B. Harrison, S.L. Hatch, and D. Bezanson. 2004. Ecoregions of Texas. Retrieved from <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-6#pane-41> (accessed November 16, 2020).

Griffith, G., Bryce, S., Omernik, J., Rogers, A. 2007. Ecoregions of Texas. Retrieved from <http://ecologicalregions.info/htm/pubs/TXeco_Jan08_v8_Cmprsd.pdf> (accessed May 27, 2021).

Hale, Carol S. 2004. Mid-Brazos River Watershed Riparian Wildlife Habitat Evaluation. U. S. Fish and Wildlife Service Region 2, Arlington Ecological Services Field Office, Arlington, Texas. Retrieved from <https://www.fws.gov/southwest/es/arlingtontexas/pdf/midbrazosreport.pdf> (accessed May 21, 2021).

Hammerson, G. 2020. Common Carp (*Cyprinus carpio*). NatureServe Explorer. Retrieved from <https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.105636/Cyprinus_carpio> (accessed November 23, 2020).

Harriet, P., A. Fusaro, A. Davidson, K. Alame, M. Gappy, and W. Conard. 2021. Rhithropanopeus harrisii (Gould, 1841): U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, and NOAA Great Lakes Aquatic Nonindigenous Species Information System, Ann Arbor, MI. Retrieved from <https://nas.er.usgs.gov/queries/greatlakes/FactSheet.aspx?Species_ID=197&Potential=Y&Type=2&HUCNumber=> (accessed June 3, 2021).

Haynie, C.B. 2017. Birds of Dinosaur Valley State Park: A Field Checklist. Natural Resources Program, Texas Parks and Wildlife Department. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_p4503_0094a.pdf> (accessed November 12, 2020).

HCN (Hood County News). 2021. "With stalemate over sewer plant, Granbury officials face possible city-wide building ban, lawsuit." April 9. 2021. Retrieved from <https://www.hcnews.com/news/with-stalemate-over-sewer-plant-granbury-of%ed%af%80%ed%b1%afcials-face-possible-city-wide-building-ban-lawsuit/article_434a176e-9966-11eb-8478-5b59edcea613.html> (accessed June 1, 2021).

HUD (U.S. Department of Housing and Urban Development). 2009. *HUD Noise Guidebook,* March 2009. Retrieved from <https://www.hudexchange.info/resource/313/hud-noise-guidebook/> (accessed May 5, 2021).

iNaturalist. 2020a. Hood County Reptiles. Data Download. Retrieved from <https://www.inaturalist.org/places/hood-county#taxon=26036> (accessed November 20, 2020).

iNaturalist. 2020b. Hood County Amphibians. Data Download. Retrieved from <https://www.inaturalist.org/places/hood-county#taxon=40151> (accessed November 20, 2020).

iNaturalist. 2020c. Hood County Mammals. Data Download. Retrieved from <https://www.inaturalist.org/places/hood-county#taxon=40151> (accessed November 20, 2020).

Invenergy. 2020. Samson Solar. Retrieved from<https://samsonsolarenergycenter.com/#media> (accessed September 13, 2021).

Jacono, C.C., M.M. Richerson, V. Howard Morgan, and I.A. Pfingsten. 2020. *Hydrilla Verticillata*. U.S. Geological Survey, Nonindigenous Aquatic Species Database. Retrieved from <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=6> (accessed November 23, 2020).

Landis, D. and Fiedler, A. Prairie Fen Companion Plant Facts: Cattail. MSU Department of Entomology. Retrieved from <https://www.canr.msu.edu/nativeplants/uploads/files/Cattail.pdf> (accessed May 2, 2021).

LBNL (Lawrence Berkeley National Laboratory). 2019. Benchmarking Anticipated Wind Project Lifetimes: Results from a Survey of U.S. Wind Industry Professionals. September 2019. Retrieved from <https://eta.lbl.gov/publications/benchmarking-anticipated-wind-project> (accessed June 2, 2021).

LBNL. 2020. Benchmarking Utility-Scale PV Operational Expenses and Project Lifetimes: Results from a Survey of U.S. Solar Industry Professionals. June 2020. Retrieved from <https://eta-publications.lbl.gov/sites/default/files/solar_life_and_opex_report.pdf> (accessed April 29, 2021.

Leidos. 2016. Comparison of Fuels Used for Electric Generation in the U.S. Retrieved from <https://www.ngsa.org/download/Leidos-Update-2016-fuel-comparison.pdf> (accessed August 6, 2019).

Lockwood, Mark. 1997. Learn About Texas Birds. Texas Parks and Wildlife Department. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_p4000_0038.pdf> (accessed May 21, 2021).

Lumen (Lumen Learning). 2021. "Introduction to Local Government." Retrieved from <https://courses.lumenlearning.com/austinccstexasgovernment1/chapter/introduction-to-local-government/#:~:text=Counties%20in%20Texas%20do%20not,structures%3A%20antennas)> (accessed June 1, 2021).

Luminant. 2007. Comanche Peak Steam Electric Station, License Amendment Request (LAR) 07-004, Revision to Operating License and Technical Specification 1.0 "Use and Application" and 3.7.17, "Spent Fuel Assembly Shortage" to Revise Rated Thermal Power from 3458 MWT to 3612 MWT. Dockets 50-445 and 50-446. August 28, 2007. ADAMS Accession No. ML072490131.

Luminant. 2011. Sandow Power Plant Celebrates 30 Years of Operations. Retrieved from <https://www.luminant.com/sandow-power-plant-celebrates-30-years-of-operations/> (accessed March 23, 2021).

Luminant. 2013a. Comanche Peak Nuclear Power Plant, Units 3 and 4, COLA Review (Letter to NRC, Application Review Suspended). November 7, 2013. Retrieved from <https://www.nrc.gov/docs/ML1331/ML13316A369.pdf> (accessed April 27, 2021). ADAMS Accession No. ML13316A369.

Luminant. 2013b. Comanche Peak Nuclear Power Plant Units 3 and 4 COLA Environmental Report, Revision 4. November 2013. ADAMS Ascension Nos. ML13345A366, ML13345A374, ML13345A636, ML13345A656, ML13345A663, ML13345A674, ML13345A682, ML13345A685, ML13345A720, ML13345A729.

Luminant. 2015. Martin Lake Power Plant and Mines. Retrieved from <https://www.luminant.com/wp-content/uploads/2015/02/MartinLake_Facts.pdf> (accessed March 23, 2021.

Luminant. 2017a. 2016 Annual Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant. January 1, 2016 to December 31, 2016. Dockets 50-445 and 50-446. April 23, 2017. ADAMS Accession No. ML17124A376.

Luminant. 2017b. Luminant to Close Two Texas Power Plants. Retrieved from <https://www.luminant.com/luminant-close-two-texas-power-plants/> (accessed March 23, 2021).

Luminant. 2017c. Luminant Announces Decision to Retire Its Monticello Power Plant. Retrieved from <https://www.luminant.com/luminant-announces-decision-retire-monticello-power-plant/> (accessed March 23, 2021).

Luminant. 2018a. 2017 Annual Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant. January 1, 2017 to December 31, 2017. Dockets 50-445 and 50-446. March 13, 2018. ADAMS Accession No. ML18129A218.

Luminant. 2018b. Upton 2 Solar Power Plant Achieves Operation. June 4, 2018. Retrieved from <https://www.luminant.com/upton-2-solar-power-plant-achieves-commercial-operation/#:~:text=IRVING%2C%20Texas%2C%20June%201%2C,Texas'%20largest%20operating%20solar%20facility> (accessed June 1, 2021).

Luminant. 2019. 2018 Annual Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant. January 1, 2018 to December 31, 2018. Dockets 50-445 and 50-446. April 10, 2019. ADAMS Accession No. ML19122A387.

Luminant. 2020a. Comanche Peak Nuclear Power Plant. Fire Protection Report Units 1 and 2. Revision 33. June 25, 2020. ADAMS Accession No. ML20315A108.

Luminant. 2020b. 2019 Annual Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant. January 1, 2019 to December 31, 2019. Dockets 50-445 and 50-446. March 27, 2020. ADAMS Accession No. ML20113E981.

Luminant. 2020c. Comanche Peak Nuclear Power Plant Annual Radiological Environmental Operating Report. January 1, 2019 through December 31, 2019. April 27, 2020. ADAMS Accession No. ML20122A15.

Luminant. 2020d. Comanche Peak Nuclear Power Plant FSAR Chapter 2 Excerpt. November 13, 2020. ADAMS Accession No. ML20311A164.

Luminant. 2021a. 2020 Annual Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant. January 01, 2020 to December 31, 2020. Dockets 50-445 and 50-446. March 29, 2021. ADAMS Accession No. ML21118A008.

Luminant. 2021b. Squaw Creek Park. Retrieved from <https://www.luminant.com/squaw-creek-park/#parkinfo> (accessed April 26, 2021).

Luminant. 2021c. About Luminant. Retrieved from <https://www.luminant.com/about/> (accessed March 23, 2021).

McBride. 2009. Distribution and Status of the Brazos River Water Snake. Retrieved from <https://tpwd.texas.gov/huntwild/wild/research/highlights/taxa/publications/McBride_2009_WaterSnake.pdf> (accessed November 24, 2020).

McLure, M.L., C.L. Burdett, M.L. Farnsworth, S.J. Sweeney, and R.S. Miller. 2018. A Globally Distributed Alien Invasive Species Poses Risks to United States Imperiled Species. Nature 8: 5331. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5871849/pdf/41598_2018_Article_23657.pdf> (accessed November 23, 2020).

McWilliams J. 2004. *Arundo donax*. In: Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Retrieved from <https://www.fs.fed.us/database/feis/plants/graminoid/arudon/all.html> (accessed November 24, 2020).

NCDC (National Climatic Data Center). 2020. Local Climatological Data (LCD), 2019 Annual Summary with Comparative Data for Dallas-Fort Worth (KDFW), Waco (KACT), and Abilene (KABI), Texas. Retrieved from <https://www.ncdc.noaa.gov/IPS/lcd/lcd.html> (accessed July 30, 2020).

NCEI (National Centers for Environmental Information). 2020. Storm Events Database. Search Results for Somervell County, Texas. Event type: Thunderstorms, Tornados and Hurricanes. Retrieved from <https://www.ncdc.noaa.gov/stormevents> (accessed July 30, 2020).

NCES (National Center for Education Statistics). 2021. Hood, Somervell, and Tarrant County schools. Retrieved from <https://nces.ed.gov/ccd/districtsearch/> (accessed February 9, 2021).

NCSL (National Conference of State Legislatures). 2021. Federal and State Recognized Tribes. Retrieved from <https://www.ncsl.org/research/state-tribal-institute/list-of-federal-and-state-recognized-tribes.aspx#fl> (accessed February 15, 2021).

NCTCOG (North Central Texas Council of Governments). 2021. Comprehensive Economic Development Strategy for the North Central Texas Region. Retrieved from <https://www.nctcog.org/nctedd/regional-ceds> (accessed February 16, 2021).

NEI (Nuclear Energy Institute). 2005. Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document. NEI 05-01, Rev A. ADAMS Accession No. MLML060530203.

NEI. 2007. Industry Groundwater Protection Initiative – Final Guidance Document. August 2007. ADAMS Accession No. ML072610036.

NEI. 2019a. Revision 1 to NEI 07-07, Industry Groundwater Protection Initiative – Final Guidance Document, Rev 1. March 2019. ADAMS Accession No. ML19132A071.

NEI. 2019b. Model SLR New and Significant Assessment Approach for SAMA. NEI Report 17-04, Rev 1. August 2019. ADAMS Accession No. ML19316C718.

NETL (National Energy Technology Laboratory). 2010a. Life Cycle Analysis: Natural Gas Combined Cycle (NGCC) Power Plant. DOE/NETL-403-110509. September 30, 2010.

NETL. 2010b. Estimated Freshwater Need to Meet Future Thermoelectric Generation Requirements, Appendix D. DOE/NETL-400-2010-1339. Sept 30, 2010.

Nico, L., E. Maynard, P.J. Schofield, M. Cannister, J. Larson, A. Fusaro, and M. Nielson. 2020. Cyprinus Carpio (Linnaeus, 1758): U.S. Geological Survey, Nonindigenous Aquatic Species Database. Retrieved from <https://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=4> (accessed November 24, 2020).

NMSU (New Mexico State University). 2018. Toxic Golden Algae (*Prymnesium parvum*). Retrieved from <https://aces.nmsu.edu/pubs/_circulars/CR647/welcome.html> (accessed November 23, 2020).

NOAA (National Oceanic and Atmospheric Administration). 2020. EFH Mapper. Retrieved from <https://www.habitat.noaa.gov/protection/efh/efhmapper/> (accessed November 12, 2020).

NOAA 2021a. Rainbow Climatology. Retrieved from <https://www.weather.gov/fwd/rainbowclimatology> (accessed January 18, 2021).

NOAA. 2021b. Historical Hurricane Tracks – GIS Map Viewer. Retrieved from <https://coast.noaa.gov/hurricanes/#map=4/32/-80> (accessed March 4, 2021).

NPS (National Park Service). 2018. Great Plains Province Series: Physiographic Provinces. Retrieved from <https://www.nps.gov/articles/greatplainsprovince.htm#:~:text=The%20Great%20Plains%20spans%20725%2C000,changes%20in%20vegetation%20and%20soils> (accessed November 16, 2020).

NPS. 2021. Series: Physiographic Provinces. Great Plains Province. <https://www.nps.gov/articles/greatplainsprovince.htm> (accessed May 19, 2021).

NRC (U.S. Nuclear Regulatory Commission). 1981. *Final Environmental Statement related to the operation of Comanche Peak Steam Electric Station Units 1 and 2*. NUREG-0755. September 1981. ADAMS Accession No. ML20079M793.

NRC. 1982. NUREG-0773, The Development of Severe Reactor Accident Source Terms: 1957-1981, NRC, November 1982. ADAMS Accession No. ML20070D151.

NRC. 1988 SECY 88-147, Report on the Integration Plan for Closure of Severe Accident Issues. Washington, DC: NRC. July 20, 1988. ADAMS Accession No. ML20151H338.

NRC. 1989. NUREG-0775, Final Environmental Statement related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2, NRC, October 1989. ADAMS Accession No. ML19332D079.

NRC. 1990a. Comanche Peak Power Company LLC and Vistra Operations Company, LLC. Docket No. 50-445, Comanche Peak Nuclear Power Plant, Unit No. 1 Facility Operations License, License No. NPF-87. April 17, 1990. ADAMS Accession No. ML053180521.

NRC. 1990b. Comanche Peak Nuclear Power Plant Unit No. 1 Facility Operating License, Issued June 25, 1990. ADAMS Accession No. ML021790360.

NRC. 1993. Comanche Peak Nuclear Power Plant Unit No. 2 Facility Operating License, Issued April 6, 1993. ADAMS Accession No. ML022270634.

NRC. 1996a. Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses. NUREG-1440. May 1996. ADAMS Accession No. ML20112H565.

NRC. 1996b. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. NUREG-1437, 1996. ADAMS Accession No. ML13106A241.

NRC. 1996c. Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response, NUREG-1529, Volume 2, Office of Nuclear Regulatory Research. May 1996. ADAMS Accession No. ML16362A345.

NRC. 1997a. NUREG/CR-6295, Reassessment of Selected Factors Affecting Siting of Nuclear Power Plants, NRC, February 1997. ADAMS Accession No. ML20135F947.

NRC. 1997b. U.S. Nuclear Regulatory Commission. 1997. Issuance for Public Comment of Proposed 1 Rulemaking for Shutdown and Fuel Storage Pool Operation. SECY-97-168. July 1997. ADAMS Accession No. ML003752569.

NRC. 1999. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants. NUREG-1437, Addendum 1, Main Report, Section 6.3—Transportation, Table 9.1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants. August 1999. ADAMS Accession No. ML20211J993.

NRC. 2001. NUREG/CR-6703, Environmental Effects of Extending Fuel Burnup Above 60 GWd/MTU, NRC, January 2001. ADAMS Accession No. ML010310298.

NRC. 2002. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, Supplement 1. October 2002. ADAMS Accession Nos. ML023470304 and ML023470323.

NRC. 2004. NUREG/BR-0058, Revision 9, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," September 2004. ADAMS Accession No. ML042820192.

NRC. 2005. NUREG-1850, Frequently Asked Questions on License Renewal of Nuclear Power Reactors. Washington, DC: NRC. Mar 31, 2005. ADAMS Accession No. ML061110022.

NRC. 2007a. Comanche Peak Steam Electric Station (CPSES) Units 1 and 2 Issuance of Amendments: Re: Technical Specification Changes related to CPSES Unit 1 Steam Generator Replacement Project. February 20, 2007. ADAMS Accession No. ML070350046.

NRC. 2007b. Meteorological Monitoring Programs for Nuclear Power Plants. Regulatory Guide 1.23, Revision 1. March 2007. ADAMS Accession No. ML070350028.

NRC. 2008a. Comanche Peak Steam Electric Station, Units 1 and 2- Issuance of Amendments Re: License Amendment Request 07-004, Revision to Operating License and Technical Specification 1.0 "Use and Application" to Revise Rated Thermal Power from 3458 MWT to 3612 MWT. TAC Nos. MD6615 and MD6616. June 27, 2008. ADAMS Accession No. ML081510173.

NRC. 2008b. Comanche Peak Steam Electric Station, Units 1 and 2, Final Environmental Assessment and Finding of No Significant Impact Related to the Proposed License Amendment to Increase the Maximum Reactor Power Level. Docket Nos. 50-445 and 50-446. 7590-01-P. June 16, 2008. ADAMS Accession No. ML081510247.

NRC. 2008c. Squaw Creek Reservoir Characterization Study. Final Report. March 2008. ADAMS Accession No. ML092180087.

NRC. 2011. Environmental Impact Statement for Combined Licenses (COLs) for Comanche Peak Nuclear Power Plant Units 3 and 4. Final Report. NUREG-1943, Volumes 1 and 2. ADAMS Accession Nos. ML11131A001 and ML13345A720.

NRC. 2013a. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. NUREG-1437, Vols. 1, 2, and 3, Revision 1. June 2013. ADAMS Accession No. ML13106A241.

NRC. 2013b. Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications. Regulatory Guide 4.2, Supplement 1, Revision 1. June 2013. ADAMS Accession No. ML13067A354.

NRC. 2013c. Environmental Impact Statement for Combined License (COL) for Enrico Fermi Unit 3. Final Report. NUREG-2105, Vols. 1 and 2. January 2013. ADAMS Accession Nos. ML12307A172 and ML12307A176.

NRC. 2013d. Comanche Peak Nuclear Power Plant, Units 3 & 4 COLA Part 3 – Environmental Report. ADAMS Accession No. ML13345A374.

NRC. 2013e. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. NUREG-1437, Vols. 1, 2, and 3, Revision 1. June 2013. ADAMS Accession Nos. ML13106A241, ML13106A242 and ML13106A244.

NRC. 2013f. CLI-13-07, Memorandum and Order in the Matter of Exelon Generation Company, LLC (Limerick Generating Station, Units 1 and 2). October 31, 2013. ADAMS Accession No. ML13304B417.

NRC. 2013g. NRR Office Instruction No. LIC-203 – Procedural Guidance for Preparing Categorical Exclusions, Environmental Assessments, and Considering Environmental Issues. Revision 3. July 1, 2013. ADAMS Accession No. ML12234A708.

NRC. 2014. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants: Limerick Generating Station, Units 1 and 2—Final Report. NUREG-1437, Supplement 49. August 2014. ADAMS Accession No. ML14238A284.

NRC. 2015. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, Supplement 53 Regarding Sequoyah Nuclear Plant, Units 1 and 2. Final Report. March 2015. ADAMS Accession No. ML15075A438.

NRC. 2016. NRC Letter, Comanche Peak Nuclear Plant, Units 1 and 2 - Staff Assessment of Information Provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident and Staff Closure of Activities Associated with Recommendation 2.1, "Seismic" (CAC NOS. MF3937 AND MF3938), January 26, 2016. ADAMS Accession No. ML16014A125.

NRC. 2018. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 58 Regarding River Bend Station, Unit 1, Final Report, NUREG-1437, Supplement 58, October 2018. ADAMS Accession No. ML17174A531.

NRC. 2019. Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 5, Second Renewal Regarding Subsequent License Renewal for Turkey Point Nuclear Generating Unit Nos. 3 and 4, NUREG-1437 Supplement 5, Second Renewal. October 2019. ADAMS Accession No. ML19290H346.

NRC. 2020a. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 6, Second Renewal Regarding Subsequent License Renewal for Surry Power Station Units 1 and 2, April 2020. ADAMS Accession No. ML20071D538.

NRC. 2020b. Occupational Radiation Exposure at Commercial Nuclear Power Reactors and 20 Other Facilities 2018, NUREG-0713, Vol. 40. March 2020. ADAMS Accession No. ML120087J424.

NRC. 2020c. NRR Office Instruction No. LIC-203, Procedural Guidance for Preparing Categorical Exclusions, Environmental Assessments, and Considering Environmental Issues. Revision 4. ADAMS Accession No. ML20016A379.

NRC. 2020d. Locations of Low-Level Waste Disposal Facilities. Retrieved from <https://www.nrc.gov/waste/llw-disposal/licensing/locations.html> (accessed June 23, 2021).

NRC. 2020e. US-APWR Application Review Schedule. Retrieved from <https://www.nrc.gov/reactors/new-reactors/design-cert/apwr/review-schedule.html, (accessed April 19, 2021).

NRC. 2021a. 2020 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant. April 28, 2021. ADAMS Accession No. ML21118A008.

NRC. 2021b. Facility Locator. Retrieved from <https://www.nrc.gov/info-finder/reactors/index.html> (accessed June 23, 2021).

NREL. 2018. Geothermal Resource of the United States. Retrieved from <https://www.nrel.gov/gis/geothermal.html> (accessed September 24, 2018).

NuScale (NuScale Power, LLC). 2019a. Minimizing Environmental Footprint. Retrieved from <https://www.nuscalepower.com/environment/environmental-footprint> (accessed July 18, 2019).

NuScale. 2019b. Technology Overview, How the NuScale Module Works. Retrieved from <https://www.nuscalepower.com/technology/technology-overview> (accessed July 17, 2019).

ORNL (Oak Ridge National Laboratory). 2012. An Assessment of Energy Potential at Non-Powered Dams in the United States. Oak Ridge, TN: ORNL. April 2012. Retrieved from <http://www1.eere.energy.gov/water/pdfs/npd_report.pdf> (accessed July 2, 2019 and February 28, 2020).

Perry, H. 2020. *Rhithropanopeus harrisii* (Gould, 1841): U.S. Geological Survey, Nonindigenous Aquatic Species Database. Retrieved from <https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=98790> (accessed December 1, 2020).

SCAD (Somervell Central Appraisal District). 2020. Annual Reporting overview. Retrieved from <https://www.somervellcad.net/> (accessed December 10, 2020).

SCWD (Somervell County Water District). 2021a. Wheeler Branch Dam. Retrieved from <http://www.scwd.com/2-wheeler-branch-dam--paluxy-river-channel-dam.html> (accessed February 10, 2021).

SCWD. 2021b. Water Conservation Plan (2019 Draft). Retrieved from <http://www.scwd.com/water-conservation.html> (accessed February 10, 2021).

Shackelford, C.E., E.R. Rozenburg, W.C. Hunter, and M.W. Lockwood. 2005. Migration and the Migratory Birds of Texas, 4th edition. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_0511.pdf> (accessed November 16, 2020).

SI (Smithsonian Institution). 2007. *Sus scrofa*. Retrieved from <https://naturalhistory2.si.edu/smsfp/IRLspec/sus_scrofa.htm> (accessed November 30, 2020).

TAMFS (Texas A&M Forest Service). 2020. Grand Prairie and Plains Ecoregions. Retrieved from <http://texastreeid.tamu.edu/content/texasEcoRegions/GrandPrairiePlains/#:~:text=The%20Grand%20Prairie%20and%20Plains,%2C%20rolling%20and%20well%2Ddrained> (accessed November 16, 2020).

TAMU (Texas A&M University). 2017. Freshwater Mussels (Unionidae): Central and West Texas Final Report. Retrieved from <https://comptroller.texas.gov/programs/natural-resources/research/ongoing-studies/ctfm/> (accessed November 24, 2020).

TAC (Texas Administrative Code). 2021. Title 30, Environmental Quality. Part 1, Texas Commission on Environmental Quality. Chapter 335 Industrial Solid Waste and Municipal Hazardous Waste. Rule 335.513. Retrieved from <https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=335&rl=513> (accessed May 17, 2021).

TAsC (Texas Association of Counties). 2021. “About Texas Counties.” Retrieved from <https://county.org/About-Texas-Counties> (accessed June 1, 2021).

TC (Tarrant County). 2021a. FY 2019 CAFR, Principal Employers. Retrieved from <https://www.tarrantcounty.com/en/auditor/financial-accounting/annual-financial-reports/cafr.html> (accessed February 8, 2021).

TC. 2021b. Tarrant County cities. Retrieved from <http://www.tarrantcounty.com/en/county/about-tarrant/incorporated-areas.html?linklocation=supermenu&linkname=Incorporated%20Areas> (accessed February 10, 2021).

TCEQ (Texas Commission on Environmental Quality). 2020. 2020 Texas Integrated Report of Surface Water Quality for the Clean Water Act Sections 305(b) and 303(d)2020. Texas 303(d) List. Retrieved from <https://www.tceq.tx.gov/waterquality/assessment/20twqi> (accessed March 3, 2021).

TCEQ. 2021a. Industrial and Hazardous Waste: Rules and Regulations for Small-Quantity Generators. RG-234, Revision 7/09. Retrieved from <https://www.tceq.texas.gov/assets/public/comm_exec/pubs/rg/rg-234.pdf> (accessed May 20, 2021).

TCEQ. 2021b. “Ozone: The Facts”. Retrieved from <https://www.tceq.texas.gov/airquality/monops/ozonefacts.html> (accessed June 22, 2021).

TCEQ. 2021c. Compliance History Search. Retrieved from <https://www2.tceq.texas.gov/oce/ch/index.cfm?fuseaction=main.viewdetails&rid=145530862003087> (accessed June 23, 2021).

TCEQ. 2021d. Spills: Rule and Laws – 30 TAC 327. Retrieved from <https://www.tceq.texas.gov/response/spills/spill_rules.html> (accessed June 23, 2021).

TCEQ. 2021e. Public Water System/Supply Registration 2130037. Retrieved from <https://www15.tceq.texas.gov/crpub/index.cfm?fuseaction=regent.shoSingleRN&re_id=778309802019261> (accessed June 13, 2021).

TCS (Texas Constitution and Statutes). 2021. Texas Local Government Code Chapter 211. Municipal Zoning Authority. Retrieved from <https://statutes.capitol.texas.gov/> (accessed February 17, 2021).

TDC (Texas Demographic Center). 2021. “Texas Population Projections Program”; “Population Projections for the State of Texas and Counties.” Retrieved from <https://demographics.texas.gov/Data/TPEPP/Projections/Index> (accessed January 20, 2021).

TDSHS. 2021. Annual Hospital List (2019). Retrieved from <https://www.dshs.texas.gov/chs/hosp/hosp2.aspx> (accessed February 9, 2021).

TEAM (Texas Ecosystem Analytical Mapper). 2021. Data Download. Texas Parks and Wildlife Department. Retrieved from <https://tpwd.texas.gov/gis/team/> (accessed March 4, 2021).

THC (Texas Historical Commission). 2021. Texas Historic Sites Atlas. Retrieved from <https://atlas.thc.texas.gov/> (accessed February 1 to 18, 2021).

Tibbs, J. and Baird, M. 2018. Wheeler Branch Reservoir 2017 Fisheries Management Survey Report. Inland Fisheries Division. Waco District, Waco, Texas. July 31, 2018. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/media/lake_survey/pwd_rp_t3200_1693a_2017.pdf.> (accessed May 2, 2021).

TNRIS (Texas Natural Resources Information System). 2020. Multi-Resolution Land Characteristics (MRLC) Consortium – National Land Cover Database 2016 (NCLD 2016). Retrieved from <https://data.tnris.org/collection/89b4016e-d091-bd45-8d3bc154f1fc> (accessed December 10, 2020).

TPWD (Texas Parks and Wildlife Department). 2007. Guidelines for Golden Alga (*Prymnesium parvum*) Management Options for Ponds and Small Reservoirs (Public Waters) in Texas. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/media/pwd_rp_t3200_1404.pdf> (accessed November 23, 2020).

TPWD. 2020a. An Analysis of Texas Waterways. Paluxy River. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/pwd_rp_t3200_1047/22_c_tx_paluxy_pedernales_san_bernard.phtml#:~:text=The%20Paluxy%20is%20a%20scenic,covered%20hills%20and%20limestone%20bluffs> (accessed November 24, 2020).

TPWD. 2020b. An Analysis of Texas Waterways. Brazos River. Retrieved from <https://tpwd.texas.gov/publications/pwdpubs/pwd_rp_t3200_1047/14_c_tx_brazos.phtml> (accessed November 24, 2020).

TPWD. 2020c. Texas Natural Diversity Database. Data Download. Retrieved from <https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/txndd/data.phtml#:~:text=TXNDD%20Information%20Request%20Tool%20(IRT,data%20repeatedly%20throughout%20the%20year> (accessed November 19, 2020).

TPWD. 2020d. Invasive, Prohibited, and Aquatic Species. Retrieved from <https://tpwd.texas.gov/huntwild/wild/species/exotic/prohibited_aquatic.phtml> (accessed November 23, 2020).

TPWD. 2020e. Biology of Golden Alga. Retrieved from <https://tpwd.texas.gov/landwater/water/environconcerns/hab/ga/bio.phtml> (accessed November 23, 2020).

TPWD. 2021a. Geographic Information Systems (GIS). Retrieved from <https://tpwd.texas.gov/gis/#data> (accessed February 3, 2021).

TPWD. 2021b. Great Texas Wildlife Trail, Cedar Loop (Somervell County). Retrieved from <https://tpwd.texas.gov/huntwild/wildlife/wildlife-trails/ppww/cedar-loop> (accessed March 2, 2021).

TPWD. 2021c. Dinosaur Valley State Park. Retrieved from <https://tpwd.texas.gov/state-parks/dinosaur-valley> (accessed April 27, 2021).

TPWD. 2021d. Whooping Crane (*Grus americana*). Retrieved from <https://tpwd.texas.gov/huntwild/wild/species/whooper> (accessed May 3, 2021).

TPWD. 2021e. Interior Least Tern (*Sterna antillarum athalasso*). Retrieved from <https://tpwd.texas.gov/huntwild/wild/species/leasttern/> (accessed May 3, 2021).

TPWD. 2021f. White-faced Ibis (*Plegadis chihi*). Retrieved from <https://tpwd.texas.gov/huntwild/wild/species/ibis/> (accessed May 3, 2021).

TPWD. 2021g. Texas Horned Lizard (*Phrynosoma cornutum*). Retrieved from <https://tpwd.texas.gov/huntwild/wild/species/thlizard/> (accessed 5-3-2021).

TPWD. 2022a. Hood County List of Rare Species. Retrieved from <https://tpwd.texas.gov/gis/rtest/> (accessed April 15, 2022).

TPWD. 2022b. Somervell County List of Rare Species. Retrieved from <https://tpwd.texas.gov/gis/rtest/> (accessed April 15 12, 2022).

TSL (Texas State Library). 2021. Texas Counties and County Seats. Retrieved from <https://www.tsl.texas.gov/ref/abouttx/countyseats.html> (accessed February 19, 2021).

TTIR (Texas Travel and Tourism). 2021. 2019 Texas Visitor Study. Retrieved from <www.travel.texas.gov> (received January 25, 2021).

TU (TU Electric). 1989. Comanche Peak Steam Electric Plant Letter No. TXX-89720, Severe Accident Mitigation Design Alternatives (SAMDAs), September 22, 1989. ADAMS Accession No. ML20248D047.

TU. 1992. TXX-92387, Comanche Peak Steam Electric Plant (CPES) Docket Nos. 50-445 and 50-446 NRC Generic Letter 88-20, Supplement 1, Report Number RXE-92-01A, Individual Plant Exam Comanche Peak Steam Electric Station Vol 1: Front-End Analysis, August 27, 1992, ADAMS Accession Nos. ML20114C606 and ML20114C610.

TU. 1995. TXX-95171, Comanche Peak Steam Electric Plant (CPES) Docket Nos. 50-445 and 50-446 NRC Generic Letter 88-20, Supplement 4, Individual Plant Examination of External Events for Severe Accident Vulnerabilities, June 25, 1995. ADAMS Accession No. ML20085N282.

TU. 2007. TXX-07106, WCAP-16840-NP, Rev. 0, 'Comanche Peak Nuclear Power Plant Stretch Power Uprate Licensing Report, August 2007. ADAMS Accession No. ML072490310.

TU. 2015. TXX-15001, Comanche Peak Steam Electric Plant Docket Nos. 50-445 and 50-446 License Amendment Request 14-002, Extension of Containment Leakage Rate Testing Program, January 2015. ADAMS Accession No. ML15036A032.

TUGC (Texas Utilities Generating Company). 1978. Comanche Peak Steam Electric Station Environmental Report Operating License Stage. ADAMS Accession No. ML20077L862.

TWDB (Texas Water Development Board). 2012. Brazos River Basin and Bay Expert Science Team Environmental Flow Regime Recommendations Report. Retrieved from <https://www.twdb.texas.gov/publications/reports/contracted_reports/doc/1248311377_Brazos.pdf> (accessed on May 2, 2021).

TWDB. 2020. Well Locations from TWDB Groundwater Database (GWDB). Retrieved from <https://www.twdb.tx.gov/mapping/gisdata.asp> (accessed December 7, 2020).

TXDOT (Texas Department of Transportation). 2021a. Texas Rail 2016. Retrieved from <https://ftp.txdot.gov/pub/txdot-info/tpp/maps/2016-railroad.pdf> (accessed February 22, 2021).

TXDOT. 2021b. AADT count. Retrieved from <https://www.txdot.gov/inside-txdot/division/transportation-planning/stars.html> (accessed February 16, 2021).

TXDOT. 2021c. Rural Transportation Improvement Program (TIP), Somervell County. Retrieved from <https://www.txdot.gov/inside-txdot/get-involved/about/hearings-meetings/fort-worth/0514201.html> (accessed February 16, 2021).

TXDOT. 2021d. Statewide Transportation Improvement Program (STIP), Hood County. Retrieved from <https://www.txdot.gov/government/programs/stips.html> (accessed May 26, 2021).

UFCAIP (University of Florida, Center for Aquatic and Invasive Plants). 2020. Hydrilla verticillate. Retrieved from <https://plants.ifas.ufl.edu/plant-directory/hydrilla-verticillata/> (accessed November 23, 2020).

USACE (U.S. Army Corps of Engineers). 1999. The Highway Methodology Workbook Supplement. Retrieved from <https://www.nae.usace.army.mil/Portals/74/docs/regulatory/Forms/HighwaySupplement6Apr2015.pdf> (accessed November 11, 2020).

USACE. 2021. Mirta-Geospatial data, Department of Defense military. Retrieved from <https://geospatial-usace.opendata.arcgis.com/datasets/fc0f38c5a19a46dbacd92f2fb823ef8c> (accessed April 13, 2021).

USACOPS. 2021. Hood, Somervell, and Tarrant law enforcement. Retrieved from <https://www.usacops.com/> (accessed February 9, 2021).

USCB (U.S. Census Bureau). 2020a. TIGER/Line Shapefiles. Retrieved from <https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.2019.html> (accessed October 14, 2020).

USCB. 2020b. Combined Statistical Areas of US. Retrieved from <https://www.census.gov/geographies/reference-maps/2020/geo/csa.html> (accessed December 18, 2020).

USCB. 2020c. Housing, Hood and Somervell Counties, 2019 and 2010 five-year estimates, 2000 SF3 data. Retrieved from <https://data.census.gov/cedsci/> (accessed December 14, 2020).

USCB. 2020d. "2010 Census Summary File 1, 2010 Census of Population and Housing, Technical Documentation". Retrieved from <https://www.census.gov/prod/cen2010/doc/sf1.pdf> (accessed February 26, 2020).

USCB. 2021a. Texas county population – 2000 and 2010. Retrieved from <https://www.census.gov/quickfacts/fact/table/> (accessed January 19, 2021).

USCB. 2021b. Texas place data – 2000, 2010, 2015-2019. Retrieved from <https://data.census.gov/cedsci/> (accessed January 19, 2021).

USCB. 2021c. Means of Transportation to Work by Selected Characteristics for Workplace Geography. Retrieved from <https://data.census.gov/cedsci/all?q=Means%20of%20Transportation%20to%20Work%20by%20Selected%20Characteristics%20for%20Workplace%20Geography&g=0400000US12> (accessed March 4, 2021).

USCB. 2021d. Housing. Tarrant County, 2010 five-year estimates, 2000 SF3 data. Retrieved from <https://data.census.gov/cedsci/> (accessed February 8, 2021).

USCB. 2022a. Texas county and state population – 2020 and 2010. Retrieved from <https://www.census.gov/quickfacts/fact/table/> (accessed February 14, 2022).

USCB. 2022b. Texas 2020 Place Data. Retrieved from <https://data.census.gov/cedsci/> (accessed February 10, 2022).

USCB. 2022c. Housing. Hood, Somervell, and Tarrant counties 2016-2020 five-year estimates. Retrieved from <https://data.census.gov/cedsci/advanced> (accessed April 14, 2022).

USCB. 2022d. Texas 2020 (PL 94-171) Block data. Retrieved from <https://data.census.gov/cedsci/> (accessed April 19, 2022).

USCB. 2022e. Block Group ACS Pov Data and Texas 2020 (PL 94-171) Block Group data. Retrieved from <https://data.census.gov/cedsci/> (accessed April 19, 2022).

USCB. 2022f. ACS Pov State Census. Retrieved from <https://data.census.gov/cedsci/> (accessed April 19, 2022).

USDA (U.S. Department of Agriculture). 2010. Federal Noxious Weed List. Retrieved from <https://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/downloads/weedlist.pdf> (accessed November 23, 2020).

USDA. 2017. National Agricultural Statistics Service 2017 Census of Agriculture. Census Volume 1, Chapter 2: County Level Data. Texas. Retrieved from <https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/Texas/> (accessed February 16, 2021).

USDA. 2020. USDA NRCS Geospatial Data Gateway. Retrieved from <https://datagateway.nrcs.usda.gov/> (accessed August 7, 2020).

USDA. 2021. NRCS Web Soil Survey. Retrieved from <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm> (accessed February 19, 2021).

USDOI (U.S. Department of the Interior). 1998 [1990; 1992]. "Guidelines for Evaluating and Documenting Traditional Cultural Properties." National Register of Historic Places, Bulletin No. 38. Retrieved from <https://www.nps.gov/nr/publications/bulletins/nrb38/> (accessed February 16, 2021).

USDOT (U.S. Department of Transportation). 2020. National Transportation Atlas Database. Retrieved from <https://www.bts.gov/maps> (accessed November 24, 2020).

USDOT. 2021. Bureau of Transportation Statistics (BTS) "National Transportation Atlas Database (NTAD) 2021." Retrieved from <https://www.bts.gov/geospatial/national-transportation-atlas-database> (accessed January 8, 2021).

USFA (U.S. Fire Administration). 2021. Texas Fire Departments. Retrieved from <https://apps.usfa.fema.gov/registry/download> (accessed February 9, 2021).

USFWS (U.S. Fish and Wildlife Service). 2002. National Wetlands Inventory: A Strategy for the 21st Century. Retrieved from <https://www.fws.gov/wetlands/Documents%5CNational-Wetlands-Inventory-A-Strategy-for-the-21st-Century.pdf> (accessed on May 27, 2021).

USFWS. 2011. Golden Eagles Status Fact Sheet. Retrieved from <https://www.fws.gov/migratorybirds/pdf/management/golden-eagle-fact-sheet.pdf> (accessed May 28, 2021).

USFWS. 2012. Land-Based Wind Energy Guidelines. Retrieved from <https://www.fws.gov/midwest/es/wind/guidance.html> (accessed June 1, 2021).

USFWS. 2013. Eagle Conservation Plan Guidance, Module 1 – Land-Based Wind Energy, Version 2. April 2013. Retrieved from <https://www.fws.gov/midwest/es/wind/guidance.html> (accessed June 1, 2021).

USFWS. 2015. Asian Clam (*Corbicula fluminea*) Ecological Risk Screening Summary. Retrieved from <https://www.fws.gov/fisheries/ans/erss/highrisk/Corbicula-fluminea-ERSS-revision-July2015.pdf> (accessed November 23, 2020).

USFWS. 2018. Water Flea (*Daphnia lumholtzi*): Ecological Risk Screening Summary. Retrieved from <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Daphnia-lumholtzi-FINAL-March2018.pdf> (accessed November 23, 2020).

USFWS. 2019. Bald Eagle Fact Sheet: Natural History, Ecology, and Recovery. Retrieved from <https://www.fws.gov/midwest/eagle/Nhistory/biologue.html> (accessed November 11, 2020).

USFWS. 2020a. National Wetlands Inventory – Texas Shapefile. Retrieved from <https://www.fws.gov/wetlands/data/Data-Download.html> (accessed November 23, 2020).

USFWS. 2020b. Federal Laws that Protect Bald and Golden Eagles. Retrieved from <https://www.fws.gov/midwest/eagle/history/protections.html> (accessed November 11, 2020).

USFWS. 2021a. Golden Cheeked Warbler. Balcones Canyonlands Refuge. Retrieved from <https://www.fws.gov/refuge/Balcones_Canyonlands/GCW.html> (accessed on May 2, 2021).

USFWS. 2021b. Rufa Red Knot. USFWS Northeast Region. Retrieved from <https://fws.gov/northeast/red-knot/#:~:text=A%20robin%2Dsized%20shorebird%2C%20the,migrants%20in%20the%20animal%20kingdom> (accessed May 3, 2021).

USFWS. 2022a. IPaC Federal Threatened and Endangered Species. Retrieved from <https://ecos.fws.gov/ipac/> (accessed April 15, 2022).

USFWS. 2022b. *Potamilus amphichaenus*. Retrieved from <https://ecos.fws.gov/ecp/species/299> (accessed April 15, 2022).

USGS (U.S. Geological Survey). 2015. Incorporating Induced Seismicity in the 2014 United States National Seismic Hazard Model-Results of 2014 Workshop and Sensitivity Studies.

USGS. 2020a. Nonindigenous Aquatic Species Database: Hydrilla verticillata Species Observation Map. Retrieved from <https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=6> (accessed November 25, 2020).

USGS. 2020b. Nonindigenous Aquatic Species Database: Corbicula fluminea Species Observation Map. Retrieved from <https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=92> (accessed November 25, 2020).

USGS. 2021a. Mineral Resources On-Line Spatial Data, Texas geologic map data. Retrieved from <https://mrdata.usgs.gov/general/map-us.html> (accessed November 24, 2020).

USGS. 2021b. National Water Information System: Estimated Use of Water in the United States, County-Level Data for 2015. Retrieved from <https://sciencebase.gov/catalog/item/get/5af3311be4b0da30c1b245d8> (accessed March 3, 2021).

USGS. 2021c. USGS 08091730 Squaw Ck Res nr Glen Rose, TX. Retrieved from <https://waterdata.usgs.gov/tx/nwis/uv?site_no=08091730> (accessed March 5, 2021).

USGS. 2021d. USGS 08090900 Lk Granbury nr Granbury, TX. Retrieved from <https://waterdata.usgs.gov/tx/nwis/uv?site_no=08090900> (accessed May 21, 2021).

USGS. 2022. Earthquake Catalog. Retrieved from <https://earthquake.usgs.gov/earthquakes/search/> (accessed February 25, 2022).

USPS (U.S. Postal Service). 2021. Zip Code Lookup. Retrieved from <https://tools.usps.com/zip-code-lookup.htm?citybyzipcode> (accessed May10, 2021).

Vistra. 2020. Climate Report. September 29, 2020. Retrieved from <https://vistra.app.box.com/s/ugex66gg7g6357ff9c1i9w73xrpaypiu> (accessed March 23, 2021).

Vistra OpCo (Vistra Operating Company). 2016. 2015 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant, April 28, 2016. ADAMS Accession No. ML16126A228.

Vistra OpCo. 2017a. 2016 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant, April 27, 2017. ADAMS Accession No. ML17124A376.

Vistra OpCo. 2017b. 2016 Radiological Environmental Operating Report, Comanche Peak Nuclear Power Plant, April 27, 2016. ADAMS Accession No. ML17125A255.

Vistra OpCo. 2018a. 2017 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant, April 30, 2018. ADAMS Accession No. ML18129A218.

Vistra OpCo. 2018b. 2017 Radiological Environmental Operating Report, Comanche Peak Nuclear Power Plant, April 30, 2017. ADAMS Accession No. ML18128A198.

Vistra OpCo. 2019a. 2018 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant, April 25, 2019. ADAMS Accession No. ML19122A387.

Vistra OpCo. 2019b. 2018 Radiological Environmental Operating Report, Comanche Peak Nuclear Power Plant, April 25, 2018. ADAMS Accession No. ML19122A093.

Vistra OpCo. 2020a. 2019 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant, April 22, 2020. ADAMS Accession No. ML20113E981.

Vistra OpCo. 2020b. 2019 Radiological Environmental Operating Report, Comanche Peak Nuclear Power Plant, April 27, 2019. ADAMS Accession No. ML20122A154.

Vistra OpCo. 2021a. 2020 Radioactive Effluent Release Report, Comanche Peak Nuclear Power Plant, April 28, 2021. ADAMS Accession No. ML21118A008.

Vistra OpCo. 2021b. 2020 Radiological Environmental Operating Report, Comanche Peak Nuclear Power Plant, April 29, 2021. ADAMS Accession No. ML21127A164.

WC (Weatherford College). 2021. Granbury Education Center. Retrieved from https://www.wc.edu/locations/granbury (accessed October 11, 2021).

10.1 Figure References

No.	Title	References
2.2-1	CPNPP Typical Water Balance	
2.2-2	In-Scope Transmission Lines	ESRI 2020
3.1-1	CPNPP Plant Layout	ESRI 2020; USCB 2020; USDA 2020; USDOT 2020
3.1-2	CPNPP Area Topography	USCB 2020
3.1-3	CPNPP Site and 6-Mile Radius	USCB 2020; USDOT 2020; USGS 2021a
3.1-4	CPNPP Site and 50-Mile Radius	USCB 2020; USDOT 2020; USGS 2021a
3.1-5	Federal, State, and Local Lands within a 6-Mile Radius of CPNPP	TPWD 2021; USCB 2020; USDA 2020; USDOT 2020
3.1-6	Federal, State, and Local Lands within a 50-Mile Radius of CPNPP	TPWD 2021; USACE 2021; USCB 2020; USDA 2020; USDOT 2020
3.2-1	Land Use/Land Cover, CPNPP Site	TNRIS 2020; USCB 2020
3.2-2	Land Use/Land Cover, 6-Mile Radius	TNRIS 2020; USCB 2020; USGS 2021a
3.3-1	2016 CPNPP Wind Rose	
3.3-2	2017 CPNPP Wind Rose	
3.3-3	2018 CPNPP Wind Rose	
3.3-4	2019 CPNPP Wind Rose	
3.3-5	2020 CPNPP Wind Rose	
3.3-6	Air Quality Non-Attainment Areas within a 62-Mile Radius of CPNPP	EPA 2021, USCB 2020
3.5-1	Physiographic Provinces	ESRI 2020; USCB 2020; USGS 2020a

No.	Title	References
3.5-2	Surficial Geology	USCB 2020; USGS 2020b
3.5-3a	Cross-Section Locations on CPNPP Site	
3.5-3b	Cross-Section A-A'	
3.5-3c	Cross-Section B-B'	
3.5-3d	Cross-Section C-C'	
3.5-3e	Cross-Section D-D'	
3.5-4	Distribution of Soil Units	USCB 2020; USDA 2021
3.5-5	Historical Earthquakes	ESRI 2020; USCB 2020; USGS 2022
3.6-1	Vicinity Hydrologic Features	USCB 2020; USGS 2021a
3.6-2	FEMA Floodplain Zones at CPNPP	FEMA 2020; USCB 2020; USDA 2020
3.6-3	TPDES Outfalls	USDA 2020
3.6-4	Average Condenser Discharge Temperatures	
3.6-5	Onsite Wells	USCB 2020; USDA 2020
3.6-6	November 29, 2018, Potentiometric Map	USDA 2020
3.6-7	June 27, 2019, Potentiometric Map	USDA 2020
3.6-8	Offsite Registered Water Wells within 2 Miles of CPNPP	TWDB 2020; USCB 2020; USDA 2020
3.7-1	NWI Wetlands within a 6-Mile Radius of CPNPP	USCB 2020; USDA 2020; USFWS 2020
3.7-2	NWI Wetlands on the CPNPP Site	USCB 2020; USDA 2020; USFWS 2020
3.8-1	USGS 1889 Granbury, Texas, Map	USGS 2020c

No.	Title	References
3.8-2	CPNPP Property, 1961	USGS 2020c
3.8-3	Vistra OpCo Property, 2016	USGS 2020c
3.8-4	NRHP-Listed Resources and Cemeteries within 6 Miles of CPNPP	THC 2021; USDA 2020
3.8-5	Construction Photographs of the CPNPP Site Over an 18-Month Period	
3.8-6	Construction Photographs of the CPNPP Site After Tree Removal, Mechanical Leveling, and Initial Excavation	
3.8-7	Construction Photographs of CPNPP Showing Areas Excavated for Structures, Facing South	
3.8-8	Construction Photographs of CPNPP Showing Structures, Buildings, and SCR, Facing North	
3.8-9	Late-Construction Photograph of CPNPP Showing Structures, Buildings, and SCR, Facing Northeast	
3.8-10	Late-Construction Photograph of CPNPP Showing Structures, Buildings, and SCR, Dam and Spillway, Facing West-Northwest	
3.11-1 through 3.11-15	EJ Figures (Minority Populations)	USCB 2020; USCB 2021; USCB 2022; USGS 2021
3.11-16 through 3.11-18	EJ Figures (Low Income)	USCB 2020; USCB 2021; USCB 2022; USGS 2021

EPA (U.S. Environmental Protection Agency). 2021. Nonattainment Areas for Criteria Pollutants (Green Book). Retrieved from <https://www.epa.gov/green-book> (accessed March 4, 2021).

ESRI (Environmental System Research Institute). 2020. Living Atlas of the World Basemaps. Accessed in ArcGIS.

FEMA (Federal Emergency Management Agency). 2020. FEMA Flood Map Service Center, Flood Insurance Rate Maps (FIRMs). Retrieved from <https://msc.fema.gov/portal/home> (accessed December 9, 2020).

THC (Texas Historical Commission). 2021. Texas Historic Sites Atlas. Retrieved from <https://atlas.thc.texas.gov/> (accessed February 1 to 18, 2021).

TNRIS (Texas Natural Resource Information System). 2020. MRLC National Land Cover Database 2016 (NLCD 2016). Retrieved from <https://data.tnris.org/collection/89b4016e-d091-46f6-bd45-8d3bc154f1fc> (accessed December 10, 2020).

TPWD (Texas Parks and Wildlife Department). 2021. Geographic Information Systems – State Park Boundaries. Retrieved from <https://tpwd.texas.gov/gis/#data> (accessed February 3, 2021).

TWDB (Texas Water Development Board). 2020. Well Locations from TWDB Groundwater Database (GWDB). Retrieved from <https://www.twdb.texas.gov/mapping/gisdata.asp> (accessed December 7, 2020).

USACE (US Army Corps of Engineers). 2021. Military Installations, Ranges, and Training Areas (MIRTA) DoD Sites. Retrieved from <https://geospatial-usace.opendata.arcgis.com/datasets/fc0f38c5a19a46dbacd92f2fb823ef8c> (accessed April 13, 2021).

USCB (US Census Bureau). 2020. TIGER/Line Shapefiles, 2019 Shapefiles. Retrieved from <https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.2019.html> (accessed October 14, 2020).

USCB. 2021. "American Fact Finder, 2000, 2010, 2015-2019 ACS 5-year Estimates Place TX". Retrieved from <https://data.census.gov/cedsci/> (accessed January 19, 2021).

USCB. 2022. Block Group ACS Pov Data and Texas 2020 (PL 94-171) Block Group Data. Retrieved from <https://data.census.gov/cedsci/> (accessed April 19, 2022).

USDA (US Department of Agriculture). 2020. USDA NRCS Geospatial Data Gateway. Retrieved from <https://datagateway.nrcs.usda.gov/> (accessed August 7, 2020).

USDA. 2021. NRCS Web Soil Survey. Retrieved from <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm> (accessed February 19, 2021).

USDOT (US Department of Transportation). 2020. National Transportation Atlas Database. Retrieved form <https://www.bts.gov/maps/> (accessed November 24, 2020).

USFWS (US Fish and Wildlife Service). 2020. National Wetlands Inventory – Texas Shapefile. Retrieved from <https://www.fws.gov/wetlands/data/Data-Download.html> (accessed November 23, 2020).

USGS (US Geological Survey). 2020a. USGS Water Mission Area NSDI Node – Physiographic Divisions of the Conterminous U.S. Retrieved from <https://water.usgs.gov/GIS/metadata.usgswrd/XML/physio.xml> (accessed November 24, 2020).

USGS. 2020b. Mineral Resources Online Spatial Data – Texas Geologic Map Data. Retrieved from <https://mrdata.usgs.gov/geology/state/state.php?state=TX> (accessed November 24, 2020).

USGS. 2020c. TopoView USGS Topographic Maps. Retrieved from <https://ngmdb.usgs.gov/topoview/> (accessed December 18, 2020).

USGS. 2021. National Hydrography Dataset, Texas Geodatabase. Retrieved from <https://www.usgs.gov/core-science-systems/ngp/national-hydrogaphy> (accessed January 14, 2021).

USGS. 2022. Earthquake Catalog. Retrieved from <https://earthquake.usgs.gov/earhtquakes/search/> (accessed February 25, 2022).

Attachment A: NRC NEPA Issues for License Renewal

NRC NEPA Issues for License Renewal of Nuclear Power Plants

Comanche Peak Nuclear Power Plant Units 1 and 2 Environmental Report

NRC NEPA Issues for License Renewal of Nuclear Power Plants

Vistra Operations Company (Vistra OpCo) has prepared this environmental report (ER) for the license renewal of Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. The NRC included in the regulation the list of 78 National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to Subpart A of 10 CFR Part 51, Table B-1).

The following table lists the 78 issues from 10 CFR Part 51, Appendix B, Table B-1, and identifies the section in this ER in which Vistra OpCo addresses each issue.

Table A-1 CPNPP ER Cross-Reference of License Renewal NEPA Issues

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Land Use			
1	Onsite land use	1	4.1	4.2.1.1/4-6
2	Offsite land use	1	4.1	4.2.1.1/4-7
3	Offsite land use in transmission line rights-of-way	1	4.0.1	4.2.1.1/4-6
	Visual Resources			
4	Aesthetic impacts	1	4.1	4.2.1.2/4-9
	Air Quality			
5	Air quality (all plants)	1	4.2	4.3.1.1/4-14
6	Air quality effects of transmission lines	1	4.2	4.3.1.1/4-14
	Noise			
7	Noise impacts	1	4.3	4.3.1.2/4-19
	Geologic Impacts			
8	Geology and soils	1	4.4	4.4/4-29
	Surface Water Resources			
9	Surface water use and quality (non-cooling system impacts)	1	4.5	4.5.1.1/4-30
10	Altered current patterns at intake and discharge structures	1	4.5	4.5.1.1/4-36
11	Altered salinity gradients	1	4.0.1	4.5.1.1/4-36
12	Altered thermal stratification of lakes	1	4.5	4.5.1.1/4-37
13	Scouring caused by discharged cooling water	1	4.5	4.5.1.1/4-38
14	Discharge of metals in cooling system effluent	1	4.5	4.5.1.1/4-38
15	Discharge of biocides, sanitary wastes, and minor chemical spills	1	4.5	4.5.1.1/4-39
16	Surface water use conflicts (plants with once-through cooling systems)	1	4.5	4.5.1.1/4-40
17	Surface water use conflicts (plants with cooling ponds, or cooling towers using makeup water from a river)	2	4.5.1	4.5.1.1/4-41
18	Effects of dredging on surface water quality	1	4.5	4.5.1.1/4-42
19	Temperature effects on sediment transport capacity	1	4.5	4.5.1.1/4-43
	Groundwater Resources			
20	Groundwater contamination and use (non-cooling system impacts)	1	4.5	4.5.1.2/4-45
21	Groundwater use conflicts (plants that withdraw <100 gpm)	1	4.5	4.5.1.2/4-47

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
22	Groundwater use conflicts (plants that withdraw >100 gpm)	2	4.5.3	4.5.1.2/4-48
23	Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	2	4.5.2	4.5.1.2/4-48
24	Groundwater quality degradation resulting from water withdrawals	1	4.5	4.5.1.2/4-49
25	Groundwater quality degradation (plants with cooling ponds in salt marshes)	1	4.0.1	4.5.1.2/4-50
26	Groundwater quality degradation (plants with cooling ponds at inland sites)	2	4.5.4	4.5.1.2/4-51
27	Radionuclides released to groundwater	2	4.5.5	4.5.1.2/4-51
	Terrestrial Resources			
28	Effects on terrestrial resources (non-cooling system impacts)	2	4.6.5	4.6.1.1/4-59
29	Exposure of terrestrial organism to radionuclides	1	4.6	4.6.1.1/4-61
30	Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)	1	4.6	4.6.1.1/4-64
31	Cooling tower impacts on vegetation (plants with cooling towers)	1	4.0.1	4.6.1.1/4-69
32	Bird collisions with plant structures and transmission lines	1	4.6	4.6.1.1/4-70
33	Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	2	4.6.4	4.6.1.1/4-75
34	Transmission line ROW management impacts on terrestrial resources	1	4.6	4.6.1.1/4-75
35	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	4.6	4.6.1.1/4-80
	Aquatic Resources			
36	Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	2	4.6.1	4.6.1.2/4-87
37	Impingement and entrainment of aquatic organisms (plants with cooling towers)	1	4.0.1	4.6.1.2/4-92
38	Entrainment of phytoplankton and zooplankton (all plants)	1	4.6	4.6.1.2/4-93
39	Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	2	4.6.2	4.6.1.2/4-94

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
40	Thermal impacts on aquatic organisms (plants with cooling towers)	1	4.0.1	4.6.1.2/4-96
41	Infrequently reported thermal impacts (all plants)	1	4.6	4.6.1.2/4-97
42	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication	1	4.6	4.6.1.2/4-100
43	Effects of non-radiological contaminants on aquatic organisms	1	4.6	4.6.1.2/4-103
44	Exposure of aquatic organisms to radionuclides	1	4.6	4.6.1.2/4-105
45	Effect of dredging on aquatic organisms	1	4.6	4.6.1.2/4-107
46	Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	2	4.6.3	4.6.1.2/4-109
47	Effects on aquatic resources (non-cooling system impacts)	1	4.6	4.6.1.2/4-110
48	Impacts of transmission line ROW management on aquatic resources	1	4.6	4.6.1.2/4-112
49	Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses	1	4.6	4.6.1.2/4-110
	Special Status Species and Habitats			
50	Threatened, endangered, and protected species and essential fish habitat	2	4.6.6	4.6.1.3/4-115
	Historic and Cultural Resources			
51	Historic and cultural resources	2	4.7	4.7.1/4-122
	Socioeconomics			
52	Employment and income, recreation and tourism	1	4.8	4.8.1.1/4-127
53	Tax revenues	1	4.8	4.8.1.1/4-128
54	Community services and education	1	4.8	4.8.1.1/4-129
55	Population and housing	1	4.8	4.8.1.1/4-130
56	Transportation	1	4.8	4.8.1.1/4-131
	Human Health			
57	Radiation exposures to the public	1	4.9	4.9.1.1.1/4-140
58	Radiation exposures to plant workers	1	4.9	4.9.1.1.1/4-136
59	Human health impacts from chemicals	1	4.9	4.9.1.1.2/4-147
60	Microbiological hazards to the public (plants that use cooling ponds, lake, or canals or that discharge to a river)[c]	2	4.9.1	4.9.1.1.3/4-149
61	Microbiological hazards to plant workers	1	4.9	4.9.1.1.3/4-149
62	Chronic effects of electromagnetic fields	UC	4.0.3	4.9.1.1.4/4-150
63	Physical occupational hazards	1	4.9	4.9.1.1.5/4-156
64	Electric shock hazards	2	4.9.2	4.9.1.1.5/4-156

No.	Issue[(a)]	Category	ER Section	GEIS Cross Reference (Section/Page)[(b)]
	Postulated Accidents			
65	Design-basis accidents	1	4.15.1	4.9.1.2/4-158
66	Severe accidents	2	4.15.2	4.9.1.2/4-158
	Environmental Justice			
67	Minority and low-income populations	2	4.10.1	4.10.1/4-167
	Waste Management			
68	Low-level waste storage and disposal	1	4.11	4.11.1.1/4-171
69	Onsite storage of spent nuclear fuel	1	4.11	4.11.1.2/4-172
70	Offsite radiological impacts of spent nuclear fuel and high-level waste disposal	1	4.11	4.11.1.3/4-175
71	Mixed waste storage and disposal	1	4.11	4.11.1.4/4-178
72	Non-radioactive waste storage and disposal	1	4.11	4.11.1.5/4-179
	Cumulative Impacts			
73	Cumulative impacts	2	4.12	4.13/4-243
	Uranium Fuel Cycle			
74	Offsite radiological impacts–individual impacts from other than the disposal of spent fuel and high-level waste	1[(d)]	4.13	4.12.1.1/4-193
75	Offsite radiological impacts–collective impacts from other than the disposal of spent fuel and high-level waste	1	4.13	4.12.1.1/4-194
76	Non-radiological Impacts of the uranium fuel cycle	1	4.13	4.12.1.1/4-194
77	Transportation	1	4.13	4.12.1.1/4-196
	Termination of Nuclear Power Plant Operations and Decommissioning			
78	Termination of plant operations and decommissioning	1	4.14	4.12.2.1/4-201

a) 10 CFR 51, Subpart A, Appendix A, Table B-1 (issue numbers added to facilitate discussion).

b) Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, Rev 1).

c) Wording from [10 CFR 51.53(c)(3)(ii)(G)].

d) SECY-14-0072 (July 21, 2014).

UC = uncategorized (categorization and impact finding definitions do not apply to the issue).

Attachment B: TPDES Permit

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak
Nuclear Power Plant
(Vistra Operations
Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100007
TXX-21001
February 2, 2021

Earl Lott, Director, Office of Water, MC-158
Texas Commission on Environmental Quality
P. O. Box 13087
Austin, TX 78711-3087

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Lott:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is preparing an application for renewing the operating licenses for the two power generation units at our Comanche Peak Nuclear Power Plant (CPNPP) for an additional 20 years (see Table 1). Vistra OpCo is contacting the Texas Commission on Environmental Quality (TCEQ) because assistance is needed in assessing the impacts from continued operation during this renewed license period.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

The U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal applicant provide a certification or waiver pursuant to Clean Water Act Section 401. The license renewal application also includes an environmental report that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The environmental report addresses the potential impact on air quality, water resources, terrestrial and aquatic ecology resources, and socioeconomics. To facilitate Vistra OpCo's preparation of the license renewal environmental report and an efficient and effective consultation process by the NRC, Vistra OpCo is contacting TCEQ early in the application process. The NRC may consult TCEQ regarding the license renewal and, in particular, the 401 certification.

CPNPP operates under its Texas Commission on Environmental Quality (TCEQ)-issued Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ000185400. CPNPP also operates under a general permit for industrial stormwater and TPDES General Permit No. TXR050000. The Atomic Energy Commission prepared Final Environmental Statement for CPNPP states that the Texas Water Quality Board (TCEQ predecessor agency) issued a water quality certification pursuant to Section 401 on March 1, 1974. This letter seeks TCEQ confirmation that CPNPP's 1974 certification remains valid for the extended license period.

The power plant property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. Other than normal activities to maintain existing structures and operations, Vistra OpCo does not anticipate any ground-disturbing activities during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment activities in conjunction with license renewal, nor is the continued operation of CPNPP anticipated to adversely affect the environment or any cultural or historic resources.

Vistra OpCo is requesting TCEQ response to this letter confirming the authorization mentioned under Section 401. TCEQ input is requested by March 18, 2021. Vistra OpCo plans to contact TCEQ in a few weeks to request the scheduling of a virtual meeting to go over our request and answer any questions the TCEQ staff may have. Vistra OpCo plans to include this letter and any TCEQ response in the environmental report.

Vistra OpCo requests that TCEQ send their letter response to Randy Harding (see contact information below). Please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com) if you have any questions or comments.

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

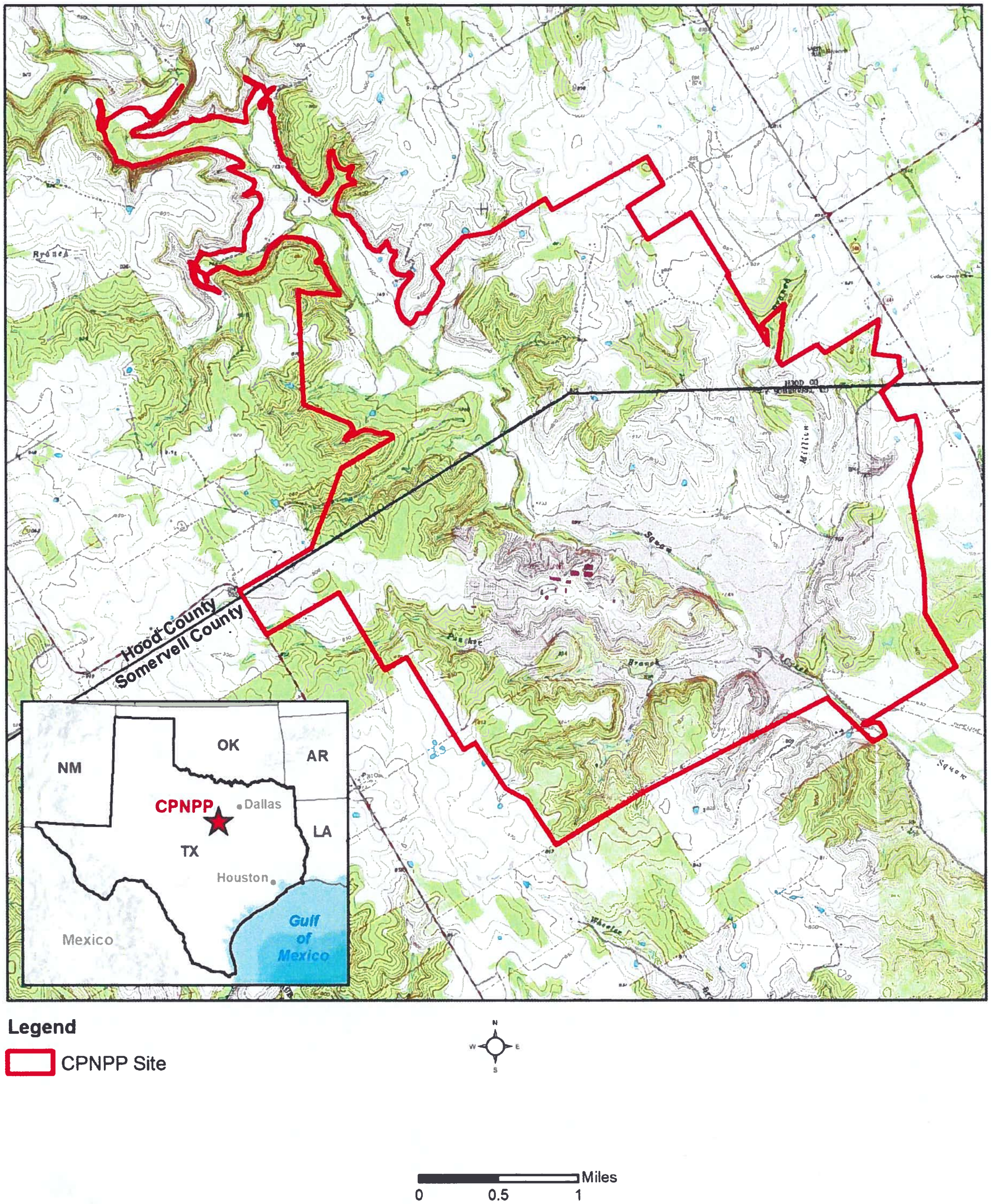
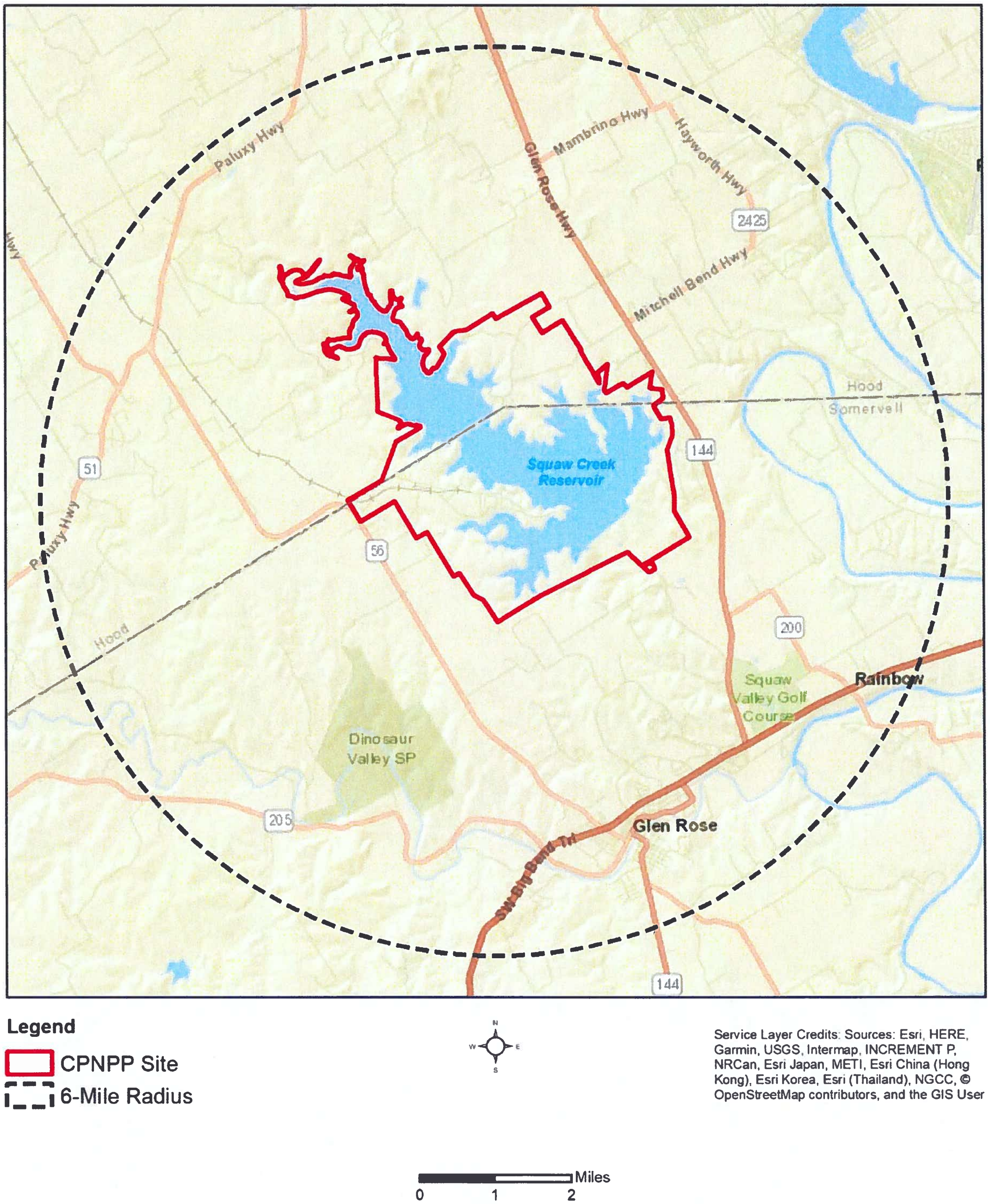


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

CP-202100146
MISC 21-028

February 26, 2021

Mr. Randy Harding, Environmental Consultant
Comanche Peak Nuclear Power Plant
6322 North FM 56 / E30
Glen Rose, Texas 76043

Re: 401 Certification of the Comanche Peak Nuclear Power Plant License Renewal

Dear Mr. Harding:

Thank you for your letter informing us of your preparations to renew the Comanche Peak Nuclear Power Plant (CPNPP) operating license with the U.S. Nuclear Regulatory Commission (NRC). The Water Quality Division of the Office of Water is responsible for conducting Section 401 water quality certification reviews of federal permits and licenses, and division staff are available to discuss with you and the NRC the 401 certification needs of the CPNPP license renewal.

Please contact Mr. Peter Schaefer, leader of the Standards Implementation Team in the Water Quality Division, to initiate the discussion and to schedule coordination meetings. Peter may be reached at 512-239-4372 or peter.schaefer@tceq.texas.gov.

Sincerely,

Earl Lott

Earl Lott, Director
Office of Water

GE/sea

RECEIVED

MAR 17 2021

REGULATORY AFFAIRS

CP-202100147
MISC 21-029

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

March 12, 2021

Mr. Randy Harding, Environmental Consultant
Comanche Peak Nuclear Power Plant
6322 North FM 56 / E30
Glen Rose, Texas 76043

Re: 401 Certification of the Comanche Peak Nuclear Power Plant License Renewal

Dear Mr. Harding:

Thank you for your letter informing us of your preparations to renew the Comanche Peak Nuclear Power Plant (CPNPP) operating license with the U.S. Nuclear Regulatory Commission (NRC). Your letter states that the Final Environmental Statement for CPNPP prepared by the Atomic Energy Commission states that the Texas Water Quality Board (TCEQ predecessor agency) issued a water quality certification pursuant to Section 401 of the Clean Water Act on March 1, 1974. Your letter seeks TCEQ confirmation that CPNPP's 1974 certification remains valid for the extended license period. The Water Quality Division of the Office of Water is responsible for conducting Section 401 water quality certification reviews of federal permits and confirms that the previous 401 water quality certification issued on March 1, 1974 remains valid.

If you have any questions or need further assistance, please contact Mr. Peter Schaefer, leader of the Standards Implementation Team in the Water Quality Division. Mr. Schaefer may be reached at 512-239-4372 or peter.schaefer@tceq.texas.gov.

Sincerely,

David W Galindo

David W. Galindo, Deputy Director
Water Quality Division
Texas Commission on Environmental Quality

DWG/PS

ccs: Mr. Gary Spicer, Luminant, via e-mail at gary.spicer@luminant.com
Mr. Steven Sewell, Luminant, via e-mail at steven.sewell@luminant.com
Mr. Todd Evans, Luminant, via e-mail at todd.evans@luminant.com

REC'D OCT 17 2019

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 14, 2019

Mr. James Burke, COO
Vistra Energy
1601 Bryan Street
Dallas, Texas 75201

Re: Comanche Peak Power Company LLC, TPDES Permit No. WQ0001854000 (CN605255884; RN103044053)

Dear Mr. Burke:

Enclosed is a copy of the above referenced water quality permit issued on behalf of the Executive Director pursuant to Chapter 26 of the Texas Water Code.

Self-reporting or Discharge Monitoring Forms and instructions will be forwarded to you from the Water Quality Management Information Systems Team so that you may comply with monitoring requirements. For existing facilities, revised forms will be forwarded if monitoring requirements have changed.

Enclosed is a "Notification of Completion of Wastewater Treatment Facilities" form. Use this form (if needed) when the facility begins to operate or goes into a new phase. The form notifies the agency when the proposed facility is completed or when it is placed in operation. This notification complies with the special provision incorporated into the permit, as applicable.

Should you have any questions, please contact Ms. Sarah A. Johnson, Ph.D. of the Texas Commission on Environmental Quality's (TCEQ) Wastewater Permitting Section at (512) 239-4671 or if by correspondence, include MC 148 in the letterhead address below.

Sincerely,

David W. Galindo, Director
Water Quality Division

DWG/SAJ/kb

cc: Mr. Ryan Bayle, P.G., Water Resources Coordinator, Luminant Generation Company LLC
6555 Sierra Drive, Irving, Texas 75039
Mr. Gary Spicer, Water and Waste Compliance Manager, Luminant Generation Company LLC
6555 Sierra Drive, Irving, Texas 75039

TPDES PERMIT NO.
WQ0001854000
[For TCEQ office use only - EPA I.D. No. TX0065854]

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P.O. Box 13087
Austin, Texas 78711-3087

This renewal replaces TPDES Permit No. WQ0001854000, issued on December 21, 2015.

PERMIT TO DISCHARGE WASTES
under provisions of
Section 402 of the Clean Water Act,
Chapter 26 of the Texas Water Code,
and 40 CFR Part 423

Comanche Peak Power Company LLC

whose mailing address is

1601 Bryan Street
Dallas, Texas 75201

is authorized to treat and discharge wastes from Comanche Peak Nuclear Power Plant, an electric generating station (SIC 4911)

located at 6322 North Farm-to-Market Road 56, northwest of the City of Glen Rose, in Somervell County, Texas 76043

via Outfalls 001, 002, 003, and 004 to Squaw Creek Reservoir, thence to Squaw Creek, thence to Paluxy River/North Paluxy River in Segment No. 1229 of the Brazos River Basin

only according to effluent limitations, monitoring requirements, and other conditions set forth in this permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. The issuance of this permit does not grant to the permittee the right to use private or public property for conveyance of wastewater along the discharge route described in this permit. This includes, but is not limited to, property belonging to any individual, partnership, corporation, or other entity. Neither does this permit authorize any invasion of personal rights nor any violation of federal, state, or local laws or regulations. It is the responsibility of the permittee to acquire property rights as may be necessary to use the discharge route.

This permit shall expire at midnight, five years from the date of permit issuance.

ISSUED DATE: **October 7, 2019**

For the Commission

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS Outfall Number 001

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge once-through and auxiliary cooling waters and previously monitored effluent [1] subject to the following effluent limitations:

The daily average flow of effluent shall not exceed 3,168 million gallons per day (MGD). The daily maximum flow shall not exceed 3,168 MGD.

Effluent Characteristics	Discharge Limitations					Minimum Self-Monitoring Requirements	
	Daily Average		Daily Maximum		Single Grab	Report Daily Average and Daily Maximum	
	lbs/day	mg/L	lbs/day	mg/L	mg/L	Measurement Frequency	Sample Type
Flow	3,168 MGD		3,168 MGD		N/A	Continuous [2]	Record
Temperature [3]	113°F		116°F		N/A	Continuous	Record
Free Available Chlorine [4]	440	0.2	1,101	0.5	0.5	1/week [6]	Grab
Total Residual Chlorine [5]	N/A	N/A	880	0.2	0.2	1/week [6]	Grab

2. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

3. Effluent monitoring samples shall be taken at the following location: At Outfall 001, where once-through and auxiliary cooling water and previously monitored effluent [1] are discharged from the discharge structure to Squaw Creek Reservoir.

[1] Effluent previously monitored at Outfall 004 may be discharged through Outfall 001.
[2] Flow rates must be obtained from pump curve data.
[3] See Other Requirements No. 6 and No. 9.
[4] See Other Requirement No. 7.
[5] See Other Requirement No. 8.
[6] Samples must be representative of periods of chlorination.

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge cooling water, low-volume waste sources [1] (auxiliary cooling water from the Service Water System), and stormwater runoff from the Safe Shutdown Impoundment (SSI) subject to the following effluent limitations:

Volume: Intermittent and flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [2]	Estimate
Total Suspended Solids	30	100	100	1/week [2]	Grab
Oil and Grease	15	20	20	1/week [2]	Grab

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and must be monitored 1/week [2] by grab sample.

3. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples must be taken at the following location: At Outfall 002, where SSI effluents are discharged to Squaw Creek Reservoir.

[1] See Other Requirement No. 10.
[2] When discharge occurs.

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge treated domestic wastewater subject to the following effluent limitations:

Volume: Flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [1]	Estimate
Total Suspended Solids	20	45	45	2/month	Grab
Biochemical Oxygen Demand, 5-day	20	45	45	2/month	Grab
Escherichia coli [2]	126 [2 and 3]	399 [2]	399 [2]	1/week	Grab

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and must be monitored 2/month by grab sample.

3. Disinfection for the effluent is normally provided by ultraviolet (UV) radiation. In the event that the UV system is taken out of service, an alternative disinfection system must be used. If chlorination is used for disinfection, the effluent must contain a chlorine residual of at least 1.0 mg/L and a maximum chlorine residual of 4.0 mg/L after a detention time of at least 20 minutes (based on peak flow) and must be monitored five times per week by grab sample.

4. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

5. Effluent monitoring samples must be taken at the following location: At Outfall 003, where treated domestic wastewater is discharged from the sewage treatment plant prior to entering Squaw Creek Reservoir.

[1] Flow monitoring may be suspended on weekends and holidays. Flow rates for weekends and holidays must be averaged from the flow totalizer readings taken the next working day.
[2] Colony-forming units (CFU) or most probable number (MPN) per 100 mL.
[3] Daily average *E. coli* must be reported as the geometric mean for the effluent samples collected during the calendar month.

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Outfall Number 004

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge stormwater runoff, low-volume waste sources [1] and previously monitored effluent (metal cleaning waste) subject to the following effluent limitations:

Volume: Intermittent and flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [2]	Estimate
Total Suspended Solids	30	100	100	1/week [2]	Grab [3]
Oil and Grease	15	20	20	1/week [2]	Grab [3]

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and must be monitored 1/week [3] by grab sample.

3. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples must be taken at the following location: At Outfall 004, where low volume waste sources and previously monitored effluent are discharged either (a) prior to mixing with the once-through and auxiliary cooling waters that discharge via Outfall 001 or (b) to Squaw Creek Reservoir.

[1] See Other Requirement No. 10.
[2] When discharge occurs.
[3] See Other Requirement No. 13.

1. During the period beginning upon the date of permit issuance and lasting through the date of permit expiration, the permittee is authorized to discharge metal cleaning waste [1] subject to the following effluent limitations:

Volume: Intermittent and flow-variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Report Daily Average and Daily Maximum Measurement Frequency	Sample Type
Flow	Report, MGD	Report, MGD	N/A	1/day [2]	Estimate
Iron, Total	1.0	1.0	1.0	1/week [2]	Grab
Copper, Total	0.5	1.0	1.0	1/week [2]	Grab

2. Effluent limitations for pH, total suspended solids, and oil and grease apply at Outfall 004 and must be monitored at Outfall 004 by grab sample [2].

3. There must be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples must be taken at the following location: At Outfall 104, where metal cleaning waste is discharged from the retention ponds or temporary treatment facilities prior to mixing with the low-volume waste sources to discharge via Outfall 004.

[1] See Other Requirement No. 11.
[2] When discharge occurs.

DEFINITIONS AND STANDARD PERMIT CONDITIONS

As required by Title 30 Texas Administrative Code (TAC) Chapter 305, certain regulations appear as standard conditions in waste discharge permits. 30 TAC §§305.121 - 305.129 (relating to Permit Characteristics and Conditions) as promulgated under the Texas Water Code (TWC) §§5.103 and 5.105, and the Texas Health and Safety Code (THSC) §§361.017 and 361.024(a), establish the characteristics and standards for waste discharge permits, including sewage sludge, and those sections of 40 Code of Federal Regulations (CFR) Part 122 adopted by reference by the Commission. The following text includes these conditions and incorporates them into this permit. All definitions in Texas Water Code §26.001 and 30 TAC Chapter 305 shall apply to this permit and are incorporated by reference. Some specific definitions of words or phrases used in this permit are as follows:

1. Flow Measurements

    a. Annual average flow - the arithmetic average of all daily flow determinations taken within the preceding 12 consecutive calendar months. The annual average flow determination shall consist of daily flow volume determinations made by a totalizing meter, charted on a chart recorder, and limited to major domestic wastewater discharge facilities with a one million gallons per day or greater permitted flow.

    b. Daily average flow - the arithmetic average of all determinations of the daily flow within a period of one calendar month. The daily average flow determination shall consist of determinations made on at least four separate days. If instantaneous measurements are used to determine the daily flow, the determination shall be the arithmetic average of all instantaneous measurements taken during that month. Daily average flow determination for intermittent discharges shall consist of a minimum of three flow determinations on days of discharge.

    c. Daily maximum flow - the highest total flow for any 24-hour period in a calendar month.

    d. Instantaneous flow - the measured flow during the minimum time required to interpret the flow measuring device.

    e. 2-hour peak flow (domestic wastewater treatment plants) - the maximum flow sustained for a two-hour period during the period of daily discharge. The average of multiple measurements of instantaneous maximum flow within a two-hour period may be used to calculate the 2-hour peak flow.

    f. Maximum 2-hour peak flow (domestic wastewater treatment plants) - the highest 2-hour peak flow for any 24-hour period in a calendar month.

2. Concentration Measurements

    a. Daily average concentration - the arithmetic average of all effluent samples, composite or grab as required by this permit, within a period of one calendar month, consisting of at least four separate representative measurements.

        i. For domestic wastewater treatment plants - When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values in the previous four consecutive month period consisting of at least four measurements shall be utilized as the daily average concentration.

        ii. For all other wastewater treatment plants - When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values taken during the month shall be utilized as the daily average concentration.

    b. 7-day average concentration - the arithmetic average of all effluent samples, composite or grab as required by this permit, within a period of one calendar week, Sunday through Saturday.

    c. Daily maximum concentration - the maximum concentration measured on a single day, by the sample type specified in the permit, within a period of one calendar month.

    d. Daily discharge - the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total

mass of the pollutant discharged over the sampling day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the sampling day.

The "daily discharge" determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the "daily discharge" determination of concentration shall be the arithmetic average (weighted by flow value) of all samples collected during that day.

e. Bacteria concentration (Fecal coliform, *E. coli*, or Enterococci) – the number of colonies of bacteria per 100 milliliters effluent. The daily average bacteria concentration is a geometric mean of the values for the effluent samples collected in a calendar month. The geometric mean shall be determined by calculating the nth root of the product of all measurements made in a calendar month, where n equals the number of measurements made; or computed as the antilogarithm of the arithmetic mean of the logarithms of all measurements made in a calendar month. For any measurement of bacteria equaling zero, a substitute value of one shall be made for input into either computation method. If specified, the 7-day average for bacteria is the geometric mean of the values for all effluent samples collected during a calendar week.

f. Daily average loading (lbs/day) - the arithmetic average of all daily discharge loading calculations during a period of one calendar month. These calculations must be made for each day of the month that a parameter is analyzed. The daily discharge, in terms of mass (lbs/day), is calculated as (Flow, MGD × Concentration, mg/L × 8.34).

g. Daily maximum loading (lbs/day) - the highest daily discharge, in terms of mass (lbs/day), within a period of one calendar month.

3. Sample Type

   a. Composite sample - For domestic wastewater, a composite sample is a sample made up of a minimum of three effluent portions collected in a continuous 24-hour period or during the period of daily discharge if less than 24 hours, and combined in volumes proportional to flow, and collected at the intervals required by 30 TAC §319.9(a). For industrial wastewater, a composite sample is a sample made up of a minimum of three effluent portions collected in a continuous 24-hour period or during the period of daily discharge if less than 24 hours, and combined in volumes proportional to flow, and collected at the intervals required by 30 TAC §319.9(c).

   b. Grab sample - an individual sample collected in less than 15 minutes.

4. Treatment Facility (facility) - wastewater facilities used in the conveyance, storage, treatment, recycling, reclamation or disposal of domestic sewage, industrial wastes, agricultural wastes, recreational wastes, or other wastes including sludge handling or disposal facilities under the jurisdiction of the Commission.

5. The term "sewage sludge" is defined as solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in 30 TAC Chapter 312. This includes the solids that have not been classified as hazardous waste separated from wastewater by unit processes.

6. Bypass - the intentional diversion of a waste stream from any portion of a treatment facility.

MONITORING AND REPORTING REQUIREMENTS

1. Self-Reporting

   Monitoring results shall be provided at the intervals specified in the permit. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall conduct effluent sampling and reporting in accordance with 30 TAC §§319.4 - 319.12. Unless otherwise specified, effluent monitoring data shall be submitted each month, to the Enforcement Division (MC 224), by the 20th day of the following month for each discharge that is described by this permit whether or not a discharge is made for that month. Monitoring results must be submitted online using the NetDMR reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. Monitoring results must be signed and certified as required by Monitoring and Reporting Requirements No. 10.

As provided by state law, the permittee is subject to administrative, civil and criminal penalties, as applicable, for negligently or knowingly violating the Clean Water Act; TWC Chapters 26, 27, and 28; and THSC Chapter 361, including but not limited to knowingly making any false statement, representation, or certification on any report, record, or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, or falsifying, tampering with or knowingly rendering inaccurate any monitoring device or method required by this permit or violating any other requirement imposed by state or federal regulations.

2. Test Procedures

   a. Unless otherwise specified in this permit, test procedures for the analysis of pollutants shall comply with procedures specified in 30 TAC §§319.11 - 319.12. Measurements, tests, and calculations shall be accurately accomplished in a representative manner.

   b. All laboratory tests submitted to demonstrate compliance with this permit must meet the requirements of 30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification.

3. Records of Results

   a. Monitoring samples and measurements shall be taken at times and in a manner so as to be representative of the monitored activity.

   b. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), monitoring and reporting records, including strip charts and records of calibration and maintenance, copies of all records required by this permit, records of all data used to complete the application for this permit, and the certification required by 40 CFR §264.73(b)(9) shall be retained at the facility site, or shall be readily available for review by a TCEQ representative for a period of three years from the date of the record or sample, measurement, report, application or certification. This period shall be extended at the request of the Executive Director.

   c. Records of monitoring activities shall include the following:

      i. date, time, and place of sample or measurement;
      ii. identity of individual who collected the sample or made the measurement;
      iii. date and time of analysis;
      iv. identity of the individual and laboratory who performed the analysis;
      v. the technique or method of analysis; and
      vi. the results of the analysis or measurement and quality assurance/quality control records.

   The period during which records are required to be kept shall be automatically extended to the date of the final disposition of any administrative or judicial enforcement action that may be instituted against the permittee.

4. Additional Monitoring by Permittee

   If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit using approved analytical methods as specified above, all results of such monitoring shall be included in the calculation and reporting of the values submitted on the approved self-report form. Increased frequency of sampling shall be indicated on the self-report form.

5. Calibration of Instruments

   All automatic flow measuring or recording devices and all totalizing meters for measuring flows shall be accurately calibrated by a trained person at plant start-up and as often thereafter as necessary to ensure accuracy, but not less often than annually unless authorized by the Executive Director for a longer period. Such person shall verify in writing that the device is operating properly and giving accurate results. Copies of the verification shall be retained at the facility site or shall be readily available for review by a TCEQ representative for a period of three years.

6. Compliance Schedule Reports

   Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date to the regional office and the Enforcement Division (MC 224).

7. Noncompliance Notification

   a. In accordance with 30 TAC §305.125(9) any noncompliance that may endanger human health or safety, or the environment shall be reported by the permittee to the TCEQ. Report of such information shall be provided orally or by facsimile transmission (FAX) to the regional office within 24 hours of becoming aware of the noncompliance. A written submission of such information shall also be provided by the permittee to the regional office and the Enforcement Division (MC 224) within five working days of becoming aware of the noncompliance. For Publicly Owned Treatment Works (POTWs), effective September 1, 2020, the permittee must submit the written report for unauthorized discharges and unanticipated bypasses that exceed any effluent limit in the permit using the online electronic reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. The written submission shall contain a description of the noncompliance and its cause; the potential danger to human health or safety, or the environment; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.

   b. The following violations shall be reported under Monitoring and Reporting Requirement 7.a.:

      i. unauthorized discharges as defined in Permit Condition 2(g).
      ii. any unanticipated bypass that exceeds any effluent limitation in the permit.
      iii. violation of a permitted maximum daily discharge limitation for pollutants listed specifically in the Other Requirements section of an Industrial TPDES permit.

   c. In addition to the above, any effluent violation that deviates from the permitted effluent limitation by more than 40% shall be reported by the permittee in writing to the regional office and the Enforcement Division (MC 224) within 5 working days of becoming aware of the noncompliance.

   d. Any noncompliance other than that specified in this section, or any required information not submitted or submitted incorrectly, shall be reported to the Enforcement Division (MC 224) as promptly as possible. For effluent limitation violations, noncompliances shall be reported on the approved self-report form.

8. In accordance with the procedures described in 30 TAC §§35.301 - 35.303 (relating to Water Quality Emergency and Temporary Orders) if the permittee knows in advance of the need for a bypass, it shall submit prior notice by applying for such authorization.

9. Changes in Discharges of Toxic Substances

   All existing manufacturing, commercial, mining, and silvicultural permittees shall notify the regional office, orally or by facsimile transmission within 24 hours, and both the regional office and the Enforcement Division (MC 224) in writing within five (5) working days, after becoming aware of or having reason to believe:

   a. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant listed at 40 CFR Part 122, Appendix D, Tables II and III (excluding Total Phenols) that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

      i. one hundred micrograms per liter (100 μg/L);
      ii. two hundred micrograms per liter (200 μg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
      iii. five (5) times the maximum concentration value reported for that pollutant in the permit application; or
      iv. the level established by the TCEQ.

b. That any activity has occurred or will occur that would result in any discharge, on a nonroutine or infrequent basis, of a toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

i. five hundred micrograms per liter (500 μg/L);
ii. one milligram per liter (1 mg/L) for antimony;
iii. ten (10) times the maximum concentration value reported for that pollutant in the permit application; or
iv. the level established by the TCEQ.

10. Signatories to Reports

All reports and other information requested by the Executive Director shall be signed by the person and in the manner required by 30 TAC §305.128 (relating to Signatories to Reports).

11. All POTWs must provide adequate notice to the Executive Director of the following:

a. any new introduction of pollutants into the POTW from an indirect discharger that would be subject to CWA §301 or §306 if it were directly discharging those pollutants;

b. any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit; and

c. for the purpose of this paragraph, adequate notice shall include information on:

i. the quality and quantity of effluent introduced into the POTW; and
ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

PERMIT CONDITIONS

1. General

a. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in an application or in any report to the Executive Director, it shall promptly submit such facts or information.

b. This permit is granted on the basis of the information supplied and representations made by the permittee during action on an application, and relying upon the accuracy and completeness of that information and those representations. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked, in whole or in part, in accordance with 30 TAC Chapter 305, Subchapter D, during its term for good cause including, but not limited to, the following:

i. violation of any terms or conditions of this permit;
ii. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
iii. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

c. The permittee shall furnish to the Executive Director, upon request and within a reasonable time, any information to determine whether cause exists for amending, revoking, suspending, or terminating the permit. The permittee shall also furnish to the Executive Director, upon request, copies of records required to be kept by the permit.

2. Compliance

a. Acceptance of the permit by the person to whom it is issued constitutes acknowledgment and agreement that such person will comply with all the terms and conditions embodied in the permit, and the rules and other orders of the Commission.

b. The permittee has a duty to comply with all conditions of the permit. Failure to comply with any permit condition constitutes a violation of the permit and the Texas Water Code or the Texas Health and Safety Code, and is grounds for enforcement action, for permit amendment,

revocation, or suspension, or for denial of a permit renewal application or an application for a permit for another facility.

c. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

d. The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal or other permit violation that has a reasonable likelihood of adversely affecting human health or the environment.

e. Authorization from the Commission is required before beginning any change in the permitted facility or activity that may result in noncompliance with any permit requirements.

f. A permit may be amended, suspended and reissued, or revoked for cause in accordance with 30 TAC §§305.62 and 305.66 and TWC §7.302. The filing of a request by the permittee for a permit amendment, suspension and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

g. There shall be no unauthorized discharge of wastewater or any other waste. For the purpose of this permit, an unauthorized discharge is considered to be any discharge of wastewater into or adjacent to water in the state at any location not permitted as an outfall or otherwise defined in the Other Requirements section of this permit.

h. In accordance with 30 TAC §305.535(a), the permittee may allow any bypass to occur from a TPDES permitted facility that does not cause permitted effluent limitations to be exceeded or an unauthorized discharge to occur, but only if the bypass is also for essential maintenance to assure efficient operation.

i. The permittee is subject to administrative, civil, and criminal penalties, as applicable, under Texas Water Code §§7.051 - 7.075 (relating to Administrative Penalties), 7.101 - 7.111 (relating to Civil Penalties), and 7.141 - 7.202 (relating to Criminal Offenses and Penalties) for violations including, but not limited to, negligently or knowingly violating the federal CWA §§301, 302, 306, 307, 308, 318, or 405, or any condition or limitation implementing any sections in a permit issued under the CWA §402, or any requirement imposed in a pretreatment program approved under the CWA §§402(a)(3) or 402(b)(8).

3. Inspections and Entry

a. Inspection and entry shall be allowed as prescribed in the TWC Chapters 26, 27, and 28, and THSC Chapter 361.

b. The members of the Commission and employees and agents of the Commission are entitled to enter any public or private property at any reasonable time for the purpose of inspecting and investigating conditions relating to the quality of water in the state or the compliance with any rule, regulation, permit, or other order of the Commission. Members, employees, or agents of the Commission and Commission contractors are entitled to enter public or private property at any reasonable time to investigate or monitor or, if the responsible party is not responsive or there is an immediate danger to public health or the environment, to remove or remediate a condition related to the quality of water in the state. Members, employees, Commission contractors, or agents acting under this authority who enter private property shall observe the establishment's rules and regulations concerning safety, internal security, and fire protection, and if the property has management in residence, shall notify management or the person then in charge of his presence and shall exhibit proper credentials. If any member, employee, Commission contractor, or agent is refused the right to enter in or on public or private property under this authority, the Executive Director may invoke the remedies authorized in TWC §7.002. The statement above, that Commission entry shall occur in accordance with an establishment's rules and regulations concerning safety, internal security, and fire protection, is not grounds for denial or restriction of entry to any part of the facility, but merely describes the Commission's duty to observe appropriate rules and regulations during an inspection.

4. Permit Amendment or Renewal

   a. The permittee shall give notice to the Executive Director as soon as possible of any planned physical alterations or additions to the permitted facility if such alterations or additions would require a permit amendment or result in a violation of permit requirements. Notice shall also be required under this paragraph when:

      i. the alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in accordance with 30 TAC §305.534 (relating to New Sources and New Dischargers); or

      ii. the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in the permit, nor to notification requirements in Monitoring and Reporting Requirements No. 9; or

      iii. the alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

   b. Prior to any facility modifications, additions, or expansions that will increase the plant capacity beyond the permitted flow, the permittee must apply for and obtain proper authorization from the Commission before commencing construction.

   c. The permittee must apply for an amendment or renewal at least 180 days prior to expiration of the existing permit in order to continue a permitted activity after the expiration date of the permit. If an application is submitted prior to the expiration date of the permit, the existing permit shall remain in effect until the application is approved, denied, or returned. If the application is returned or denied, authorization to continue such activity shall terminate upon the effective date of the action. If an application is not submitted prior to the expiration date of the permit, the permit shall expire and authorization to continue such activity shall terminate.

   d. Prior to accepting or generating wastes that are not described in the permit application or that would result in a significant change in the quantity or quality of the existing discharge, the permittee must report the proposed changes to the Commission. The permittee must apply for a permit amendment reflecting any necessary changes in permit conditions, including effluent limitations for pollutants not identified and limited by this permit.

   e. In accordance with the TWC §26.029(b), after a public hearing, notice of which shall be given to the permittee, the Commission may require the permittee, from time to time, for good cause, in accordance with applicable laws, to conform to new or additional conditions.

   f. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under CWA §307(a) for a toxic pollutant that is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition. The permittee shall comply with effluent standards or prohibitions established under CWA §307(a) for toxic pollutants within the time provided in the regulations that established those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. Permit Transfer

   a. Prior to any transfer of this permit, Commission approval must be obtained. The Commission shall be notified in writing of any change in control or ownership of facilities authorized by this permit. Such notification should be sent to the Applications Review and Processing Team (MC 148) of the Water Quality Division.

   b. A permit may be transferred only according to the provisions of 30 TAC §305.64 (relating to Transfer of Permits) and 30 TAC §50.133 (relating to Executive Director Action on Application or WQMP update).

6. Relationship to Hazardous Waste Activities

   This permit does not authorize any activity of hazardous waste storage, processing, or disposal that requires a permit or other authorization pursuant to the Texas Health and Safety Code.

7. Relationship to Water Rights

   Disposal of treated effluent by any means other than discharge directly to water in the state must be specifically authorized in this permit and may require a permit pursuant to Texas Water Code Chapter 11.

8. Property Rights

   A permit does not convey any property rights of any sort, or any exclusive privilege.

9. Permit Enforceability

   The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

10. Relationship to Permit Application

    The application pursuant to which the permit has been issued is incorporated herein; provided, however, that in the event of a conflict between the provisions of this permit and the application, the provisions of the permit shall control.

11. Notice of Bankruptcy.

    a. Each permittee shall notify the executive director, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of Title 11 (Bankruptcy) of the United States Code (11 USC) by or against:

       i. the permittee;
       ii. an entity (as that term is defined in 11 USC, §101(15)) controlling the permittee or listing the permit or permittee as property of the estate; or
       iii. an affiliate (as that term is defined in 11 USC, §101(2)) of the permittee.

    b. This notification must indicate:

       i. the name of the permittee;
       ii. the permit number(s);
       iii. the bankruptcy court in which the petition for bankruptcy was filed; and
       iv. the date of filing of the petition.

OPERATIONAL REQUIREMENTS

1. The permittee shall at all times ensure that the facility and all of its systems of collection, treatment, and disposal are properly operated and maintained. This includes, but is not limited to, the regular, periodic examination of wastewater solids within the treatment plant by the operator in order to maintain an appropriate quantity and quality of solids inventory as described in the various operator training manuals and according to accepted industry standards for process control. Process control, maintenance, and operations records shall be retained at the facility site, or shall be readily available for review by a TCEQ representative, for a period of three years.

2. Upon request by the Executive Director, the permittee shall take appropriate samples and provide proper analysis in order to demonstrate compliance with Commission rules. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall comply with all applicable provisions of 30 TAC Chapter 312 concerning sewage sludge use and disposal and 30 TAC §§319.21 - 319.29 concerning the discharge of certain hazardous metals.

3. Domestic wastewater treatment facilities shall comply with the following provisions:

   a. The permittee shall notify the Municipal Permits Team, Wastewater Permitting Section (MC 148) of the Water Quality Division, in writing, of any facility expansion at least 90 days prior to conducting such activity.

   b. The permittee shall submit a closure plan for review and approval to the Municipal Permits Team, Wastewater Permitting Section (MC 148) of the Water Quality Division, for any closure activity at least 90 days prior to conducting such activity. Closure is the act of permanently taking a waste management unit or treatment facility out of service and includes the permanent removal from service of any pit, tank, pond, lagoon, surface impoundment or other treatment unit regulated by this permit.

4. The permittee is responsible for installing prior to plant start-up, and subsequently maintaining, adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failures by means of alternate power sources, standby generators, or retention of inadequately treated wastewater.

5. Unless otherwise specified, the permittee shall provide a readily accessible sampling point and, where applicable, an effluent flow measuring device or other acceptable means by which effluent flow may be determined.

6. The permittee shall remit an annual water quality fee to the Commission as required by 30 TAC Chapter 21. Failure to pay the fee may result in revocation of this permit under TWC §7.302(b)(6).

7. Documentation

   For all written notifications to the Commission required of the permittee by this permit, the permittee shall keep and make available a copy of each such notification under the same conditions as self-monitoring data are required to be kept and made available. Except for information required for TPDES permit applications, effluent data, including effluent data in permits, draft permits and permit applications, and other information specified as not confidential in 30 TAC §1.5(d), any information submitted pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted in the manner prescribed in the application form or by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, information may be made available to the public without further notice. If the Commission or Executive Director agrees with the designation of confidentiality, the TCEQ will not provide the information for public inspection unless required by the Texas Attorney General or a court pursuant to an open records request. If the Executive Director does not agree with the designation of confidentiality, the person submitting the information will be notified.

8. Facilities that generate domestic wastewater shall comply with the following provisions; domestic wastewater treatment facilities at permitted industrial sites are excluded.

   a. Whenever flow measurements for any domestic sewage treatment facility reach 75% of the permitted daily average or annual average flow for three consecutive months, the permittee must initiate engineering and financial planning for expansion or upgrading of the domestic wastewater treatment or collection facilities. Whenever the flow reaches 90% of the permitted daily average or annual average flow for three consecutive months, the permittee shall obtain necessary authorization from the Commission to commence construction of the necessary additional treatment or collection facilities. In the case of a domestic wastewater treatment facility that reaches 75% of the permitted daily average or annual average flow for three consecutive months, and the planned population to be served or the quantity of waste produced is not expected to exceed the design limitations of the treatment facility, the permittee shall submit an engineering report supporting this claim to the Executive Director of the Commission.

      If in the judgment of the Executive Director the population to be served will not cause permit noncompliance, then the requirement of this section may be waived. To be effective, any waiver must be in writing and signed by the Director of the Enforcement Division (MC 149) of the Commission, and such waiver of these requirements will be reviewed upon expiration of the existing permit; however, any such waiver shall not be interpreted as condoning or excusing any violation of any permit parameter.

b. The plans and specifications for domestic sewage collection and treatment works associated with any domestic permit must be approved by the Commission, and failure to secure approval before commencing construction of such works or making a discharge is a violation of this permit and each day is an additional violation until approval has been secured.

c. Permits for domestic wastewater treatment plants are granted subject to the policy of the Commission to encourage the development of area-wide waste collection, treatment, and disposal systems. The Commission reserves the right to amend any domestic wastewater permit in accordance with applicable procedural requirements to require the system covered by this permit to be integrated into an area-wide system, should such be developed; to require the delivery of the wastes authorized to be collected in, treated by or discharged from said system, to such area-wide system; or to amend this permit in any other particular to effectuate the Commission's policy. Such amendments may be made when the changes required are advisable for water quality control purposes and are feasible on the basis of waste treatment technology, engineering, financial, and related considerations existing at the time the changes are required, exclusive of the loss of investment in or revenues from any then existing or proposed waste collection, treatment or disposal system.

9. Domestic wastewater treatment plants shall be operated and maintained by sewage plant operators holding a valid certificate of competency at the required level as defined in 30 TAC Chapter 30.

10. For Publicly Owned Treatment Works (POTWs), the 30-day average (or monthly average) percent removal for BOD and TSS shall not be less than 85%, unless otherwise authorized by this permit.

11. Facilities that generate industrial solid waste as defined in 30 TAC §335.1 shall comply with these provisions:

a. Any solid waste, as defined in 30 TAC §335.1 (including but not limited to such wastes as garbage, refuse, sludge from a waste treatment, water supply treatment plant or air pollution control facility, discarded materials, discarded materials to be recycled, whether the waste is solid, liquid, or semisolid), generated by the permittee during the management and treatment of wastewater, must be managed in accordance with all applicable provisions of 30 TAC Chapter 335, relating to Industrial Solid Waste Management.

b. Industrial wastewater that is being collected, accumulated, stored, or processed before discharge through any final discharge outfall, specified by this permit, is considered to be industrial solid waste until the wastewater passes through the actual point source discharge and must be managed in accordance with all applicable provisions of 30 TAC Chapter 335.

c. The permittee shall provide written notification, pursuant to the requirements of 30 TAC §335.8(b)(1), to the Corrective Action Section (MC 127) of the Remediation Division informing the Commission of any closure activity involving an Industrial Solid Waste Management Unit, at least 90 days prior to conducting such an activity.

d. Construction of any industrial solid waste management unit requires the prior written notification of the proposed activity to the Registration and Reporting Section (MC 129) of the Permitting and Remediation Support Division. No person shall dispose of industrial solid waste, including sludge or other solids from wastewater treatment processes, prior to fulfilling the deed recordation requirements of 30 TAC §335.5.

e. The term "industrial solid waste management unit" means a landfill, surface impoundment, waste-pile, industrial furnace, incinerator, cement kiln, injection well, container, drum, salt dome waste containment cavern, or any other structure vessel, appurtenance, or other improvement on land used to manage industrial solid waste.

f. The permittee shall keep management records for all sludge (or other waste) removed from any wastewater treatment process. These records shall fulfill all applicable requirements of 30 TAC Chapter 335 and must include the following, as it pertains to wastewater treatment and discharge:

i. volume of waste and date(s) generated from treatment process;
ii. volume of waste disposed of on-site or shipped off-site;
iii. date(s) of disposal;

iv. identity of hauler or transporter;
v. location of disposal site; and
vi. method of final disposal.

The above records shall be maintained on a monthly basis. The records shall be retained at the facility site, or shall be readily available for review by authorized representatives of the TCEQ for at least five years.

12. For industrial facilities to which the requirements of 30 TAC Chapter 335 do not apply, sludge and solid wastes, including tank cleaning and contaminated solids for disposal, shall be disposed of in accordance with THSC Code Chapter 361.

TCEQ Revision 01/2016

OTHER REQUIREMENTS

1. This provision supersedes and replaces Provision No. 1, Paragraph 1 of Monitoring and Reporting Requirements found on Page 4 of this permit.

   Monitoring results shall be provided at the intervals specified in the permit. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall conduct effluent sampling and reporting in accordance with 30 TAC §§319.4 - 319.12. Unless otherwise specified, effluent monitoring data shall be submitted each month, to the TCEQ Compliance Monitoring Team (MC-224), by the 25th day of the following month for each discharge that is described by this permit whether or not a discharge is made for that month. Monitoring results must be submitted online using the NetDMR reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. Monitoring results must be signed and certified as required by Monitoring and Reporting Requirements No. 10.

2. Violations of daily maximum limitations for the following pollutants shall be reported orally or by facsimile to TCEQ Region 4 within 24 hours from the time the permittee becomes aware of the violation, followed by a written report within five working days to TCEQ Compliance Monitoring Team (MC 224) and Region 4:

Pollutant	MAL [1] (mg/L)
Copper (Total)	0.002
Lead (Total)	0.0005

   Test methods used must be sensitive enough to demonstrate compliance with the permit effluent limitations. If an effluent limit for a pollutant is less than the minimum analytical level (MAL), then the test method for that pollutant must be sensitive enough to demonstrate compliance at the MAL. Permit compliance/noncompliance determinations will be based on the effluent limitations contained in this permit, with consideration given to the MAL for the pollutants specified above.

   When an analysis of an effluent sample for a pollutant listed above indicates no detectable levels above the MAL and the test method detection level is as sensitive as the specified MAL, a value of zero shall be used for that measurement when making calculations for the self-reporting form. This applies to determinations of daily maximum concentration, calculations of loading and daily averages, and other reportable results.

   When a reported value is zero based on this MAL provision, the permittee shall submit the following statement with the self-reporting form either as a separate attachment to the form or as a statement in the comments section of the form:

   > "The reported value(s) of zero for ____[list pollutant(s)]____ on the self-reporting form for [monitoring period date range]____ is based on the following conditions: (1) the analytical method used had a method detection level as sensitive as the MAL specified in the permit, and (2) the analytical results contained no detectable levels above the specified MAL."

   When an analysis of an effluent sample for a pollutant indicates no detectable levels and the test method detection level is not as sensitive as the MAL specified in the permit, or an MAL is not

[1] Minimum analytical level (MAL)

specified in the permit for that pollutant, the level of detection achieved shall be used for that measurement when making calculations for the self-reporting form. A zero may not be used.

3. Wastewater discharged via Outfalls 002 and 004 must be sampled and analyzed as directed below for those parameters listed in Tables 1, 2, and 3 of Attachment A of this permit. Analytical testing for Outfalls 002 and 004 must be completed within 60 days of initial discharge. Results of the analytical testing must be submitted within 90 days of initial discharge to the TCEQ Compliance Monitoring Team (MC-224) and Industrial Wastewater Permits Team (MC-148). Based on a technical review of the submitted analytical results, an amendment may be initiated by TCEQ staff to include additional effluent limitations, monitoring requirements, or both.

Table 1: Analysis is required for all pollutants in Table 1. Wastewater must be sampled and analyzed for those parameters listed in Table 1 for a minimum of four sampling events that are each at least one week apart.

Table 2: Analysis is required for those pollutants in Table 2 that are used at the facility that could in any way contribute to contamination in the Outfall 002 or 004 discharge. Sampling and analysis must be conducted for a minimum of four sampling events that are each at least one week apart.

Table 3: For all pollutants listed in Table 3, the permittee shall indicate whether each pollutant is believed to be present or absent in the discharge. Sampling and analysis must be conducted for each pollutant believed present for a minimum of one sampling event.

The permittee shall report the flow at Outfalls 002 and 004 in MGD in Attachment A. The permittee shall indicate on each table whether the samples are composite (C) or grab (G) by checking the appropriate box.

In addition, the permittee shall sample for total organic carbon (TOC) at Outfall 004 for four sampling events. Each sampling event be at least one week apart from the others. Analytical testing for TOC at Outfall 004 must be completed within 60 days of permit issuance. Results of the analytical testing must be submitted to the TCEQ Compliance Monitoring Team (MC-224) and Industrial Wastewater Permits Team (MC-148). Based on a technical review of the submitted analytical results, an amendment may be initiated by TCEQ staff to include additional effluent limitations, monitoring requirements, or both.

Pollutant	**Effluent Concentration (µg/L)**				
	Sample 1	**Sample 2**	**Sample 3**	**Sample 4**	**Average**
Total Organic Carbon					

4. <u>COOLING WATER INTAKE STRUCTURE REQUIREMENTS</u>

A. *Closed Cycle Recirculating System* (CCRS), as defined as 40 CFR §125.92(c), means a system designed and properly operated using minimized make-up and blowdown flows withdrawn from a water of the United States to support contact or non-contact cooling uses within a facility, or a system designed to include certain impoundments. A closed-cycle recirculating system passes cooling water through the condenser and other components of the cooling system and reuses the water for cooling multiple times.

1) CCRS also includes a system with impoundments of waters of the United States (WOTUS). where the impoundment was constructed prior to October 14, 2014 and created for the

purpose of serving as part of the cooling water system as documented in the project purpose statement for any required Clean Water Act section 404 permit obtained to construct the impoundment. In the case of an impoundment whose construction pre-dated the CWA requirement to obtain a section 404 permit, documentation of the project's purpose must be demonstrated to the satisfaction of the Director. This documentation could be some other license or permit obtained to lawfully construct the impoundment for the purposes of a cooling water system, or other such evidence as the Director finds necessary. For impoundments constructed in uplands or not in WOTUS, no documentation of a section 404 or other permit is required. If WOTUS are withdrawn for purposes of replenishing losses to a CCRS other than those due to blowdown, drift, and evaporation from the cooling system, the Director may determine a cooling system is a CCRS if the facility demonstrates to the satisfaction of the Director that make-up water withdrawals attributed specifically to the cooling portion of the cooling system have been minimized.

B. Operation and Maintenance

The permittee shall adhere to the requirements of 40 CFR §125.96 when the CWIS is in operation. Specifically, the facility shall:

1) monitor actual intake flow, as defined at 40 CFR §125.92(a), withdrawn by CWIS for cooling purposes, including cooling water withdrawals; and

2) conduct visual or remote inspections, as required by 40 CFR §125.96(e).

Alternatives to the procedures described at 40 CFR §125.96(e) have not been approved by the TCEQ. Requests for alternative procedures must be submitted in writing to the TCEQ's Industrial Wastewater Permitting Team (MC-148) for review and approval and a copy sent to the TCEQ Compliance Monitoring Team (MC-224).

C. Record Keeping

Records (e.g. electronic logs, data acquisition system records, operating procedures, operator logs, etc.) documenting the operation and maintenance described above shall be kept on site until the subsequent permit is issued, per the requirements of 40 CFR §125.97(d), and made available to TCEQ personnel upon request.

D. Changes in the Cooling Water Intake Structure

The facility must notify the TCEQ Industrial Permits Team (MC 148), Compliance Monitoring Team (MC-224), and TCEQ Region 4 Office in writing at least 30 days prior to any changes or modifications of the design of the CWIS and copy the TCEQ Compliance Monitoring Team (MC-224).

If it is determined that the proposed CWIS configuration does not meet best technology available standards for impingement mortality and entrainment, the permit may be reopened to incorporate additional requirements.

5. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

6. <u>TEMPERATURE</u>

The flow-weighted average temperature (FWAT) must be computed and recorded on a daily basis. FWAT must be computed at equal time intervals not greater than two hours. The FWAT must be calculated as follows:

$$FWAT = \frac{\Sigma\,(\text{INSTANTANEOUS FLOW} \times \text{INSTANTANEOUS TEMPERATURE})}{\Sigma\,(\text{INSTANTANEOUS FLOW})}$$

The *daily average temperature* must be the arithmetic average of all FWATs calculated during the calendar month.

The *daily maximum temperature* must be the highest FWAT calculated during the calendar month.

7. FREE AVAILABLE CHLORINE

A. The term *free available chlorine* means the value obtained using any of the "chlorine—free available" methods in Table IB in 40 CFR §136.3(a) where the method has the capability of measuring free available chlorine, or other methods approved by the permitting authority.

B. Free available chlorine (FAC) may not be discharged from any unit for more than two hours in any one day, and not more than one unit in any plant may discharge free available chlorine at any one time unless the permittee can demonstrate to the permitting authority that the units in a particular location cannot operate at or below this level of chlorination.

C. Daily mass loading of FAC must be calculated using the following equation:

FAC (lbs/day) = FAC (mg/L) × flow (MGD) × 8.345 × (2 hours/24 hours)

where: FAC (mg/L) = concentration of FAC measured in the effluent during representative period of chlorination.

flow (MGD) = total actual flow of discharge via outfall during sampling day

8. TOTAL RESIDUAL CHLORINE

A. The term total residual chlorine (or total residual oxidants for intake water with bromides) means the value obtained using any of the "chlorine—total residual" methods in Table IB in 40 CFR §136.3(a), or other methods approved by the permitting authority.

B. Total residual chlorine (TRC) may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control.

C. Simultaneous multi-unit chlorination is permitted.

D. The daily maximum mass loading of TRC must be calculated using the following equation:

TRC (lbs/day) = TRC (mg/L) × flow (MGD) × 8.345 × (total hours of chlorination/24 hours) × (# of units)

where: TRC (mg/L) = maximum concentration of TRC measured in the effluent during representative period of chlorination

flow (MGD) = total actual flow of discharge via outfall during sampling day

9. The permittee has submitted, in a letter dated December 21, 2016, a plan to characterize the thermal plume in the receiving water through either the use of a model, mass balance, or via collected or existing in-stream temperature data. The permittee is required to implement the plan following its approval by the TCEQ on January 12, 2019.

The permittee is hereby placed on notice that the Executive Director of the TCEQ will be initiating changes to evaluation procedures and/or rulemaking that may affect thermal requirements for this facility.

10. The term *low volume waste sources* means, taken collectively as if from one source, wastewater from all sources except those for which specific limitations or standards are otherwise established in 40 CFR Part 423. Low volume waste sources include, but are not limited to, the following: Wastewaters from ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, recirculating house service water systems, and wet scrubber air pollution control systems whose primary purpose is particulate removal. Sanitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems are not included in this definition.

11. The term *chemical metal cleaning waste* means any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning.

    The term *metal cleaning waste* means any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

12. The mixing zone for Outfall 001 is defined as a volume within a radius of 100 feet from the point of discharge to Squaw Creek Reservoir. Chronic toxic criteria apply at the edge of the mixing zone.

    The mixing zone for Outfall 002 is defined as a volume within a radius of 37.5 feet from the point of discharge to Squaw Creek Reservoir. Chronic toxic criteria apply at the edge of the mixing zone.

    The mixing zone for Outfall 004 is defined as a volume within a radius of 100 feet from the point of discharge to Squaw Creek Reservoir. Chronic toxic criteria apply at the edge of the mixing zone.

13. If more than one source is associated with this particular waste category, the permittee may obtain grab samples from each source. The permittee may either analyze the samples individually and report the highest value for reporting purposes or follow the appropriate procedure below.

    A. <u>Total Suspended Solids</u>
    Grab samples obtained from each source may either be individually analyzed for reporting the arithmetic average and maximum values or physically combined into a single flow-weighted sample for analysis and reporting.

    B. <u>Oil and Grease</u>
    The permittee submitted a letter dated July 28, 1999 from Mr. Gerald Johnson to Mr. Chris Linendoll of the TCEQ which requested and described an alternate sampling procedure using EPA-approved method 1664A, hexane extractable material (HEM) method, in order to maintain the ability to composite samples by flow weighting from individual sources. This alternate sampling procedure has been approved by the Executive Director of the TCEQ and may be used to obtain oil and grease samples as described in the letter from multiple discharge locations for a single outfall.

    C. <u>pH</u>
    Samples must be obtained from each source and must be analyzed separately for pH. The highest and lowest value recorded for pH must be utilized for reporting purposes.

    The permittee may apply for consideration of alternate sampling and laboratory test methods by submitting a request to the TCEQ, in accordance with 40 CFR §136.5, for referral to the Regional ATP Coordinator.

14. ONCE-THROUGH COOLING WATER EXEMPTION

In accordance with 30 TAC §307.8(d) and based upon statistical analysis and source investigation, a once-through cooling water exemption for total dissolved solids (TDS), chloride, and sulfate has been approved by the Standards Implementation Team for Outfall 001. As a result of this analysis, the permit has been issued without effluent limitations based on water quality criteria for TDS, chloride, and sulfate; however, monitoring of these exempted pollutants is required as shown below:

Outfall	Pollutant	Daily Average (mg/L)	Daily Maximum (mg/L)	Measurement Frequency
001	TDS	Report	Report	1/quarter
	Chloride	Report	Report	1/quarter
	Sulfate	Report	Report	1/quarter

Monitoring results must be kept on site for a minimum of five years, made available to authorized representatives of the TCEQ upon request, and submitted with the application for the next permit renewal.

This monitoring requirement is effective upon the date of permit issuance and expires one day prior to the date of permit expiration. If it is determined that this monitoring requirement should be continued in subsequent permits, the TCEQ will include this provision in subsequent permits.

15. This permit does not authorize on-site disposal of sewage sludge. The permittee shall ensure that all sewage sludge which is not a hazardous waste (as defined in 30 TAC Chapter 335) is handled, transported, and disposed of in compliance with the applicable provisions of 30 TAC Chapter 312. The permittee shall ensure that all sewage sludge which is a hazardous waste (as defined in 30 TAC Chapter 335) is handled, transported, and disposed of in compliance with the applicable provisions of 30 TAC Chapter 335. The permittee shall keep records of all sludges removed from the wastewater treatment plant site. Such records will include the following information:

A. Volume (dry weight basis) of sludge disposed;

B. Date of disposal;

C. Identity and registration number of hauler;

D. Location and registration or permit number of disposal site; and

E. Method of final disposal.

The above records must be maintained on a monthly basis and be available at the plant site for inspection by authorized representatives of the TCEQ for at least five years.

16. POND REQUIREMENTS

A wastewater pond must comply with the following requirements. A wastewater pond (or lagoon) is an earthen structure used to evaporate, hold, store, or treat water that contains a *waste* or *pollutant*

or that would cause *pollution* upon *discharge* as those terms are defined in Texas Water Code §26.001, but does not include a pond that contains only stormwater.

A. A wastewater pond **subject to 40 CFR Part 257, Subpart D** (related to coal combustion residuals) must comply with those requirements in lieu of the requirements in B through G of POND REQUIREMENTS.

B. An **existing** wastewater pond must be maintained to meet or exceed the original approved design and liner requirements; or, in the absence of original approved requirements, must be maintained to prevent unauthorized discharges of wastewater into or adjacent to water in the state. The permittee shall maintain copies of all liner construction and testing documents at the facility or in a reasonably accessible location and make the information available to the executive director upon request.

C. A **new** wastewater pond constructed after the issuance date of this permit must be lined in compliance with one of the following requirements if it will contain process wastewater as defined in 40 CFR §122.2. The executive director will review ponds that will contain only non-process wastewater on a case-by-case basis to determine whether the pond must be lined. If a pond will contain only non-process wastewater, the owner shall notify the Industrial Permits Team (MC-148) to obtain a written determination at least 90 days before the pond is placed into service and copy the TCEQ Compliance Monitoring Team (MC-224). The permittee must submit all information about the proposed pond contents that is reasonably necessary for the executive director to make a determination. If the executive director determines that a pond does not need to be lined, then the pond is exempt from C(1) through C(3) and D through G of POND REQUIREMENTS.

A wastewater pond that only contains domestic wastewater must comply with the design requirements in 30 TAC Chapter 217 and 30 TAC §309.13(d) in lieu of items C(1) through C(3) of this subparagraph.

(1) Soil liner: The soil liner must contain clay-rich soil material (at least 30% of the liner material passing through a #200 mesh sieve, liquid limit greater than or equal to 30, and plasticity index greater than or equal to 15) that completely covers the sides and bottom of the pond. The liner must be at least 3.0 feet thick. The liner material must be compacted in lifts of no more than 8 inches to 95% standard proctor density at the optimum moisture content in accordance with ASTM D698 to achieve a permeability less than or equal to 1×10^{-7} (≤ 0.0000001) cm/sec. For in-situ soil material that meets the permeability requirement, the material must be scarified at least 8 inches deep and then re-compacted to finished grade.

(2) Synthetic membrane: The liner must be a synthetic membrane liner at least 40 mils in thickness that completely covers the sides and the bottom of the pond. The liner material used must be compatible with the wastewater and be resistant to degradation (e.g., from ultraviolet light, chemical reactions, wave action, erosion, etc.). The liner material must be installed and maintained in accordance with the manufacturer's guidelines. A wastewater pond with a synthetic membrane liner must include an underdrain with a leak detection and collection system.

(3) Alternate liner: The permittee shall submit plans signed and sealed by a Texas-licensed professional engineer for any other equivalently protective pond lining method to the Industrial Permits Team (MC-148) and copy the Compliance Monitoring Team (MC-224).

D. For a pond that must be lined according to subparagraph C (including ponds with in-situ soil liners), the permittee shall provide certification, signed and sealed by a Texas-licensed

professional engineer, stating that the completed pond lining and any required underdrain with leak detection and collection system for the pond meet the requirements in subparagraph C(1) – C(3) before using the pond. The certification shall include the following minimum details about the pond lining system: (1) pond liner type (in-situ soil, amended in-situ soil, imported soil, synthetic membrane, or alternative), (2) materials used, (3) thickness of materials, and (4) either permeability test results or a leak detection and collection system description, as applicable.

The certification must be provided to the TCEQ Water Quality Assessment Team (MC-150), Industrial Permits Team (MC-148), Compliance Monitoring Team (MC-224) and regional office. A copy of the liner certification and construction details (i.e., as-built drawings, construction QA/QC documentation, and post construction testing) must be kept on-site or in a reasonably accessible location (in either hardcopy or digital format) until the pond is closed.

E. Protection and maintenance requirements for a pond subject to subparagraph B or C (including ponds with in-situ soil liners).

(1) The permittee shall maintain a liner to prevent the unauthorized discharge of wastewater into or adjacent to water in the state.

(2) A liner must be protected from damage caused by animals. Fences or other protective devices or measures may be used to satisfy this requirement.

(3) The permittee shall maintain the structural integrity of the liner and shall keep the liner and embankment free of woody vegetation, animal burrows, and excessive erosion.

(4) The permittee shall inspect each pond liner and each leak detection system at least once per month. Evidence of damage or unauthorized discharge must be evaluated by a Texas-licensed professional engineer or Texas-licensed professional geoscientist within 30 days. The permittee is not required to drain an operating pond or to inspect below the waterline during these routine inspections.

a. A Texas-licensed professional engineer or Texas-licensed professional geoscientist must evaluate damage to a pond liner, including evidence of an unauthorized discharge without visible damage.

b. Pond liner damage must be repaired at the recommendation of a Texas-licensed professional engineer or Texas-licensed professional geoscientist. If the damage is significant or could result in an unauthorized discharge, then the repair must be documented and certified by a Texas-licensed professional engineer. Within 60 days after a repair is completed, the liner certification must be provided to the TCEQ Water Quality Assessment Team (MC-150), Compliance Monitoring Section (MC-224), and regional office. A copy of the liner certification must be maintained at the facility or in a reasonably accessible location and made available to the executive director upon request.

c. A release determination and subsequent corrective action will be based on 40 CFR Part 257 or the Texas Risk Reduction Program (30 TAC Chapter 350), as applicable. If evidence indicates that an unauthorized discharge occurred, including evidence that the actual permeability exceeds the design permeability, the matter may also be referred to the TCEQ Enforcement Division to ensure the protection of the public and the environment.

F. For a pond subject to subparagraph B or C (including ponds with in-situ soil liners), the permittee shall have a Texas-licensed professional engineer perform an evaluation of each pond

that requires a liner at least once every five years. The evaluation must include: (1) a physical inspection of the pond liner to check for structural integrity, damage, and evidence of leaking; (2) a review of the liner documentation for the pond; and (3) a review of all documentation related to liner repair and maintenance performed since the last evaluation. For the purposes of this evaluation, evidence of leaking also includes evidence that the actual permeability exceeds the design permeability. The permittee is not required to drain an operating pond or to inspect below the waterline during the evaluation. A copy of the engineer's evaluation report must be maintained at the facility or in a reasonably accessible location and made available to the executive director upon request.

G. For a pond subject to subparagraph B or C (including ponds with in-situ soil liners), the permittee shall maintain at least 2.0 feet of freeboard in the pond except when:

(1) the freeboard requirement temporarily cannot be maintained due to a large storm event that requires the additional retention capacity to be used for a limited period of time;

(2) the freeboard requirement temporarily cannot be maintained due to upset plant conditions that require the additional retention capacity to be used for treatment for a limited period of time; or

(3) the pond was not required to have at least 2.0 feet of freeboard according to the requirements at the time of construction.

17. Prior to construction of any new domestic wastewater treatment facilities, the permittee shall submit to the TCEQ Enforcement Division (MC 224) and Wastewater Permitting Section (MC-148) a summary transmittal letter in accordance with the requirements in 30 TAC §217.6(d). If requested by the Wastewater Permitting Section, the permittee shall submit plans, specifications and a final engineering design report which comply with 30 TAC Chapter 217, Design Criteria for Domestic Wastewater Systems. The permittee shall clearly show how the treatment system will meet the effluent limitations required on page 2b of this permit.

18. The domestic wastewater treatment plant (Outfall 003) must be operated and maintained by a wastewater treatment plant operator holding a valid certificate of competency. The certificate of competency for the operator must be a Class D or higher certificate in accordance with 30 TAC §30.350.

Attachment A

Table 1:

Conventionals and Non-conventionals

Outfall No.:	☐C ☐G	**Effluent Concentration (mg/L)**					
Pollutant		**Samp.**	**Samp.**	**Samp.**	**Samp.**	**Average**	
Flow (MGD)							
BOD (5-day)							
CBOD (5-day)							
Chemical Oxygen Demand							
Total Organic Carbon							
Dissolved Oxygen							
Ammonia Nitrogen							
Total Suspended Solids							
Nitrate Nitrogen							
Total Organic Nitrogen							
Total Phosphorus							
Oil and Grease							
Total Residual Chlorine							
Total Dissolved Solids							
Sulfate							
Chloride							
Fluoride							
Total Alkalinity (mg/L as $CaCO_3$)							
Temperature (°F)							
pH (Standard Units; min/max)							

Metals

Pollutant	**Effluent Concentration (µg/L)**[1]					**MAL**[2] **(µg/L)**
	Samp.	**Samp.**	**Samp.**	**Samp.**	**Average**	
Aluminum, Total						2.5
Antimony, Total						5
Arsenic, Total						0.5
Barium, Total						3
Beryllium, Total						0.5
Cadmium, Total						1
Chromium, Total						3
Chromium, Hexavalent						3
Chromium, Trivalent						N/A
Copper, Total						2
Cyanide, Free						10
Lead, Total						0.5

1 Indicate units if different than µg/L.
2 Minimum Analytical Level

Pollutant	Effluent Concentration (μg/L)[1]					MAL[2] (μg/L)
	Samp.	Samp.	Samp.	Samp.	Average	
Mercury, Total						0.005
Nickel, Total						2
Selenium, Total						5
Silver, Total						0.5
Thallium, Total						0.5
Zinc, Total						5.0

Table 2-

Toxic Pollutants with Water Quality Criteria

Outfall No.: ☐C ☐G	**Samp. 1 (μg/L)**[1]	**Samp. 2 (μg/L)**[1]	**Samp. 3 (μg/L)**[1]	**Samp. 4 (μg/L)**[1]	**Avg. (μg/L)**[1]	**MAL**[2] **(μg/L)**
Pollutant						
Acrolein						0.7
Acrylonitrile						50
Anthracene						10
Benzene						10
Benzidine						50
Benzo(*a*)anthracene						5
Benzo(*a*)pyrene						5
Bis(2-chloroethyl)ether						10
Bis(2-ethylhexyl) phthalate						10
Bromodichloromethane						10
Bromoform						10
Carbon Tetrachloride						2
Chlorobenzene						10
Chlorodibromomethane						10
Chloroform						10
Chrysene						5
Cresols						10
1,2-Dibromoethane						10
m-Dichlorobenzene						10
o-Dichlorobenzene						10
p-Dichlorobenzene						10
3,3'-Dichlorobenzidine						5
1,2-Dichloroethane						10
1,1-Dichloroethylene						10
Dichloromethane						20
1,2-Dichloropropane						10
1,3-Dichloropropylene						10
2,4-Dimethylphenol						10
Di-*n*-Butyl Phthalate						10
Epichlorohydrin						1,000

Outfall No.: ☐C ☐G Pollutant	Samp. 1 (µg/L) [1]	Samp. 2 (µg/L) [1]	Samp. 3 (µg/L) [1]	Samp. 4 (µg/L) [1]	Avg. (µg/L) [1]	MAL [2] (µg/L)
Ethylbenzene						10
Ethylene Glycol						—
Fluoride						500
Hexachlorobenzene						5
Hexachlorobutadiene						10
Hexachlorocyclopentadiene						10
Hexachloroethane						20
4,4′-Isopropylidenediphenol [bisphenol A]						—
Methyl Ethyl Ketone						50
Methyl *tert*-butyl ether [MTBE]						—
Nitrobenzene						10
N-Nitrosodiethylamine						20
N-Nitroso-di-*n*-Butylamine						20
Nonylphenol						333
Pentachlorobenzene						20
Pentachlorophenol						5
Phenanthrene						10
Polychlorinated Biphenyls (PCBs) [3]						0.2
Pyridine						20
1,2,4,5-Tetrachlorobenzene						20
1,1,2,2-Tetrachloroethane						10
Tetrachloroethylene						10
Toluene						10
1,1,1-Trichloroethane						10
1,1,2-Trichloroethane						10
Trichloroethylene						10
2,4,5-Trichlorophenol						50
TTHM (Total Trihalomethanes)						10
Vinyl Chloride						10

3 Total of detects for PCB-1242, PCB-1254, PCB-1221, PCB-1232, PCB-1248, PCB-1260, PCB-1016. If all values are non-detects, enter the highest non-detect preceded by a "<" symbol.

Table 3

Outfall No. ☐C ☐G **Pollutant**	**Believed Present**	**Believed Absent**	**Average Concentration (mg/L)**	**Maximum Concentration (mg/L)**	**No. of Samples**	**MAL (mg/L)**
Bromide						0.400
Color (PCU)						—
Nitrate-Nitrite (as N)						—
Sulfide (as S)						—
Sulfite (as SO_3)						—
Surfactants						—
Boron, total						0.020
Cobalt, total						0.0003
Iron, total						0.007
Magnesium, total						0.020
Manganese, total						0.0005
Molybdenum, total						0.001
Tin, total						0.005
Titanium, total						0.030

BIOMONITORING REQUIREMENTS

CHRONIC BIOMONITORING REQUIREMENTS: FRESHWATER

The provisions of this section apply to Outfall 001 for whole effluent toxicity (WET) testing.

1. Scope, Frequency, and Methodology

a. The permittee shall test the effluent for toxicity in accordance with the provisions below. Such testing will determine if an appropriately dilute effluent sample adversely affects the survival, reproduction, or growth of the test organisms.

b. The permittee shall conduct the following toxicity tests utilizing the test organisms, procedures, and quality assurance requirements specified in this part of this permit and in accordance with "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," fourth edition (EPA-821-R-02-013) or its most recent update:

1) Chronic static renewal survival and reproduction test using the water flea (*Ceriodaphnia dubia*) (Method 1002.0). This test should be terminated when 60% of the surviving adults in the control produce three broods or at the end of eight days, whichever occurs first. This test shall be conducted once per quarter.

2) Chronic static renewal 7-day larval survival and growth test using the fathead minnow (*Pimephales promelas*) (Method 1000.0). A minimum of five replicates with eight organisms per replicate shall be used in the control and in each dilution. This test shall be conducted once per quarter.

The permittee must perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit.

c. The permittee shall use five effluent dilution concentrations and a control in each toxicity test. These effluent dilution concentrations are 32%, 42%, 56%, 75%, and 100% effluent. The critical dilution, defined as 100% effluent, is the effluent concentration representative of the proportion of effluent in the receiving water during critical low flow or critical mixing conditions.

d. This permit may be amended to require a WET limit, a chemical-specific effluent limit, a best management practice, or other appropriate actions to address toxicity. The permittee may be required to conduct a toxicity reduction evaluation (TRE) after multiple toxic events.

e. Testing Frequency Reduction

1) If none of the first four consecutive quarterly tests demonstrates significant toxicity, the permittee may submit this information in writing and, upon approval, reduce the testing frequency to once per six months for the invertebrate test species and once per year for the vertebrate test species.

2) If one or more of the first four consecutive quarterly tests demonstrates significant toxicity, the permittee shall continue quarterly testing for that species until this permit is reissued. If a testing frequency reduction had been previously granted and a subsequent test demonstrates significant toxicity, the permittee will resume a quarterly testing frequency for that species until this permit is reissued.

2. Required Toxicity Testing Conditions

a. Test Acceptance - The permittee shall repeat any toxicity test, including the control and all effluent dilutions, which fail to meet the following criteria:

1) a control mean survival of 80% or greater;

2) a control mean number of water flea neonates per surviving adult of 15 or greater;

3) a control mean dry weight of surviving fathead minnow larvae of 0.25 mg or greater;

4) a control coefficient of variation percent (CV%) of 40 or less between replicates for the young of surviving females in the water flea test; and the growth and survival endpoints in the fathead minnow test;

5) a critical dilution CV% of 40 or less for the young of surviving females in the water flea test; and the growth and survival endpoints for the fathead minnow test. However, if statistically significant lethal or nonlethal effects are exhibited at the critical dilution, a CV% greater than 40 shall not invalidate the test;

6) a percent minimum significant difference of 47 or less for water flea reproduction; and

7) a percent minimum significant difference of 30 or less for fathead minnow growth.

b. Statistical Interpretation

1) For the water flea survival test, the statistical analyses used to determine if there is a significant difference between the control and an effluent dilution shall be the Fisher's exact test as described in the manual referenced in Part 1.b.

2) For the water flea reproduction test and the fathead minnow larval survival and growth tests, the statistical analyses used to determine if there is a significant difference between the control and an effluent dilution shall be in accordance with the manual referenced in Part 1.b.

3) The permittee is responsible for reviewing test concentration-response relationships to ensure that calculated test-results are interpreted and reported correctly. The document entitled "Method Guidance and Recommendation for Whole Effluent Toxicity (WET) Testing (40 CFR Part 136)" (EPA 821-B-00-004) provides guidance on determining the validity of test results.

4) If significant lethality is demonstrated (that is, there is a statistically significant difference in survival at the critical dilution when compared to the survival in the control), the conditions of test acceptability are met, and the survival of the test organisms are equal to or greater than 80% in the critical dilution and all dilutions below that, then the permittee shall report a survival No Observed Effect Concentration (NOEC) of not less than the critical dilution for the reporting requirements.

5) The NOEC is defined as the greatest effluent dilution at which no significant effect is demonstrated. The Lowest Observed Effect Concentration (LOEC) is defined as the lowest effluent dilution at which a significant effect is demonstrated. A significant effect is herein defined as a statistically significant difference between the survival, reproduction, or growth of the test organism in a specified effluent dilution when compared to the survival, reproduction, or growth of the test organism in the control.

6) The use of NOECs and LOECs assumes either a monotonic (continuous) concentration-response relationship or a threshold model of the concentration-response relationship. For any test result that demonstrates a non-monotonic (non-continuous) response, the NOEC should be determined based on the guidance manual referenced in Item 3.

7) Pursuant to the responsibility assigned to the permittee in Part 2.b.3), test results that demonstrate a non-monotonic (non-continuous) concentration-response relationship may be submitted, prior to the due date, for technical review. The guidance manual referenced in Item 3 will be used when making a determination of test acceptability.

8) TCEQ staff will review test results for consistency with rules, procedures, and permit requirements.

c. Dilution Water

1) Dilution water used in the toxicity tests must be the receiving water collected as close to the point of discharge as possible but unaffected by the discharge.

2) Where the receiving water proves unsatisfactory as a result of pre-existing instream toxicity (i.e. fails to fulfill the test acceptance criteria of Part 2.a.), the permittee may substitute synthetic dilution water for the receiving water in all subsequent tests provided the unacceptable receiving water test met the following stipulations:

a) a synthetic lab water control was performed (in addition to the receiving water control) which fulfilled the test acceptance requirements of Part 2.a;

b) the test indicating receiving water toxicity was carried out to completion (i.e., 7 days);

c) the permittee submitted all test results indicating receiving water toxicity with the reports and information required in Part 3.

3) The synthetic dilution water shall consist of standard, moderately hard, reconstituted water. Upon approval, the permittee may substitute other appropriate dilution water with chemical and physical characteristics similar to that of the receiving water.

d. Samples and Composites

1) The permittee shall collect a minimum of three composite samples from Outfall 001. The second and third composite samples will be used for the renewal of the dilution concentrations for each toxicity test.

2) The permittee shall collect the composite samples such that the samples are representative of any periodic episode of chlorination, biocide usage, or other potentially toxic substance being discharged on an intermittent basis.

3) The permittee shall initiate the toxicity tests within 36 hours after collection of the last portion of the first composite sample. The holding time for any subsequent composite sample shall not exceed 72 hours. Samples shall be maintained at a temperature of 0-6 degrees Centigrade during collection, shipping, and storage.

4) If Outfall 001 ceases discharging during the collection of effluent samples, the requirements for the minimum number of effluent samples, the minimum number of effluent portions, and the sample holding time are waived during that sampling period. However, the permittee must have collected an effluent composite sample volume sufficient to complete the required toxicity tests with renewal of the effluent. When possible, the effluent samples used for the toxicity tests shall be collected on separate days if the discharge occurs over multiple days. The sample collection duration and the static renewal protocol associated with the abbreviated sample collection must be documented in the full report.

3. <u>Reporting</u>

All reports, tables, plans, summaries, and related correspondence required this section shall be submitted to the attention of the Standards Implementation Team (MC 150) of the Water Quality Division.

a. The permittee shall prepare a full report of the results of all tests conducted in accordance with the manual referenced in Part 1.b. for every valid and invalid toxicity test initiated whether carried to completion or not.

b. The permittee shall routinely report the results of each biomonitoring test on the Table 1 forms provided with this permit.

1) Annual biomonitoring test results are due on or before January 20th for biomonitoring conducted during the previous 12-month period.

2) Semiannual biomonitoring test results are due on or before July 20th and January 20th for biomonitoring conducted during the previous 6-month period.

3) Quarterly biomonitoring test results are due on or before April 20th, July 20th, October 20th, and January 20th for biomonitoring conducted during the previous calendar quarter.

4) Monthly biomonitoring test results are due on or before the 20th day of the month following sampling.

c. Enter the following codes for the appropriate parameters for valid tests only:

1) For the water flea, Parameter TLP3B, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

2) For the water flea, Parameter TOP3B, report the NOEC for survival.

3) For the water flea, Parameter TXP3B, report the LOEC for survival.

4) For the water flea, Parameter TWP3B, enter a "1" if the NOEC for reproduction is less than the critical dilution; otherwise, enter a "0."

5) For the water flea, Parameter TPP3B, report the NOEC for reproduction.

6) For the water flea, Parameter TYP3B, report the LOEC for reproduction.

7) For the fathead minnow, Parameter TLP6C, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

8) For the fathead minnow, Parameter TOP6C, report the NOEC for survival.

9) For the fathead minnow, Parameter TXP6C, report the LOEC for survival.

10) For the fathead minnow, Parameter TWP6C, enter a "1" if the NOEC for growth is less than the critical dilution; otherwise, enter a "0."

11) For the fathead minnow, Parameter TPP6C, report the NOEC for growth.

12) For the fathead minnow, Parameter TYP6C, report the LOEC for growth.

d. Enter the following codes for retests only:

1) For retest number 1, Parameter 22415, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

2) For retest number 2, Parameter 22416, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

4. Persistent Toxicity

The requirements of this Part apply only when a test demonstrates a significant effect at the critical dilution. Significant effect and significant lethality were defined in Part 2.b. Significant sublethality is defined as a statistically significant difference in growth/reproduction at the critical dilution when compared to the growth/reproduction of the test organism in the control.

a. The permittee shall conduct a total of 2 additional tests (retests) for any species that demonstrates a significant effect (lethal or sublethal) at the critical dilution. The two retests shall be conducted monthly during the next two consecutive months. The

permittee shall not substitute either of the two retests in lieu of routine toxicity testing. All reports shall be submitted within 20 days of test completion. Test completion is defined as the last day of the test.

b. If the retests are performed due to a demonstration of significant lethality, and one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall initiate the TRE requirements as specified in Part 5. The provisions of Part 4.a. are suspended upon completion of the two retests and submittal of the TRE action plan and schedule defined in Part 5.

If neither test demonstrates significant lethality and the permittee is testing under the reduced testing frequency provision of Part 1.e., the permittee shall return to a quarterly testing frequency for that species.

c. If the two retests are performed due to a demonstration of significant sublethality, and one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall again perform two retests as stipulated in Part 4.a.

d. If the two retests are performed due to a demonstration of significant sublethality, and neither test demonstrates significant lethality, the permittee shall continue testing at the quarterly frequency.

e. Regardless of whether retesting for lethal or sublethal effects or a combination of the two, no more than one retest per month is required for a species.

5. <u>Toxicity Reduction Evaluation</u>

a. Within 45 days of the retest that demonstrates significant lethality, or within 45 days of being so instructed due to multiple toxic events, the permittee shall submit a general outline for initiating a TRE. The outline shall include, but not be limited to, a description of project personnel, a schedule for obtaining consultants (if needed), a discussion of influent and effluent data available for review, a sampling and analytical schedule, and a proposed TRE initiation date.

b. Within 90 days of the retest that demonstrates significant lethality, or within 90 days of being so instructed due to multiple toxic events, the permittee shall submit a TRE action plan and schedule for conducting a TRE. The plan shall specify the approach and methodology to be used in performing the TRE. A TRE is a step-wise investigation combining toxicity testing with physical and chemical analyses to determine actions necessary to eliminate or reduce effluent toxicity to a level not effecting significant lethality at the critical dilution. The TRE action plan shall describe an approach for the reduction or elimination of lethality for both test species defined in Part 1.b. At a minimum, the TRE action plan shall include the following:

1) Specific Activities - The TRE action plan shall specify the approach the permittee intends to utilize in conducting the TRE, including toxicity characterizations, identifications, confirmations, source evaluations, treatability studies, and alternative approaches. When conducting characterization analyses, the permittee shall perform multiple characterizations and follow the procedures specified in the document entitled "Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I" (EPA/600/6-91/005F) or alternate procedures. The permittee shall perform multiple identifications and follow the methods specified in the documents entitled

"Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081). All characterization, identification, and confirmation tests shall be conducted in an orderly and logical progression;

2) Sampling Plan - The TRE action plan should describe sampling locations, methods, holding times, chain of custody, and preservation techniques. The effluent sample volume collected for all tests shall be adequate to perform the toxicity characterization/identification/confirmation procedures and chemical-specific analyses when the toxicity tests show significant lethality. Where the permittee has identified or suspects a specific pollutant and source of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical-specific analyses for the identified and suspected pollutant and source of effluent toxicity;

3) Quality Assurance Plan - The TRE action plan should address record keeping and data evaluation, calibration and standardization, baseline tests, system blanks, controls, duplicates, spikes, toxicity persistence in the samples, randomization, reference toxicant control charts, and mechanisms to detect artifactual toxicity; and

4) Project Organization - The TRE action plan should describe the project staff, project manager, consulting engineering services (where applicable), consulting analytical and toxicological services, etc.

c. Within 30 days of submittal of the TRE action plan and schedule, the permittee shall implement the TRE.

d. The permittee shall submit quarterly TRE activities reports concerning the progress of the TRE. The quarterly reports are due on or before April 20th, July 20th, October 20th, and January 20th. The report shall detail information regarding the TRE activities including:

1) results and interpretation of any chemical-specific analyses for the identified and suspected pollutant performed during the quarter;

2) results and interpretation of any characterization, identification, and confirmation tests performed during the quarter;

3) any data and substantiating documentation which identifies the pollutant and source of effluent toxicity;

4) results of any studies/evaluations concerning the treatability of the facility's effluent toxicity;

5) any data which identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to meet no significant lethality at the critical dilution; and

6) any changes to the initial TRE plan and schedule that are believed necessary as a result of the TRE findings.

e. During the TRE, the permittee shall perform, at a minimum, quarterly testing using the more sensitive species. Testing for the less sensitive species shall continue at the frequency specified in Part 1.b.

f. If the effluent ceases to effect significant lethality, i.e., there is a cessation of lethality, the permittee may end the TRE. A cessation of lethality is defined as no significant lethality for a period of 12 consecutive months with at least monthly testing. At the end of the 12 months, the permittee shall submit a statement of intent to cease the TRE and may then resume the testing frequency specified in Part 1.b.

This provision accommodates situations where operational errors and upsets, spills, or sampling errors triggered the TRE, in contrast to a situation where a single toxicant or group of toxicants cause lethality. This provision does not apply as a result of corrective actions taken by the permittee. Corrective actions are herein defined as proactive efforts that eliminate or reduce effluent toxicity. These include, but are not limited to, source reduction or elimination, improved housekeeping, changes in chemical usage, and modifications of influent streams and effluent treatment.

The permittee may only apply this cessation of lethality provision once. If the effluent again demonstrates significant lethality to the same species, the permit will be amended to add a WET limit with a compliance period, if appropriate. However, prior to the effective date of the WET limit, the permittee may apply for a permit amendment removing and replacing the WET limit with an alternate toxicity control measure by identifying and confirming the toxicant and an appropriate control measure.

g. The permittee shall complete the TRE and submit a final report on the TRE activities no later than 28 months from the last test day of the retest that confirmed significant lethal effects at the critical dilution. The permittee may petition the Executive Director (in writing) for an extension of the 28-month limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE. The report shall provide information pertaining to the specific control mechanism selected that will, when implemented, result in reduction of effluent toxicity to no significant lethality at the critical dilution. The report will also provide a specific corrective action schedule for implementing the selected control mechanism.

h. Based upon the results of the TRE and proposed corrective actions, this permit may be amended to modify the biomonitoring requirements, where necessary, require a compliance schedule for implementation of corrective actions, specify a WET limit, specify a best management practice, and specify a chemical-specific limit.

i. Copies of any and all required TRE plans and reports shall also be submitted to the U.S. EPA Region 6 office, 6WQ-PO.

TABLE 1 (SHEET 1 OF 4)

BIOMONITORING REPORTING

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION

		Date Time		Date Time
Dates and Times Composites Collected	No. 1 FROM:	________________	TO:	________________
	No. 2 FROM:	________________	TO:	________________
	No. 3 FROM:	________________	TO:	________________

Test initiated: ____________________________am/pm ____________________________date

Dilution water used: ________ Receiving Water ________ Synthetic Dilution Water

NUMBER OF YOUNG PRODUCED PER ADULT AT END OF TEST

	Percent effluent (%)					
REP	0%	32%	42%	56%	75%	100%
A						
B						
C						
D						
E						
F						
G						
H						
I						
J						
Survival Mean						
Total Mean						
CV%*						
PMSD						

*Coefficient of Variation = standard deviation x 100/mean (calculation based on young of the surviving adults) Designate males (M), and dead females (D), along with number of neonates (x) released prior to death.

TABLE 1 (SHEET 2 OF 4)

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST

1. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

Is the mean number of young produced per adult significantly less than the number of young per adult in the control for the % effluent corresponding to significant nonlethal effects?

CRITICAL DILUTION (100%): _______ YES _______ NO

PERCENT SURVIVAL

	Percent effluent					
Time of Reading	0%	32%	42%	56%	75%	100%
24h						
48h						
End of Test						

2. Fisher's Exact Test:

Is the mean survival at test end significantly less than the control survival for the % effluent corresponding to lethality?

CRITICAL DILUTION (100%): _______ YES _______ NO

3. Enter percent effluent corresponding to each NOEC/LOEC below:

a.) NOEC survival = __________% effluent

b.) LOEC survival = __________% effluent

c.) NOEC reproduction = __________% effluent

d.) LOEC reproduction = __________% effluent

TABLE 1 (SHEET 3 OF 4)

BIOMONITORING REPORTING

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL

		Date Time		Date Time
Dates and Times Composites Collected	No. 1 FROM:	______________	TO:	______________
	No. 2 FROM:	______________	TO:	______________
	No. 3 FROM:	______________	TO:	______________

Test initiated: ____________________am/pm ____________________date

Dilution water used: ________ Receiving Water ________ Synthetic Dilution Water

FATHEAD MINNOW GROWTH DATA

Effluent Concentration	Average Dry Weight in milligrams in replicate chambers					Mean Dry Weight	CV%*
	A	B	C	D	E		
0%							
32%							
42%							
56%							
75%							
100%							
PMSD							

* Coefficient of Variation = standard deviation x 100/mean

1. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

   Is the mean dry weight (growth) at 7 days significantly less than the control's dry weight (growth) for the % effluent corresponding to significant nonlethal effects?

CRITICAL DILUTION (100%): _______ YES _______ NO

TABLE 1 (SHEET 4 OF 4)

BIOMONITORING REPORTING

FATHEAD MINNOW GROWTH AND SURVIVAL TEST

FATHEAD MINNOW SURVIVAL DATA

Effluent Concentration	Percent Survival in replicate chambers					Mean percent survival			CV%*
	A	B	C	D	E	24h	48h	7 day	
0%									
32%									
42%									
56%									
75%									
100%									

* Coefficient of Variation = standard deviation x 100/mean

2. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

   Is the mean survival at 7 days significantly less (p=0.05) than the control survival for the % effluent corresponding to lethality?

   CRITICAL DILUTION (100%): _______ YES _______ NO

3. Enter percent effluent corresponding to each NOEC/LOEC below:

   a.) NOEC survival = __________% effluent

   b.) LOEC survival = __________% effluent

   c.) NOEC growth = __________% effluent

   d.) LOEC growth = __________% effluent

24-HOUR ACUTE BIOMONITORING REQUIREMENTS: FRESHWATER

The provisions of this section apply to Outfall 001 for WET testing.

1. Scope, Frequency, and Methodology

a. The permittee shall test the effluent for lethality in accordance with the provisions in this section. Such testing will determine compliance with Texas Surface Water Quality Standard 30 TAC § 307.6(e)(2)(B), which requires greater than 50% survival of the appropriate test organisms in 100% effluent for a 24-hour period.

b. The toxicity tests specified shall be conducted once per six months. The permittee shall conduct the following toxicity tests using the test organisms, procedures, and quality assurance requirements specified in this section of the permit and in accordance with "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms," fifth edition (EPA-821-R-02-012) or its most recent update:

1) Acute 24-hour static toxicity test using the water flea (*Daphnia pulex* or *Ceriodaphnia dubia*). A minimum of five replicates with eight organisms per replicate shall be used in the control and each dilution.

2) Acute 24-hour static toxicity test using the fathead minnow (*Pimephales promelas*). A minimum of five replicates with eight organisms per replicate shall be used in the control and each dilution.

The permittee must perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit. All test results, valid or invalid, must be submitted as described below.

c. In addition to an appropriate control, a 100% effluent concentration shall be used in the toxicity tests. The control and dilution water shall consist of standard, synthetic, moderately hard, reconstituted water.

d. This permit may be amended to require a WET limit, a best management practice, a chemical-specific limit, or other appropriate actions to address toxicity. The permittee may be required to conduct a toxicity reduction evaluation (TRE) after multiple toxic events.

e. As the dilution series specified in the Chronic Biomonitoring Requirements includes a 100% effluent concentration, the results from those tests may fulfill the requirements of this section; any tests performed in the proper time interval may be substituted. Compliance will be evaluated as specified in Part 1.a. The 50% survival in 100% effluent for a 24-hour period standard applies to all tests utilizing a 100% effluent dilution, regardless of whether the results are submitted to comply with the minimum testing frequency.

2. Required Toxicity Testing Conditions

a. Test Acceptance – The permittee shall repeat any toxicity test, including the control, if the control fails to meet a mean survival equal to or greater than 90%.

b. Dilution Water - In accordance with Part 1.c., the control and dilution water shall consist of standard, synthetic, moderately hard, reconstituted water.

c. Samples and Composites

1) The permittee shall collect one composite sample from Outfall 001.

2) The permittee shall collect the composite sample such that the sample is representative of any periodic episode of chlorination, biocide usage, or other potentially toxic substance discharged on an intermittent basis.

3) The permittee shall initiate the toxicity tests within 36 hours after collection of the last portion of the composite sample. Samples shall be maintained at a temperature of 0-6 degrees Centigrade during collection, shipping, and storage.

4) If Outfall 001 ceases discharging during the collection of the effluent composite sample, the requirements for the minimum number of effluent portions are waived. However, the permittee must have collected a composite sample volume sufficient for completion of the required test. The abbreviated sample collection, duration, and methodology must be documented in the full report.

3. Reporting

All reports, tables, plans, summaries, and related correspondence required in this section shall be submitted to the attention of the Standards Implementation Team (MC 150) of the Water Quality Division.

a. The permittee shall prepare a full report of the results of all tests conducted pursuant to this permit in accordance with the manual referenced in Part 1.b. for every valid and invalid toxicity test initiated.

b. The permittee shall routinely report the results of each biomonitoring test on the Table 2 forms provided with this permit.

1) Semiannual biomonitoring test results are due on or before July 20th and January 20th for biomonitoring conducted during the previous 6-month period.

2) Quarterly biomonitoring test results are due on or before April 20th, July 20th, and October 20th, and January 20th for biomonitoring conducted during the previous calendar quarter.

c. Enter the following codes for the appropriate parameters for valid tests only:

1) For the water flea, Parameter TIE3D, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

2) For the fathead minnow, Parameter TIE6C, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

d. Enter the following codes for retests only:

1) For retest number 1, Parameter 22415, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

2) For retest number 2, Parameter 22416, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

4. <u>Persistent Mortality</u>

The requirements of this part apply when a toxicity test demonstrates significant lethality, which is defined as a mean mortality of 50% or greater to organisms exposed to the 100% effluent concentration for 24 hours.

a. The permittee shall conduct 2 additional tests (retests) for each species that demonstrates significant lethality. The two retests shall be conducted once per week for 2 weeks. Five effluent dilution concentrations in addition to an appropriate control shall be used in the retests. These effluent concentrations are 6%, 13%, 25%, 50%, and 100% effluent. The first retest shall be conducted within 15 days of the laboratory determination of significant lethality. All test results shall be submitted within 20 days of test completion of the second retest. Test completion is defined as the 24th hour.

b. If one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall initiate the TRE requirements as specified in Part 5.

5. <u>Toxicity Reduction Evaluation</u>

a. Within 45 days of the retest that demonstrates significant lethality, the permittee shall submit a general outline for initiating a TRE. The outline shall include, but not be limited to, a description of project personnel, a schedule for obtaining consultants (if needed), a discussion of influent and effluent data available for review, a sampling and analytical schedule, and a proposed TRE initiation date.

b. Within 90 days of the retest that demonstrates significant lethality, the permittee shall submit a TRE action plan and schedule for conducting a TRE. The plan shall specify the approach and methodology to be used in performing the TRE. A TRE is a step-wise investigation combining toxicity testing with physical and chemical analyses to determine actions necessary to eliminate or reduce effluent toxicity to a level not effecting significant lethality at the critical dilution. The TRE action plan shall lead to the successful elimination of significant lethality for both test species defined in item 1.b. As a minimum, the TRE action plan shall include the following:

1) Specific Activities - The TRE action plan shall specify the approach the permittee intends to utilize in conducting the TRE, including toxicity characterizations, identifications, confirmations, source evaluations, treatability studies, and alternative approaches. When conducting characterization analyses, the permittee shall perform multiple characterizations and follow the procedures specified in the document entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures" (EPA/600/6-91/003) or alternate procedures. The permittee shall perform multiple identifications and follow the methods specified in the documents entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic

Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081). All characterization, identification, and confirmation tests shall be conducted in an orderly and logical progression;

2) Sampling Plan - The TRE action plan should describe sampling locations, methods, holding times, chain of custody, and preservation techniques. The effluent sample volume collected for all tests shall be adequate to perform the toxicity characterization/identification/confirmation procedures and chemical-specific analyses when the toxicity tests show significant lethality. Where the permittee has identified or suspects a specific pollutant and source of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical-specific analyses for the identified and suspected pollutant and source of effluent toxicity;

3) Quality Assurance Plan - The TRE action plan should address record keeping and data evaluation, calibration and standardization, baseline tests, system blanks, controls, duplicates, spikes, toxicity persistence in the samples, randomization, reference toxicant control charts, and mechanisms to detect artifactual toxicity; and

4) Project Organization - The TRE action plan should describe the project staff, manager, consulting engineering services (where applicable), consulting analytical and toxicological services, etc.

c. Within 30 days of submittal of the TRE action plan and schedule, the permittee shall implement the TRE.

d. The permittee shall submit quarterly TRE activities reports concerning the progress of the TRE. The quarterly TRE activities reports are due on or before April 20th, July 20th, October 20th, and January 20th. The report shall detail information regarding the TRE activities including:

1) results and interpretation of any chemical-specific analyses for the identified and suspected pollutant performed during the quarter;

2) results and interpretation of any characterization, identification, and confirmation tests performed during the quarter;

3) any data and substantiating documentation that identifies the pollutant(s) and source of effluent toxicity;

4) results of any studies/evaluations concerning the treatability of the facility's effluent toxicity;

5) any data that identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to eliminate significant lethality; and

6) any changes to the initial TRE Plan and Schedule that are believed necessary as a result of the TRE findings.

e. During the TRE, the permittee shall perform, at a minimum, quarterly testing using the more sensitive species. Testing for the less sensitive species shall continue at the frequency specified in Part 1.b.

f. If the effluent ceases to effect significant lethality, i.e., there is a cessation of lethality, the permittee may end the TRE. A cessation of lethality is defined as no significant lethality for a period of 12 consecutive weeks with at least weekly testing. At the end of the 12 weeks, the permittee shall submit a statement of intent to cease the TRE and may then resume the testing frequency specified in Part 1.b.

This provision accommodates situations where operational errors and upsets, spills, or sampling errors triggered the TRE, in contrast to a situation where a single toxicant or group of toxicants cause lethality. This provision does not apply as a result of corrective actions taken by the permittee. Corrective actions are herein defined as proactive efforts that eliminate or reduce effluent toxicity. These include, but are not limited to, source reduction or elimination, improved housekeeping, changes in chemical usage, and modifications of influent streams and effluent treatment.

The permittee may only apply this cessation of lethality provision once. If the effluent again demonstrates significant lethality to the same species, the permit will be amended to add a WET limit with a compliance period, if appropriate. However, prior to the effective date of the WET limit, the permittee may apply for a permit amendment removing and replacing the WET limit with an alternate toxicity control measure by identifying and confirming the toxicant and an appropriate control measure.

g. The permittee shall complete the TRE and submit a final report on the TRE activities no later than 18 months from the last test day of the retest that demonstrates significant lethality. The permittee may petition the Executive Director (in writing) for an extension of the 18-month limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE. The report shall specify the control mechanism that will, when implemented, reduce effluent toxicity as specified in item 5.h. The report shall also specify a corrective action schedule for implementing the selected control mechanism.

h. Within 3 years of the last day of the test confirming toxicity, the permittee shall comply with 30 TAC § 307.6(e)(2)(B), which requires greater than 50% survival of the test organism in 100% effluent at the end of 24-hours. The permittee may petition the Executive Director (in writing) for an extension of the 3-year limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE.

The permittee may be exempted from complying with 30 TAC § 307.6(e)(2)(B) upon proving that toxicity is caused by an excess, imbalance, or deficiency of dissolved salts. This exemption excludes instances where individually toxic components (e.g., metals) form a salt compound. Following the exemption, this permit may be amended to include an ion-adjustment protocol, alternate species testing, or single species testing.

i. Based upon the results of the TRE and proposed corrective actions, this permit may be amended to modify the biomonitoring requirements where necessary, require a

compliance schedule for implementation of corrective actions, specify a WET limit, specify a best management practice, and specify a chemical specific limit.

j. Copies of any and all required TRE plans and reports shall also be submitted to the U.S. EPA Region 6 office, 6WQ-PO.

TABLE 2 (SHEET 1 OF 2)

WATER FLEA SURVIVAL

GENERAL INFORMATION

	Time	Date
Composite Sample Collected		
Test Initiated		

PERCENT SURVIVAL

Time	Rep	Percent effluent					
		0%	6%	13%	25%	50%	100%
24h	A						
	B						
	C						
	D						
	E						
	MEAN*						

Enter percent effluent corresponding to the LC50 below:

24 hour LC50 = ______% effluent

TABLE 2 (SHEET 2 OF 2)

FATHEAD MINNOW SURVIVAL

GENERAL INFORMATION

	Time	Date
Composite Sample Collected		
Test Initiated		

PERCENT SURVIVAL

Time	Rep	Percent effluent					
		0%	6%	13%	25%	50%	100%
24h	A						
	B						
	C						
	D						
	E						
	MEAN						

Enter percent effluent corresponding to the LC50 below:

24 hour LC50 = _______% effluent

Attachment C: Threatened and Endangered Species Consultation

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak
Nuclear Power Plant
(Vistra Operations
Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100010
TXX-21005
March 9, 2021

Kevin Mote
Texas Parks and Wildlife Department
114 Center Avenue
Suite 300
Brownwood, Texas 76801

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Mote:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the environmental impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units through the period of the renewed licenses.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	February 8, 2030	February 8, 2050
Unit 2	February 2, 2033	February 2, 2053

The environmental report addresses the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act. This letter seeks input from the Texas Parks and Wildlife Department (TPWD) regarding such impacts in the vicinity of the CPNPP.

As part of the renewal process, the NRC may request a consultation with the TPWD regarding the license renewal. To facilitate Vistra OpCo's assessment and to ensure an efficient and effective consultation process by the NRC, Vistra OpCo is contacting you early in the application process seeking input regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's surroundings, and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant and a table of listed species in the plant's vicinity are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

The CPNPP property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those connecting CPNPP to the switchyard.

Species potentially occurring near the power plant site, or within Somervell and Hood counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed Table 2, *Protected Species Potentially Occurring in the CPNPP Vicinity*.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities, other than those to maintain existing structures and operations, anticipated at the CPNPP site during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Vistra OpCo does not anticipate the continued operation of the CPNPP to adversely affect the environment or any of the species or habitats noted herein.

As stated earlier, this letter seeks TPWD input on Vistra OpCo's proposed continued operation of the CPNPP on listed species and important habitats within the environs of the plant. We would appreciate TPWD notifying us of your comments and any information TPWD believes we should consider in the preparation of the environmental report. Vistra OpCo requests that TPWD send a response by letter to Randy Harding (see contact information below) by April 21, 2021. Vistra OpCo plans to contact TPWD in a few weeks to request the scheduling of a virtual meeting to go over this request and answer any questions the TPWD staff may have. We plan to include this letter and any response TPWD provides in the environmental report to be submitted to the NRC as part of the license renewal application.

Vistra OpCo requests that TPWD send a letter response to Randy Harding (see contact information below). Should you or your staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity

Common Name	Scientific Name	Legal Status
Birds		
Golden-Cheeked Warbler	*Setophaga chrysoparia*	FE, SE
Least Tern	*Sterna antillarum*	SE
Piping Plover	*Charadrius melodus*	FT, ST
Red Knot	*Calidris canutus rufa*	FT
Whooping Crane	*Grus americana*	FE, SE
White-Faced Ibis	*Plegadis chihi*	ST
Black Rail	*Laterallus jamaicensis*	PT, ST
Reptiles		
Texas Horned Lizard	*Phrynosoma cornutum*	ST
Brazos Water Snake	*Nerodia harteri*	ST
Invertebrates		
Texas Fawnsfoot	*Truncilla macrodon*	FC, ST
Brazos Heelsplitter	*Potamilus streckersoni*	ST
FE= federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species; PT = federally proposed for threatened listing Sources: USFWS 2020; Texas Parks and Wildlife 2020		

Note: The area within a 6-mile radius surrounding CPNPP is considered the plant's vicinity. Somervell County, Texas and Hood County, Texas fall within the 6-mile vicinity and the protected species listings for these counties were used for preparing this table.

Figure 1. Comanche Peak Nuclear Power Plant Site

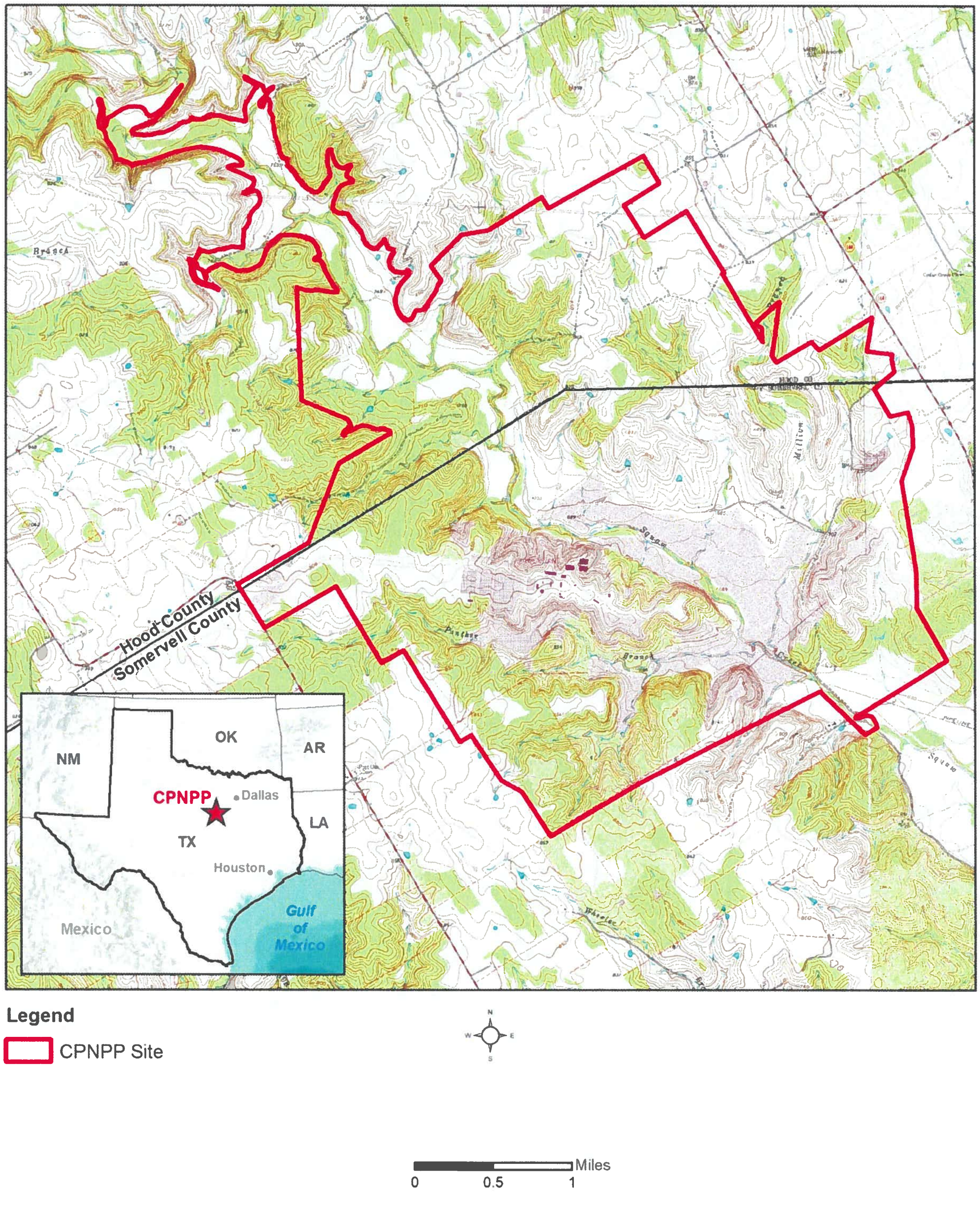
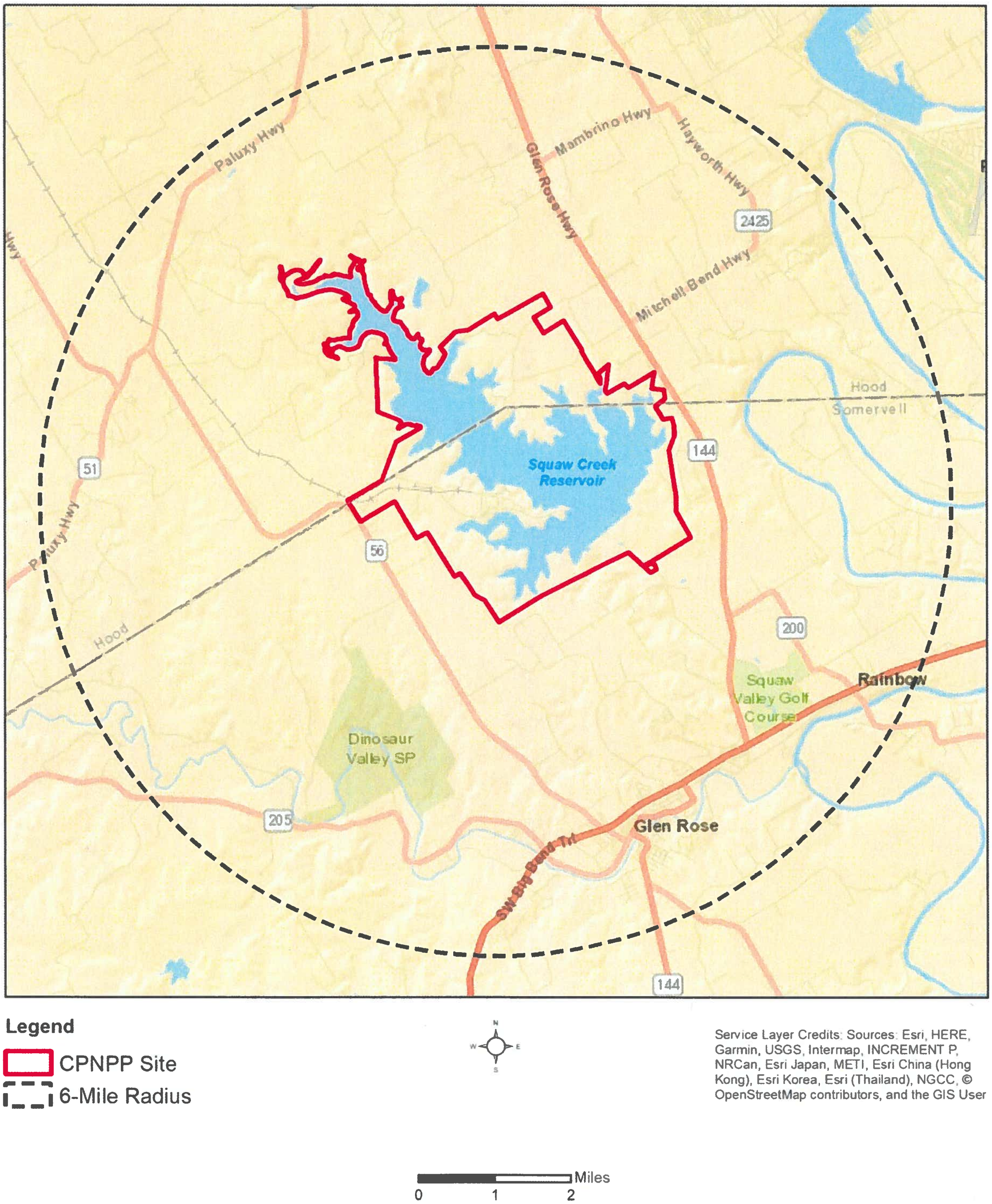


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100011
TXX-21006
March 9, 2021

Amy Lueders
U.S. Fish and Wildlife Services
10711 Burnet Road
Suite 200
Austin, TX 78758

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Ms. Lueders:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the environmental impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units through the period of the renewed licenses.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	February 8, 2030	February 8, 2050
Unit 2	February 2, 2033	February 2, 2053

The environmental report addresses the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act. This letter seeks input from the U.S. Fish and Wildlife Services (USFWS) regarding such impacts in the vicinity of the CPNPP.

As part of the renewal process, the NRC may request a consultation with the USFWS regarding the license renewal. To facilitate Vistra OpCo's assessment and to ensure an efficient and effective consultation process by the NRC, Vistra OpCo is contacting you early in the application process seeking input regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's surroundings, and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant and a table of listed species in the plant's vicinity are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

The CPNPP property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those connecting CPNPP to the switchyard.

Species potentially occurring near the power plant site, or within Somervell and Hood counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed Table 2.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities, other than those to maintain existing structures and operations, anticipated at the CPNPP site during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Vistra OpCo does not anticipate the continued operation of the CPNPP to adversely affect the environment or any of the species or habitats noted herein.

As stated earlier, this letter seeks USFWS input on Vistra OpCo's proposed continued operation of the CPNPP on listed species and important habitats within the environs of the plant. We would appreciate USFWS notifying us of your comments and any information USFWS believes we should consider in the preparation of the environmental report. Vistra OpCo requests that USFWS send a response by letter to Randy Harding (see contact information below) by April 21, 2021. Vistra OpCo plans to contact USFWS in a few weeks to request the scheduling of a virtual meeting to go over this request and answer any questions the USFWS staff may have. We plan to include this letter and any response USFWS provides in the environmental report to be submitted to the NRC as part of the license renewal application.

Vistra OpCo requests that USFWS send a letter response to Randy Harding (see contact information below). Should you or your staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:
Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Table 2. Protected Species Potentially Occurring in the CPNPP Vicinity

Common Name	Scientific Name	Legal Status
Birds		
Golden-Cheeked Warbler	*Setophaga chrysoparia*	FE, SE
Least Tern	*Sterna antillarum*	SE
Piping Plover	*Charadrius melodus*	FT, ST
Red Knot	*Calidris canutus rufa*	FT
Whooping Crane	*Grus americana*	FE, SE
White-Faced Ibis	*Plegadis chihi*	ST
Black Rail	*Laterallus jamaicensis*	PT, ST
Reptiles		
Texas Horned Lizard	*Phrynosoma cornutum*	ST
Brazos Water Snake	*Nerodia harteri*	ST
Invertebrates		
Texas Fawnsfoot	*Truncilla macrodon*	FC, ST
Brazos Heelsplitter	*Potamilus streckersoni*	ST
FE= federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species; PT = federally proposed for threatened listing Sources: USFWS 2020; Texas Parks and Wildlife 2020		

Note: The area within a 6-mile radius surrounding CPNPP is considered the plant's vicinity. Somervell County, Texas and Hood County, Texas fall within the 6-mile vicinity and the protected species listings for these counties were used for preparing this table.

Figure 1. Comanche Peak Nuclear Power Plant Site

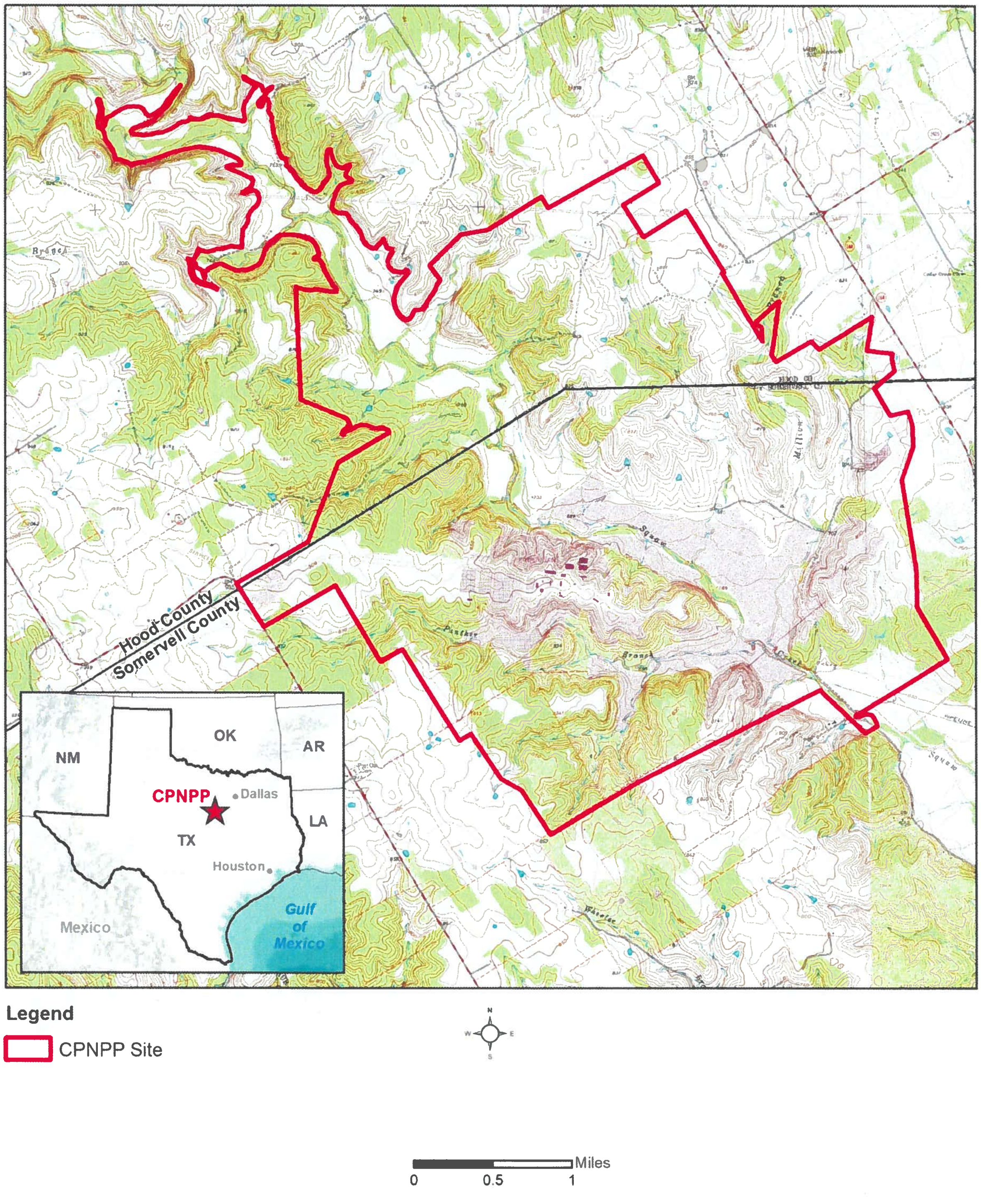
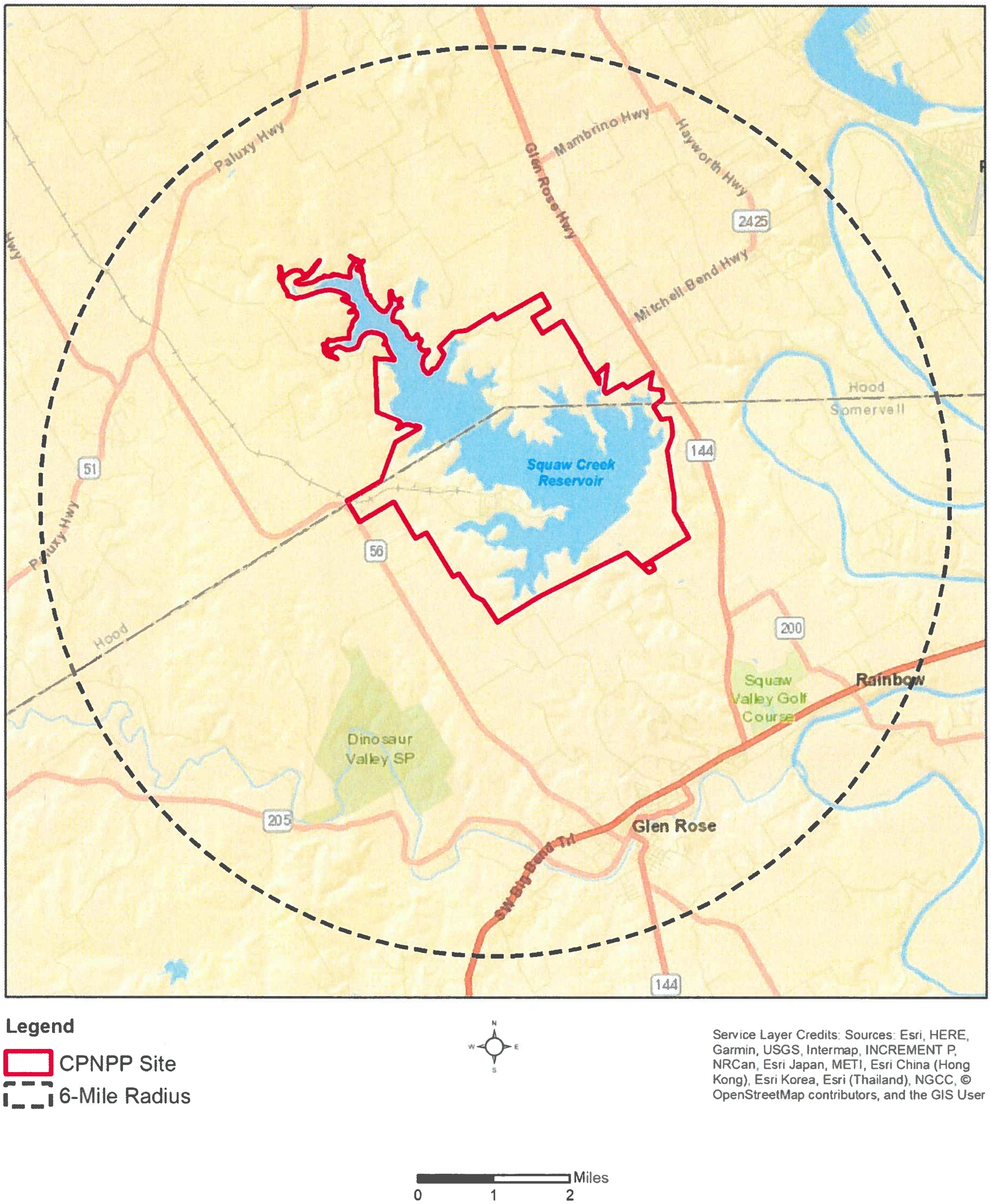


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



TEXAS PARKS & WILDLIFE

Life's better outside.®

MISC 21-047
CP-202100199

April 8, 2021

Mr. Steven K. Sewell
Comanche Peak Nuclear Power Plant
P.O. Box 1002
Glen Rose, TX 76043

RE: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Sewell:

Texas Parks and Wildlife Department (TPWD) has received the request for review of the proposed project referenced above. TPWD staff has reviewed the information provided and offers the following comments and recommendations concerning this project. For tracking purposes, please refer to TPWD project number 46273 in any return correspondence regarding this project.

Project Description

Vistra Operations Company LLC (Vistra OpCo) is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years. As part of the renewal process, Vistra OpCo is seeking input regarding the effects that license renewal activities may have on listed species and important plant and animal habitats within the plant's surroundings.

Species of Concern/Special Features

In addition to state and federally protected species, TPWD tracks species considered to be Species of Greatest Conservation Need (SGCN) that, due to limited distributions and/or declining populations, face threat of extirpation or extinction but currently lack the legal protections given to threatened or endangered species. Special landscape features, natural plant communities, and SGCN are rare resources for which TPWD actively promotes conservation, and TPWD considers it important to minimize impacts to such resources to reduce the likelihood of endangerment and preclude the need to list SGCN as threatened or endangered in the future. These species and communities are tracked in the Texas Natural Diversity Database (TXNDD). The most current and accurate TXNDD data can be requested from the TXNDD website.

The federal and state-listed endangered species golden-cheeked warbler (*Setophaga chrysoparia*) has been documented in the TXNDD at Dinosaur Valley

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800

www.tpwd.texas.gov

State Park southwest of CPNPP. As seen on the attached map, suitable habitat for this species may occur on site.

In April 2018 the U.S. Fish and Wildlife Service (USFWS) published a final rule removing the black-capped vireo *(Vireo atricapilla)* from the Federal List of Endangered and Threatened Wildlife due to recovery and as of March 30, 2020 this species is no longer state-listed endangered by TPWD. The black-capped vireo has been documented in the TXNDD at Dinosaur Valley State Park and suitable habitat for this species may occur at CPNPP.

Please note that the absence of TXNDD information in an area does not imply that a species is absent from that area. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare and protected species, data from the TXNDD does not provide a definitive statement as to the presence, absence or condition of species of concern, natural communities, or other significant features within your project area. These data are not inclusive and cannot be used as presence/absence data. This information cannot be substituted for on-the-ground surveys.

Recommendation: Please review the TPWD county lists for Hood and Somervell Counties, as rare and protected species could be present, depending upon habitat availability. The county lists are available on the Rare, Threatened, and Endangered Species of Texas website. For current USFWS threatened and endangered species lists, please see the USFWS Information for Planning and Consultation website. If the project area is found to contain rare or protected species, natural plant communities, or special features, TPWD recommends that precautions be taken to avoid impacts to them.

Determining the actual presence of a species in an area depends on many variables including daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency, and population density (both wildlife and human). The absence of a species can only be established with repeated negative observations and consideration of all factors contributing to the lack of detectable presence.

TPWD strives to respond to requests for project review within a 45-day comment period. Responses may be delayed due to workload and lack of staff. Failure to

meet the 45-day review timeframe does not constitute a concurrence from TPWD that the proposed project will not adversely impact fish and wildlife resources.

TPWD advises review and implementation of these recommendations. If you have any questions, please contact me at Richard.Hanson@tpwd.texas.gov or (806) 761-4936.

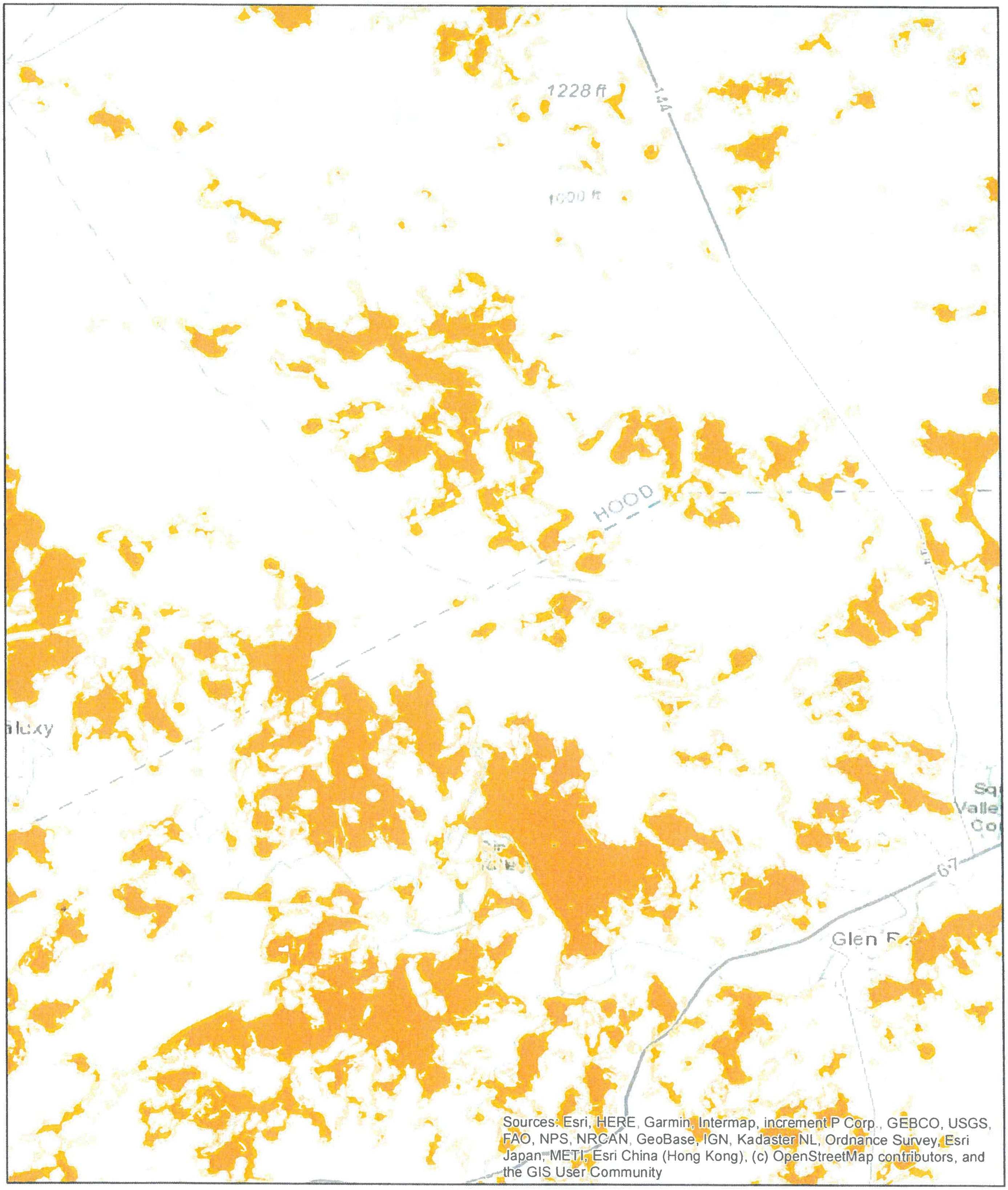
Sincerely,

Rick Hanson

Rick Hanson
Wildlife Habitat Assessment Program
Wildlife Division

RH: 46273
Attachment

Golden-cheeked Warbler Predictive Habitat Model



Date: 04/07/21

Map compiled by the Texas Parks and Wildlife Department, Wildlife Habitat Assessment Program. No claims are made to the accuracy of the data or to the suitability of the data to a particular use.

TEXAS PARKS & WILDLIFE

Life's better outside.®

Legend

- 1 Low Quality
- 2
- 3
- 4 High Quality

Harding, Randy

From: Edwards, Sean <sean_edwards@fws.gov>
Sent: Tuesday, March 23, 2021 10:56 AM
To: Harding, Randy
Subject: Comanche Peak Nuclear Power Plant Units 1 & 2 License Renewal

EXTERNAL EMAIL

Randy,

Thank you for Luminant's March 9, 2021 letter requesting information on federally listed species in the preparation of an Environmental Report as part of the renewal process for Units 1 and 2. Luminant's letter correctly identifies that the following federally listed species have the potential to occur in Hood and Somervell Counties, Texas:

- golden-cheeked warbler, federally endangered
- whooping crane, federally endangered

We recommend that Luminant evaluate the proposed actions potential to result in adverse impacts to those species and include a determination within the Environmental Report. If Luminant concludes that adverse impacts could occur, we recommend contacting our office for consultation. If Luminant determines that there would be no potential adverse impacts, we recommend that the rationale for this determination be kept in the files for the renewal process. Approximately 9 years ago, I met with staff at Comanche Peak and toured the facility within the vicinity of operations for the power plant and did not see what I would determine to be suitable habitat for the golden-cheeked warbler. The tree canopy was too open, and the average age of the juniper trees was not mature enough to support golden-cheeked warblers. We recommend that Luminant evaluate the habitat present that may be impacted for current golden-cheeked warbler suitability.

Also note that the interior least tern was federally delisted on January 12, 2021 and need not be considered for consultation. The piping plover and red knot are federally listed but are only considered for consultation with wind energy projects in Hood and Somervell Counties. The candidate mussel species you have noted in your letter would not be expected to occur in an impounded waterbody like the Squaw Creek Reservoir. The black-capped vireo was delisted in 2018, and we are conducting post-delisting monitoring of this species to evaluate its status. Pleases contact our office if this species is discovered while conducting your Environmental Report. Let me know how I may be of further assistance and I look forward to further coordination as needed.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

Harding, Randy

From: Edwards, Sean <sean_edwards@fws.gov>
Sent: Friday, September 10, 2021 9:50 AM
To: Harding, Randy
Cc: Spicer, Gary
Subject: Re: Comanche Peak Nuclear Power Plant Units 1 & 2 License Renewal

EXTERNAL EMAIL

Randy,

Good morning and I hope you've been well. I would like to offer a clarification to my prior email March 23, 2021 email. After a telephone conversation this morning with Gary Spicer of Luminant, and another review of your March 9, 2020 letter, I understand that the proposed action is a License Renewal and would not involve any impacts to the physical or biological environment at the Comanche Peak Nuclear Power facility in Hood and Somervell Counties, Texas. This being the case, the U.S. Fish & Wildlife Service has no comments, concerns, or recommendations regarding the proposed Relicensing actions. My prior recommendations to evaluate the proposed actions potential to result in adverse impacts to federally listed species are unnecessary, as the conclusion would be No Effect. We do recommend that a statement supporting the rationale for this No Effect conclusion be included within the Environmental Report being prepared for the Relicense. Thank you again for the invitation to participate and please contact me with any additional needs.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

From: Edwards, Sean
Sent: Tuesday, March 23, 2021 10:55 AM
To: randy.harding@luminant.com <randy.harding@luminant.com>
Subject: Comanche Peak Nuclear Power Plant Units 1 & 2 License Renewal

Randy,

Thank you for Luminant's March 9, 2021 letter requesting information on federally listed species in the preparation of an Environmental Report as part of the renewal process for Units 1 and 2. Luminant's letter correctly identifies that the following federally listed species have the potential to occur in Hood and Somervell Counties, Texas:

- golden-cheeked warbler, federally endangered
- whooping crane, federally endangered

We recommend that Luminant evaluate the proposed actions potential to result in adverse impacts to those species and include a determination within the Environmental Report. If Luminant concludes that adverse impacts could occur, we recommend contacting our office for consultation. If Luminant determines that there would be no potential adverse impacts, we recommend that the rationale for this determination be kept in the files for the renewal process. Approximately 9 years ago, I met with staff at Comanche Peak and toured the facility within the vicinity of operations for the power plant and did not see what I would determine to be suitable habitat for the golden-cheeked warbler. The tree canopy was too open, and the average age of the juniper trees was not mature enough to support golden-cheeked warblers. We recommend that Luminant evaluate the habitat present that may be impacted for current golden-cheeked warbler suitability.

Also note that the interior least tern was federally delisted on January 12, 2021 and need not be considered for consultation. The piping plover and red knot are federally listed but are only considered for consultation with wind energy projects in Hood and Somervell Counties. The candidate mussel species you have noted in your letter would not be expected to occur in an impounded waterbody like the Squaw Creek Reservoir. The black-capped vireo was delisted in 2018, and we are conducting post-delisting monitoring of this species to evaluate its status. Pleases contact our office if this species is discovered while conducting your Environmental Report. Let me know how I may be of further assistance and I look forward to further coordination as needed.

Kind Regards,

Sean Edwards
Fish & Wildlife Biologist
U.S. Fish & Wildlife Service
2005 NE Green Oaks Blvd. Ste. 140
Arlington, Texas 76006

Attachment D: Cultural Resources Consultation

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100008
TXX-21003
February 8, 2021

Mark Wolfe, Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Wolfe,

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2 for an additional 20 years (see Table 1). As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The environmental report addresses the potential to impact historic and cultural resources, including tribal cultural resources, on or near the CPNPP site. This letter seeks input from the Texas Historical Commission (THC) regarding such effects in the vicinity of the CPNPP site.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

As part of the renewal process, the NRC may request a consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with your agency regarding the license renewal. The timeframe for the NRC consultation request is anticipated to be within a few months of Vistra OpCo's application submittal, currently scheduled for late 2022.

To facilitate Vistra OpCo's preparation of the license renewal environmental report and to ensure an efficient and effective consultation by the NRC, Vistra OpCo is contacting you early in the application process seeking input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's surroundings and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant (Figures 1 and 2) and a table of known archaeological sites and historic properties in

the plant's vicinity (Table 2) are enclosed. A brief discussion of the plant and its operations during the extended period of operation is provided below.

The power plant property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The CPNPP site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood and Somervell counties, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those that connect CPNPP to the switchyard.

A cultural resources survey of the majority of the 7,700-acre property was conducted in 1972 prior to the construction of CPNPP and the Squaw Creek Reservoir. No National Register of Historic Places (NRHP) eligible cultural resources have been confirmed within the 7,700-acre CPNPP property. A review of the Texas Archeological Sites Atlas (The Atlas) revealed that there are 141 cultural resources within 6 miles of CPNPP. Known archaeological sites and historic properties within a 6-mile radius of CPNPP are presented in Table 2 (Enclosure). Of the 141 cultural resources, four are NRHP-listed. No structures within the CPNPP property have been documented through the Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER) programs. This license renewal will extend the CPNPP Units 1 and 2 operating licenses from 40 to 60 years. During this period, some of the CPNPP associated structures will be greater than 50 years of age; however, there are no anticipated changes to use or construction plans that may alter their current status.

During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities, other than those to maintain existing structures and operations, anticipated at the CPNPP site during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Vistra OpCo does not anticipate the continued operation of the CPNPP to adversely affect the environment or any of the cultural or historic resources noted above.

As stated earlier, this letter seeks THC input on Vistra OpCo's proposed continued operation of CPNPP on historic and cultural resources within the environs of the plant. Vistra OpCo has requested similar input from native American Indian Tribes via separate correspondence. Please notify Vistra OpCo of concerns and any information THC believes Vistra OpCo should consider in the preparation of the environmental report. THC input is requested by March 25, 2021. Vistra OpCo plans to contact THC in a few weeks to request the scheduling of a virtual meeting to go over this request and answer any questions that THC may have. Vistra OpCo plans to include this letter and any THC response provided in the final environmental report.

Vistra OpCo requests that THC send a letter response to Randy Harding (see contact information below). Please contact Steven Sewell at 254-879-6113 (Steven.Sewell@luminant.com) or Todd Evans at 2540897-8987 (Todd.Evans@luminant.com) if you have any questions or comments.

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures:

Table 2. Archaeological Sites and Historic Properties within a 6-mile Radius of Comanche Peak Nuclear Power Plant
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
1	HD-C005 Nubbin Ridge/Cedar Grove Cemetery	Nemo	Cemetery	Protected by State Burial Law
2	HD-C037 Mitchel Bend Cemetery	Nemo	Cemetery	Protected by State Burial Law
3	41HD57	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
4	41HD64	Hill City	Paleo-Archaic lithic scatter	Not evaluated
5	41HD65	Hill City	Early 20th century farmstead complex	Not evaluated
6	41HD66	Hill City	Small, thin unassigned lithic scatter	Not evaluated
7	41HD76	Hill City	Multi-component Early Archaic lithic scatter and 20th century debris scatter	Determined ineligible in ROW
8	41HD85	Nemo	Unassigned prehistoric lithic scatter	Recommended not eligible
9	41HD87	Hill City	Unassigned prehistoric lithic scatter	Recommended not eligible
10	41HD88	Hill City	Unassigned prehistoric lithic scatter	Undetermined
11	41HD89	Hill City	Early 20th century debris scatter/standing water tower, corral	Recommended not eligible
12	41HD97	Nemo	Stone field fence	Recommended not eligible in ROW
13	79003008 Somervell County Courthouse	Glen Rose West	Historic County Courthouse	NRHP Listed
14	82004523 Barnard's Mill	Glen Rose West	Historic mill and Hospital Complex	NRHP Listed

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
15	12000352 Oakdale Park District	Glen Rose East	Historic District with 29 contributing elements 14 noncontributing elements	NRHP Listed
16	14000820 Glen Rose Downtown Historic District	Glen Rose West	Historic District with 35 contributing elements 12 noncontributing elements	NRHP Listed
17	SV-C001 Post Oak Cemetery	Hill City	Cemetery	Protected by State Burial Law
18	SV-C002 Milam Chapel Cemetery	Hill City	Cemetery	Protected by State Burial Law
19	SV-C003/41SV64 Unknown Grave(s)	Glen Rose West	Cemetery	Protected by State Burial Law
20	SV-C004 Hopewell Cemetery	Hill City/Nemo	Cemetery	Protected by State Burial Law
21	SV-C005/41SV2 Cox Bend/Connally Cemetery	Nemo	Cemetery	Protected by State Burial Law
22	SV-C007 Squaw Creek Cemetery	Nemo	Cemetery	Protected by State Burial Law
23	SV-C008 Herndon Valley (Oldham) Cemetery	Nemo	Cemetery	Protected by State Burial Law
24	SV-C010 Kimmel Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
25	SV-C011 Lanham Mill Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
26	SV-C012 Glen Rose Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
27	SV-C024 McCamant Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
28	SV-C026 Unknown Cemetery	Hill City	Cemetery	Protected by State Burial Law

	Site ID#	Quadrangle	Site Type	NRHP Status
29	SV-C029 Booker Cemetery	Glen Rose West	Cemetery	Protected by State Burial Law
30	41SV1	Nemo	Reported late Paleo to early ceramic camp	Site reported destroyed by plowing and borrow pit
31	41SV3	Nemo	Unassigned prehistoric camp	No further work recommended
32	41SV4	Nemo	Archaic camp	1991 No further work 2004 Ineligible in ROW
33	41SV5	Nemo	Unassigned prehistoric camp with burned rock	No further work recommended
34	41SV6	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
35	41SV7	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
36	41SV8	Glen Rose East	Unassigned prehistoric camp/lithic scatter	Not evaluated
37	41SV9	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
38	41SV10	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
39	41SV11	Glen Rose East	Unassigned prehistoric camp with midden	Not evaluated
40	41SV12	Glen Rose East	Small unassigned prehistoric midden	No further work recommended
41	41SV13	Glen Rose East	Two areas of unassigned prehistoric middens	No further work recommended
42	41SV14	Glen Rose East	Reported site, observed as a thin lithic scatter	No further work recommended
43	41SV15	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
44	41SV16	Nemo	Small unassigned prehistoric lithic scatter	Not evaluated
45	41SV18	Glen Rose East	Archaic camp	Not evaluated

	Site ID#	Quadrangle	Site Type	NRHP Status
46	41SV19	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
47	41SV20	Glen Rose East	Archaic to Late Prehistoric camp	Not evaluated
48	41SV21	Glen Rose East	Small unassigned lithic scatter with mussel shell	Not evaluated
49	41SV22	Glen Rose East	Small unassigned lithic scatter with little mussel shell	Not evaluated
50	41SV25	Glen Rose East	Unassigned prehistoric lithic scatter	Not evaluated
51	41SV26	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
52	41SV27	Glen Rose East	Thin unassigned prehistoric lithic scatter	Not evaluated
53	41SV28	Hill City	Thin unassigned prehistoric lithic scatter	Not evaluated
54	41SV29	Hill City	Early to mid-20th century debris and windmill	Not evaluated
55	41SV30	Hill City	Multi-component site, with a prehistoric scatter/late 19th to early 20th century Hopewell Community School	Not evaluated
56	41SV31	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
57	41SV32	Hill City	Small unassigned prehistoric lithic scatter	Not evaluated
58	41SV33	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
59	41SV34	Hill City	Unassigned prehistoric lithic scatter	Not evaluated

	Site ID#	Quadrangle	Site Type	NRHP Status
60	41SV35	Hill City	Early 20th century cattle camp or farmstead	Not evaluated
61	41SV36	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
62	41SV37	Hill City	Unassigned prehistoric knapping station	Not evaluated
63	41SV38	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
64	41SV39	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
65	41SV40	Hill City	Late prehistoric lithic scatter/camp	Not evaluated
66	41SV41	Hill City	Unassigned prehistoric lithic scatter	Not evaluated
67	41SV42	Hill City	Early to mid-20th century farmstead	Not evaluated
68	41SV43	Hill City	Early to mid-20th century farmstead	Not evaluated
69	41SV44	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
70	41SV45	Hill City	Unassigned prehistoric lithic scatter	Testing was recommended
71	41SV46	Hill City	Late 19th to early 20th century farmstead	Not evaluated
72	41SV47	Nemo	Late Prehistoric Period camp site	Avoid or testing recommended
73	41SV48	Hill City	Unassigned lithic scatter	Testing recommended
74	41SV49	Nemo	Archaic lithic scatter/camp	No further work recommended
75	41SV50	Nemo	Archaic to Late Prehistoric lithic scatter/camp	No further work recommended

	Site ID#	Quadrangle	Site Type	NRHP Status
76	41SV51	Nemo	Petroglyph, a lithic scatter with diagnostic points reported from the Paleo to Late Prehistoric Periods	Protection of petroglyph recommended/Determined ineligible in ROW
77	41SV52	Hill City	Unassigned lithic scatter	Destroyed by construction
78	41SV53	Hill City	Early 20th century concrete wall features	Not evaluated
79	41SV54	Hill City	Small unassigned prehistoric lithic scatter with burned rock	Not evaluated
80	41SV55	Nemo	Archaic camp with manos and metates	Not Evaluated
81	41SV56	Hill City	Late Prehistoric camp with hearths	Determined eligible
82	41SV57	Hill City/Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
83	41SV58	Glen Rose West	Unassigned prehistoric camp with midden	Determined eligible
84	41SV59	Hill City	Unassigned prehistoric camp	Determined eligible
85	41SV61	Hill City	A possible hearth eroding from riverbank, no cultural material observed	Not evaluated as cultural material was not observed, monitoring for cultural material recommended
86	41SV62	Hill City	Unassigned lithic scatter with shell midden	Monitoring recommended
87	41SV63	Glen Rose West	1930s to 1950s trash midden and concrete slab	Undetermined
88	41SV65	Glen Rose West	Late 19th to mid-20th century farmstead	Not evaluated
89	41SV103	Glen Rose East	Unassigned prehistoric camp with PPK fragments, manos, metates and flakes exposed by plowing	Not evaluated

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
90	41SV109	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
91	41SV110	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
92	41SV111	Glen Rose West	Unassigned prehistoric lithic scatter with burned rock	Not evaluated
93	41SV112	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Not evaluated
94	41SV113	Glen Rose West	Archaic prehistoric camp with PPK fragments, manos, metates and flakes	Further survey recommended
95	41SV114	Glen Rose West	Unassigned prehistoric lithic scatter with mano and metate fragments	Site reported destroyed
96	41SV115	Hill City	Archaic to Late Prehistoric Period lithic scatter	Site reported destroyed
97	41SV117	Glen Rose West	1903 to 1943 Lanham Mill School site	Undetermined
98	41SV118	Not stated	Unassigned prehistoric site No site form	Determined ineligible
99	41SV119	Hill City	Unassigned prehistoric site No site form	Undetermined
100	41SV120	Glen Rose West	Unassigned prehistoric site No site form	Undetermined
101	41SV121	Glen Rose East	Late Prehistoric Period open camp with pottery, arrow points, and faunal fragments	Site reported destroyed

	Site ID#	Quadrangle	Site Type	NRHP Status
102	41SV122	Glen Rose East	Archaic to Late Prehistoric open camp based on PPK	Site reported destroyed
103	41SV123	Glen Rose West	Unassigned prehistoric site exposed by bulldozing	Site reported destroyed
104	41SV127	Nemo	Archaic to Late Prehistoric open camp	Not evaluated
105	41HD128	Hill City	Small Archaic activity site	No further work recommended
106	41SV129	Hill City	Unassigned lithic scatter	No further work recommended
107	41SV130	Hill City	Unassigned lithic scatter with two hearths	Testing recommended
108	41SV131	Hill City	Early 20th century Moonshine still	No further work recommended
109	41SV132	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter	No further work recommended
110	41SV133	Hill City	Thin unassigned prehistoric lithic scatter	No further work recommended
111	41SV134	Hill City	Thin unassigned prehistoric lithic scatter and rock shelter on bedrock no deposits	Not eligible
112	41SV135	Hill City	Thin unassigned prehistoric lithic scatter on exposed bedrock no soils	Not eligible
113	41SV136	Hill City	Thin unassigned camp with minor burned rock cultural deposit present	Testing for eligibility was recommended
114	41SV137	Hill City	Early to mid-20th century farmstead	No further work recommended
115	41SV138	Glen Rose West	Thin unassigned prehistoric lithic scatter	No further work recommended

Table 2 Archaeological Sites and Historic Properties within a 6-mile Radius of CPNPP

	Site ID#	Quadrangle	Site Type	NRHP Status
116	41SV139	Glen Rose West	Mid-20th century trash dump	No further work recommended
117	41SV140	Glen Rose West	Thin unassigned prehistoric lithic scatter, no deposits	No further work recommended
118	41SV141	Glen Rose West	Small thin unassigned prehistoric lithic scatter with burned rock, no deposits	No further work recommended
119	41SV142	Glen Rose West	Small unassigned prehistoric camp with burned rock, debitage, an unidentified dart point and mussel shell	Preservation recommended
120	41SV143	Glen Rose West	Small unassigned prehistoric camp with a hearth and charcoal	Unclear recommendation
121	41SV144	Glen Rose West	Small Archaic camp site, with debitage, burned rock and Granbury point	No further work recommended
122	41SV145	Glen Rose West	Small unassigned prehistoric lithic scatter with no diagnostics or cultural deposits	No further work recommended
123	41SV146	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	No further work recommended
124	41SV147	Glen Rose West	Early to mid-20th century farmstead with no remaining structures	A possible cistern was recommended for further study as destruction of the site was imminent
125	41SV148	Glen Rose West	Mid-20th century artesian wells utilized by the Lanham Mill Community	No further work recommended

	Site ID#	Quadrangle	Site Type	NRHP Status
126	41SV149	Glen Rose West	A single hearth exposed in the riverbank three meters below the surface	Further investigations of the hearth and surrounding soils was recommended
127	41SV150	Nemo	A probable Archaic camp site.	Unknown as the site form missing/report redacted
128	41SV151	Nemo	A single buried hearth exposed in backhoe trenching; no additional cultural material was observed	Determined Eligible
129	41SV153	Nemo	An extensive lens of burned rock observed in several backhoe trenches	Ineligible in ROW/undetermined
130	41SV154	Hill City	An early to mid-20th century house, well and cellar depression in poor condition	Not fully evaluated
131	41SV155	Hill City	An early to mid-20th century stone barn	Evaluation by Architectural Historian recommended
132	41SV156	Glen Rose East	A WPA constructed dam on the Paluxy River that was blown up with dynamite in the mid-20th century	Evaluation by Architectural Historian recommended
133	41SV157	Glen Rose West	Burned rock and a few flakes recovered from three backhoe test trenches, no features observed	Determined ineligible
134	41SV160	Hill City	A possible Middle Archaic lithic scatter with a mano/hammerstone fragment	No further work was recommended
135	41SV161	Hill City	An early 20th century farmstead consisting of foundations, a cistern, storm cellar two wells, corrals, and associated debris	No further work was recommended
136	41SV162	Nemo	An unassigned prehistoric lithic scatter	No further work recommended

	Site ID#	Quadrangle	Site Type	NRHP Status
137	41SV169	Hill City	An early to mid-20th century dry laid stone skirt on an earthen dam	No further work recommended
138	41SV170	Hill City	A late 19th century ford on Panther Creek	No further work recommended
139	41SV172	Glen Rose East	Buried burned rock, mussel shell and lithic debitage observe in backhoe trenches	Undetermined
140	41SV174	Nemo	Site type not listed on Atlas	Determined ineligible
141	41SV175	Nemo	Site type not listed on Atlas	Undetermined

Figure 1. Comanche Peak Nuclear Power Plant Site

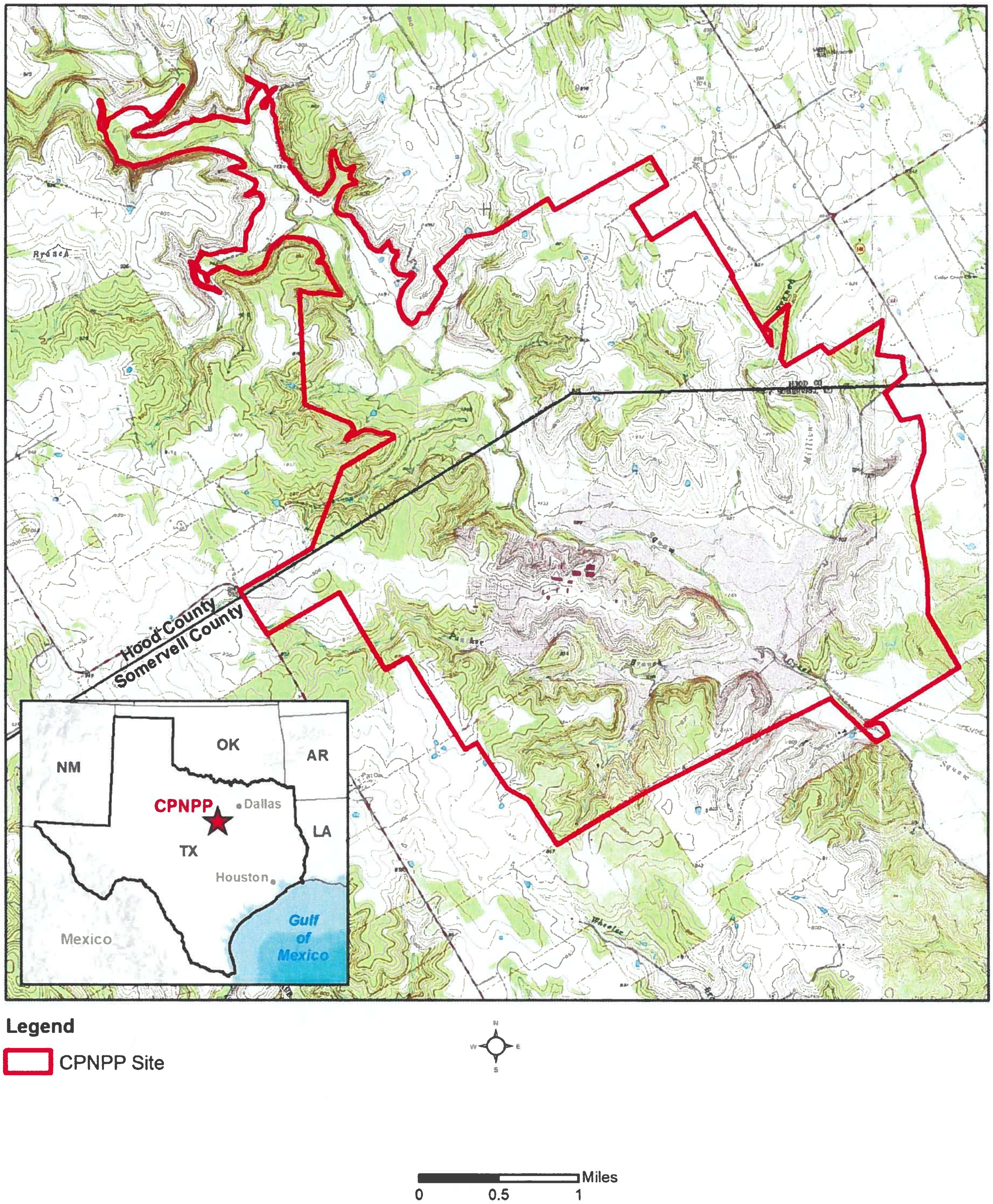
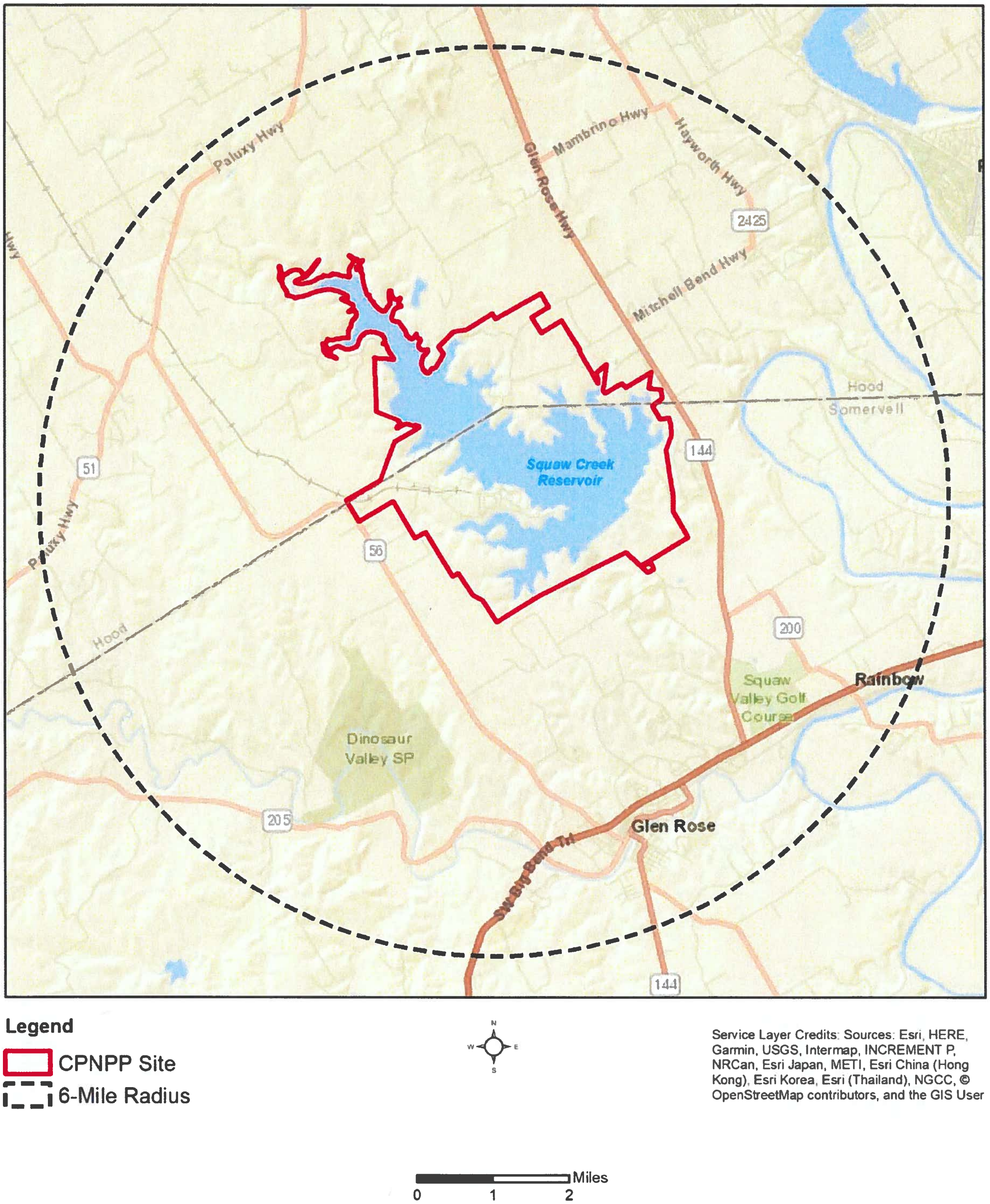


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



CP-202100162
MISC 21-032

Harding, Randy

From:	noreply@thc.state.tx.us
Sent:	Monday, March 22, 2021 8:41 AM
To:	Harding, Randy; reviews@thc.state.tx.us
Subject:	Section 106 Submission

EXTERNAL EMAIL

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas
THC Tracking #202106168
Date: 03/22/2021
Comanche Peak Nuclear Power Plants

,TX

Description: Renew operating licenses for Units 1 and 2.

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Rebecca Shelton, Caitlin Brashear, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-463-5853 to consult on further actions that may be necessary to protect historic properties.

Archeology Comments

- No identified historic properties, archeological sites, or other cultural resources are present or affected. However, if cultural materials are encountered during project activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the

irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: rebecca.shelton@thc.texas.gov, caitlin.brashear@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

Rebecca Shelton

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

CP-202100329
MISC 21-065

TEXAS HISTORICAL COMMISSION
real places telling real stories

May 27, 2021

Randy Harding
Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, TX 76043

Re: *Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal, Hood County (NRC/106, THC # 202109853)*

Dear Mr. Harding:

Thank you for your correspondence describing the above referenced projects. This letter serves as comment on the proposed undertakings from Mark Wolfe, Executive Director of the Texas Historical Commission and the State Historic Preservation Officer.

The review staff led by Caitlin Brashear has completed its review of the above-referenced project. It is our understanding that Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating licenses for the Comanche Peak Nuclear Power Plant (CNPP) Units 1 and 2 for an additional 20 years, and that the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application addresses the potential to impact historic and cultural resources. Per our correspondence of March 22, 2021, we have determined that there will be no historic resources present or affected by the proposed license renewal (see attachment). We understand that during this 20-year period, there will be above-ground resources that reach historic age (50 years or older), however as there are no anticipated changes to use or construction plans that may alter these resources, our determination of **no historic properties affected** will continue to apply. Additional consultation with our office may be required, however, for any future federal undertakings at the CNPP that include construction, demolition, or decommissioning of historic-age resources.

For future submittals, please consider using the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this federal review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review, or if we can be of further assistance, please contact Caitlin Brashear at 512-463-5851 or caitlin.brashear@thc.texas.gov.

Sincerely,

Caitlin Brashear

Caitlin Brashear, Historian, Federal Programs
For: Mark Wolfe, State Historic Preservation Officer

Attachment

Attachment: Copy of Response Letter Dated March 22, 2021

TEXAS HISTORICAL COMMISSION
real places telling real stories

Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas
THC Tracking #202106168
Date: 03/22/2021
Comanche Peak Nuclear Power Plants

,TX

Description: Renew operating licenses for Units 1 and 2.

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Rebecca Shelton, Caitlin Brashear, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- No historic properties are present or affected by the project as proposed. However, if historic properties are discovered or unanticipated effects on historic properties are found, work should cease in the immediate area; work can continue where no historic properties are present. Please contact the THC's History Programs Division at 512-463-5853 to consult on further actions that may be necessary to protect historic properties.

Archeology Comments

- No identified historic properties, archeological sites, or other cultural resources are present or affected. However, if cultural materials are encountered during project activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THCs Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: rebecca.shelton@thc.texas.gov, caitlin.brashear@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

Rebecca Shelton

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

As noted in ER Section 9.5.11, Vistra OpCo sent consultation letters to Native American groups recognized as potential stakeholders with the opportunity for comment. A list of these recipients is provided below. An example consultation letter sent by Vistra OpCo is provided in this attachment, as are all responses received.

Table D-1 List of Native American Group Recipients

Native American Tribe	First Name	Last Name	Title
Comanche Nation. Oklahoma	Martina	Minthorn	Tribal Historic Preservation Officer
Coushatta Tribe of Louisiana	Linda	Langley	Tribal Historic Preservation Officer
Apache Tribe of Oklahoma	Bobby	Komardley	Chairman
Tonkawa Tribe of Indians of Oklahoma	Lauren	Norman-Brown	Tribal Historic Preservation Officer
Delaware Nation, Oklahoma	Nekole	Alligood	Director of Cultural Resources
Wichita and Affiliated Tribes (Wichita, Keechi, Waco & Tawakonie), Oklahoma	Gary	McAdams	Tribal Historic Preservation Officer
Alabama Coushatta Tribe of Texas	Bryant	Celestine	Tribal Historic Preservation Officer
Alabama Quassarte Tribal Town	Samantha	Robison	Tribal Historic Preservation Officer
Caddo Nation	Derek	Hill	Section 106 Specialist
Cherokee Nation of Oklahoma	Elizabeth	Toombs	Tribal Historic Preservation Officer
Kialegee Tribal Town	David	Cook	Tribal Administrator
Kickapoo Traditional Tribe of Texas	Jennie	Hernandez	Tribal Administrator
Kickapoo Tribe of Oklahoma	David	Pacheco, Jr.	Chairperson
Kiowa Tribe of Oklahoma	Kellie	Lewis	Tribal Historic Preservation Officer
Mascalero Apache Tribe	Holly	Houghten	Tribal Historic Preservation Officer
Quapaw Tribe of Oklahoma	Everett	Bandy	Tribal Historic Preservation Officer
Seminole Nation of Oklahoma	Theodore	Isham	Tribal Historic Preservation Officer
Thlopthlocco Tribal Town	Terry	Clothier	Tribal Historic Preservation Officer
Tunica-Biloxi Tribe	Earl	Barbry, Jr.	Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians	Sheila	Bird	Tribal Historic Preservation Officer

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak Nuclear Power Plant (Vistra Operations Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100019
TXX-21014
January 19, 2021

Martina Minthorn
Comanche Nation, Oklahoma
6 SW D Avenue
Lawton, OK 73502

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2
License Renewal

Dear Ms. Minthorn:

Vistra Operation Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is preparing an application for renewing the operating licenses for the two power generation units at our Comanche Peak Nuclear Power Plant for an additional 20 years (see Table 1).

Comanche Peak has been providing zero-carbon power to Texas since 1990. Our company and our employees are committed to safe and reliable operations and exemplary environmental stewardship.

As part of the license renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the impacts from continued operations and any refurbishment to be undertaken to enable the continued operation of the units. This letter seeks your assistance and input regarding tribal cultural resources within the plant's surrounding area. Vistra OpCo is not aware of any tribal cultural resources within the plant's surrounding area.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

The power plant property is located approximately 4.5 miles north-northwest of Glen Rose, Texas, the nearest community, and about 65 miles southwest of the Dallas-Fort Worth metropolitan area. The Comanche Peak site is situated on approximately 7,700 acres surrounding and inclusive of the Squaw Creek Reservoir in Hood County and Somervell County, Texas. In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the site boundary. Figures 1 and 2 depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

While environmental impacts of the existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a

consultation with the Texas Historical Commission and your tribe regarding license renewal. During the license renewal term, Vistra OpCo proposes to continue operating the units as currently operated. Other than our normal activities to maintain existing structures and operations, we do not anticipate any ground-disturbing activities during the license renewal period. Additionally, Vistra OpCo does not anticipate any refurbishment activities in conjunction with license renewal, nor is the continued operation of Comanche Peak anticipated to adversely affect the environment or any cultural or historic resources. Again, Vistra OpCo is not aware of any tribal cultural resources within the plant's surrounding area.

Vistra OpCo is contacting you early in the application process with the intent of making you aware of the project, providing any data you need to ensure an efficient and effective consultation process, and to request the following:

- Input regarding tribal cultural resources within the plant's surrounding area, and
- Input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's surrounding area, and
- Any questions or additional information you find necessary for this consultation process.

We appreciate your assistance and ask that you provide us with your comments and any information you believe Vistra OpCo should consider in the preparation of the environmental report. We request that you send your response by letter to Randy Harding (see contact information below) by Feb. 26, 2021. Vistra OpCo plans to include this letter and any response letter you provide in the environmental report.

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Should you, tribal members, or your staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Sincerely,

Steven K. Sewell

Enclosures: Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

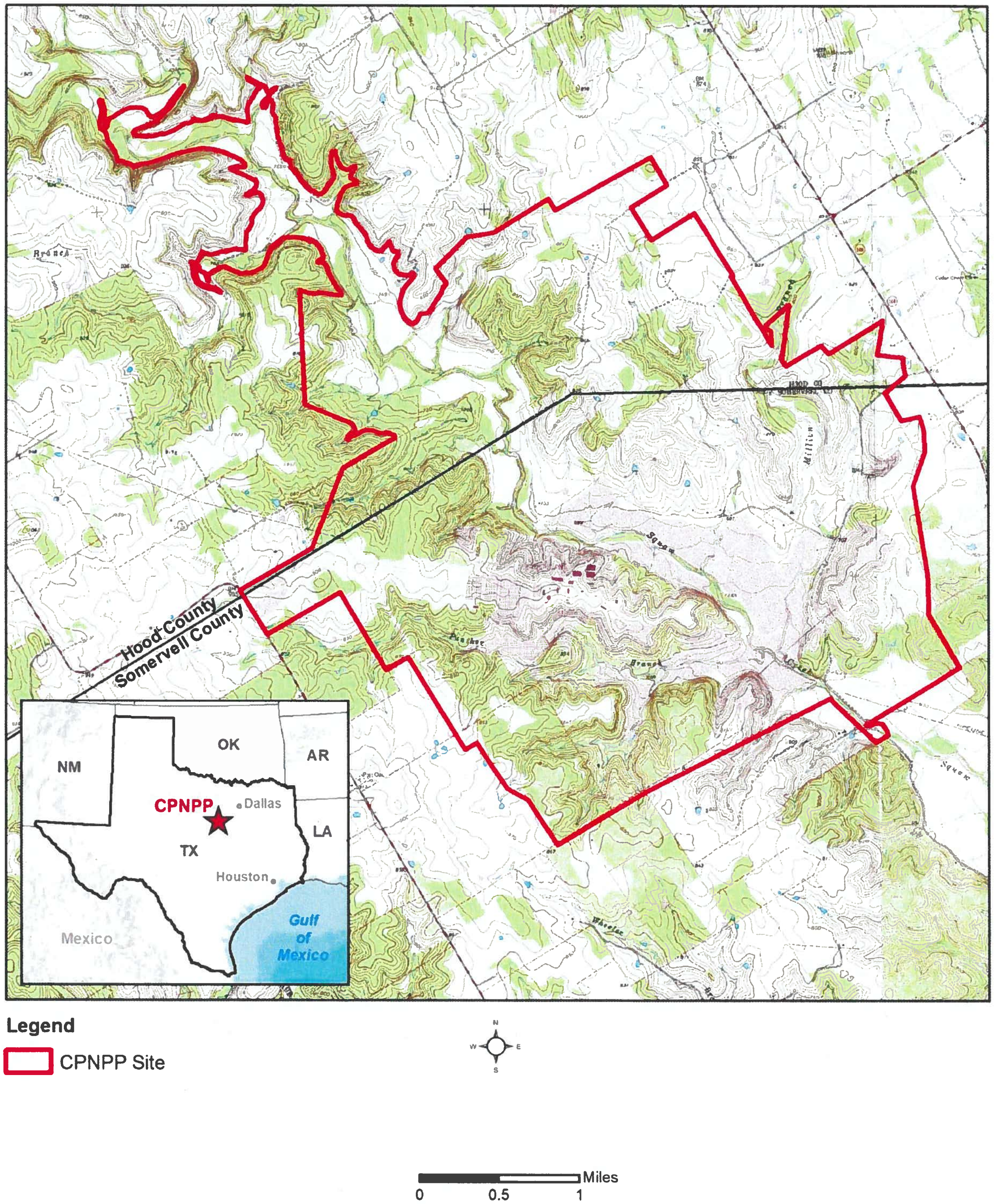
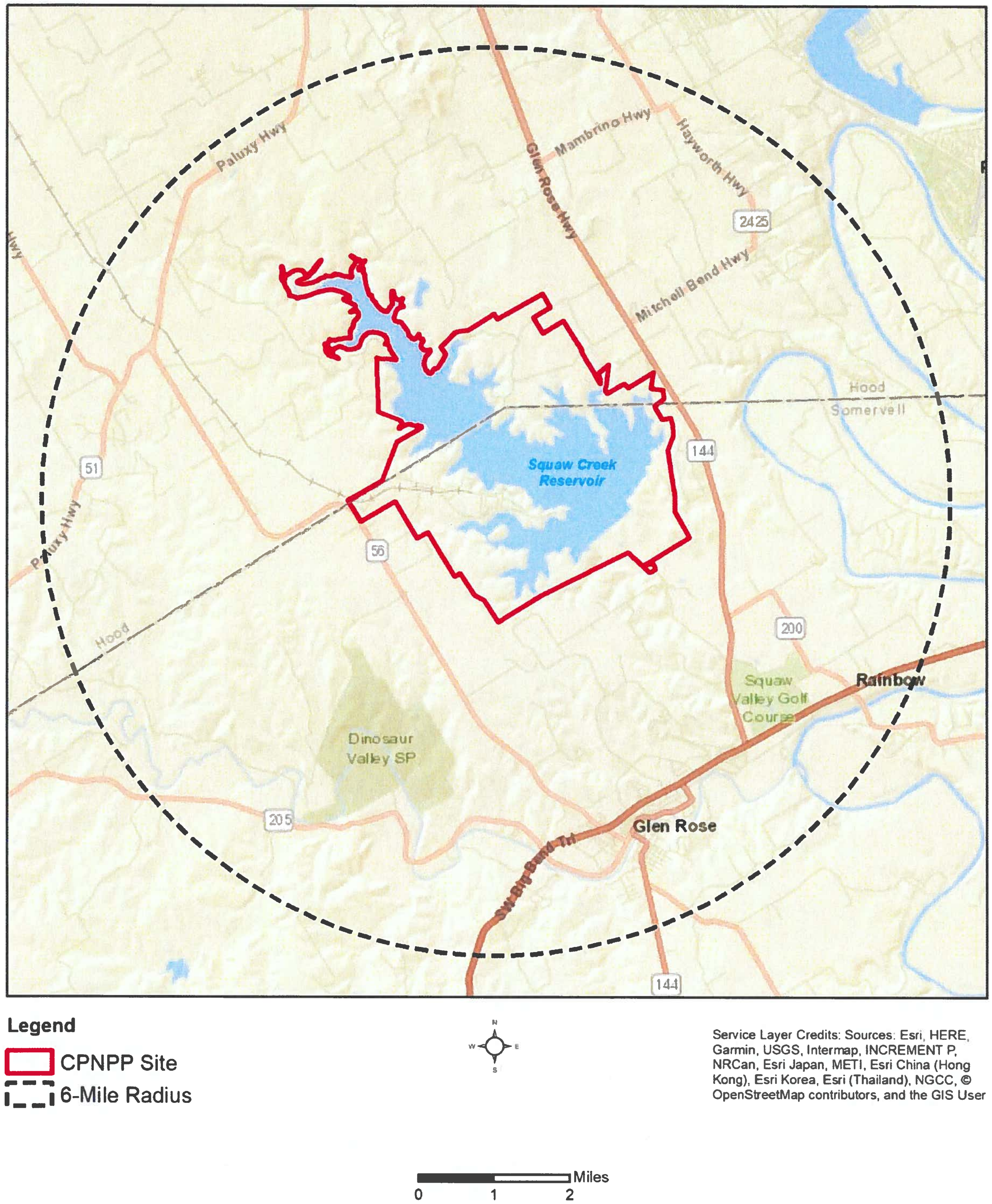


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



QUAPAW NATION

P.O. Box 765
Quapaw, OK 74363-0765

(918) 542-1853
FAX (918) 542-4694

CP-202100145
MISC-21-027

RECEIVED
MAR 17 2021
REGULATORY AFFAIRS

February 24, 2021

P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

Re: Comanche Peak Nuclear Power Plant Units 1 and 2.

To Whom It May Concern,

This project is outside of the current area of interest for the Quapaw Nation; therefore, the Quapaw Nation does not desire to comment on this project at this time. Thank you for your efforts to consult with us on this matter.

Sincerely,

Everett Bandy

Everett Bandy, THPO
Quapaw Nation
P.O. Box 765
Quapaw, OK 74363
(p) 918-238-3100

Attachment E: Other Consultations

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak
Nuclear Power Plant
(Vistra Operations
Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100009
TXX-21004
April 1, 2021

Joel Massey, Regions 2/3 Regional Medical Director
Texas Department of State Health Services
PO Box 149347
Austin, TX 78714-9347

Subject: Comanche Peak Nuclear Power Plants Units 1 and 2 License Renewal

Dear Mr. Massey,

Vistra Operations Company LLC (Vistra OpCo) is seeking a response from the Texas Department of State Health Services (DSHS) concerning thermophilic microorganisms in the portion of Squaw Creek Reservoir (SCR) that receives the circulating water system discharge from Comanche Peak Nuclear Power Plant (CPNPP). The basis for this request and specific microorganisms of potential concern is presented below. Figures depicting the plant site and the vicinity within a 6-mile radius of the station are enclosed.

Reason for Request

Vistra OpCo, a subsidiary of Vistra Corp, is preparing an application to be submitted to the U.S. Nuclear Regulatory Commission (NRC) for renewing the operating licenses for the CPNPP Units 1 and 2 for an additional 20 years (see Table 1). Vistra OpCo is contacting DSHS for assistance in assessing the potential health impacts from continued operation during the renewed license period.

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

As part of the renewal process, the NRC requires that the license renewal application include an environmental report that assesses the environmental impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units through the period of the renewed licenses. Per NRC regulations, the environmental report must include an assessment of the impact of the proposed action on public health from thermophilic organisms in affected waters. NRC guidance also states that the applicant should consult the state health departments regarding the potential risks posed by thermophilic microorganisms in the vicinity of the plant.
Vistra OpCo seeks DSHS concurrence with the following assessment regarding the public health risk posed by the potential for CPNPP's thermal discharge to SCR to enhance the concentration of thermophilic microorganisms.

Information to Support Consultation on Thermophilic Microorganisms

The CPNPP circulating water system utilizes a cooling system in which cooling water is withdrawn from SCR from its intake on the north side of the plant, the cooling water increases in temperature as it passes through the plant condensers, and is returned to SCR through the discharge point on the southeast side of the plant. The discharge is pumped through a submerged outlet into a deep arm of the SCR, allowing for high velocity subsurface mixing.

Activities in SCR include recreational boating and fishing. SCR has a public park area as well. Swimming and wading are not allowed in SCR, and in-water barriers restrict public approach to the discharge outlet by more than 1,800 feet.

The current Texas Pollution Discharge Elimination System (TPDES) permit for CPNPP establishes limits for daily maximum and daily average discharge temperatures based on a flow-weighted average temperature (FWAT) computed on a daily basis. The daily maximum discharge temperature permitted limit is 116°F for the highest FWAT during the calendar month. The daily average discharge temperature permitted limit is 113°F based on the arithmetic mean of the FWATs for the calendar month. No testing for thermophilic microorganisms is required by the TPDES.

Naegleria fowleri is ubiquitous in nature and thrives in heated water bodies at temperatures ranging from 95 to 106°F or higher. CPNPP's discharge area in the SCR could seasonally have temperatures above 95°F. However, the public is restricted from the area near the discharge and the discharge is in deep water with high-velocity mixing. Accordingly, the risk of a member of the public contracting Primary Amebic Meningoencephalitis, the infection from *N. fowleri*, is very low. There have only been 36 cases of Primary Amebic Meningoencephalitis in Texas from 1972 to 2018 according to DSHS (https://www.dshs.texas.gov/IDCU/disease/primary_amebic_menigoencephalitis/Data.aspx). The risk of infection is higher in shallow, still waters. SCR is a deep lake and CPNPP's cooling water system pumps as well as wind provide enough water movement to reduce conditions favorable to the concentration of *N. fowleri*. Further, the route of infection is through the nasal passages which requires immersion and permitted SCR recreational activities do not include swimming. CPNPP's deep, high velocity thermal discharge would not enhance the concentration of *N. fowleri*. In summary, lake conditions, along with restricting public access to the discharge area and prohibiting swimming in the SCR, reduces the risk of *N. fowleri* infection.

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95 to 115°F, although the bacteria can persist in waters from 68 to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs (https://www.osha.gov/legionnaires-disease/hazards). As such, human infection is often associated with complex water systems housed within buildings or structures. Thus, the greater health risk from *Legionella* posed by CPNPP's water systems would be to workers (i.e., occupational risk), rather than the small risk to recreational boaters at SCR. CPNPP has a comprehensive occupational safety program to address such potential risks.

Other human pathogens, including *Salmonella,* grow at a range of temperatures. The exposure route of concern would be contact with water contaminated with a sufficient microorganism population for human infection. The Centers for Disease Control reported no cases of infection from waterborne *Salmonella* spp. in the United States in 2018 (https://www.cdc.gov/salmonella/outbreaks-2018.html). The latest Centers for Disease Control data on the incidence of infection cases from waterborne pathogens in untreated recreational water is for years 2013-2014 and no cases were recorded for Texas

(https://www.cdc.gov/healthywater/surveillance/recreational/2013-2014-tables.html). Thus, the risk of infection from these other human pathogens are very low generally. CPNPP's deep, high velocity thermal discharge would further minimize the risk of enhancing their concentration. The already restricted access to the discharge area and not allowing swimming further reduces the already low risk of waterborne pathogen infection.

In summary, Vistra OpCo concludes that the CPNPP thermal discharge described above does not result in an increase in public health risk posed by the thermophilic microorganisms of concern.

As stated earlier, this letter seeks DSHS input on the potential existence and concentration of the thermophilic microorganisms of concern in SCR and DSHS concurrence that the thermal discharge to the SCR during continued operation of the CPNPP would not increase public health risk from the thermophilic microorganisms of concern. DSHS input is requested by May 13, 2021. Vistra OpCo plans to contact DSHS in a few weeks to request the scheduling of a virtual meeting to review this request and answer any questions the DSHS staff may have. Vistra OpCo plans to include this letter and any DSHS response provided in the environmental report to be submitted to the NRC as part of the license renewal application.

Vistra OpCo requests that DSHS send a letter response to Randy Harding (see contact information below). Should you or your staff have any questions or comments, please contact Steve Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

Enclosures: Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

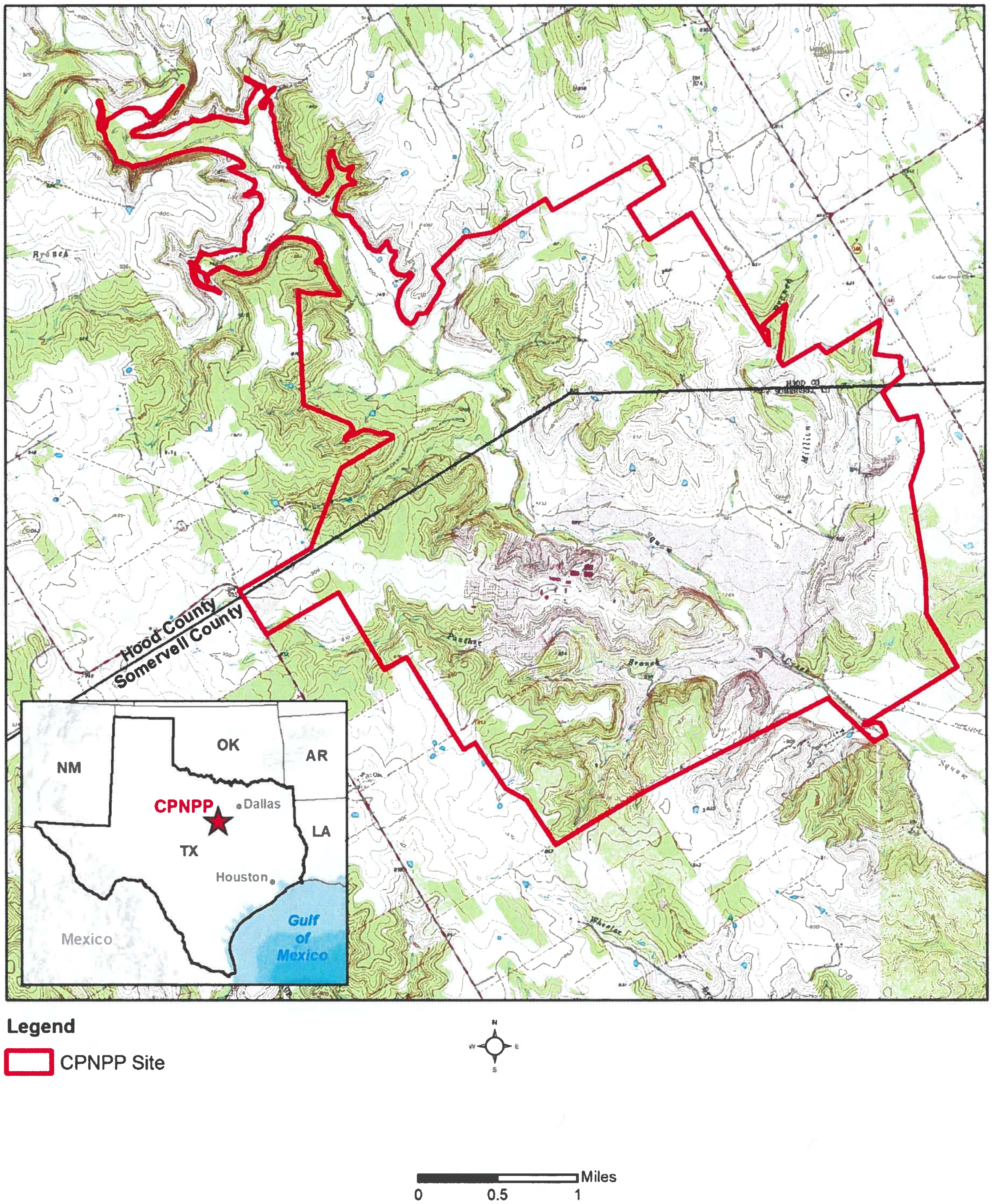
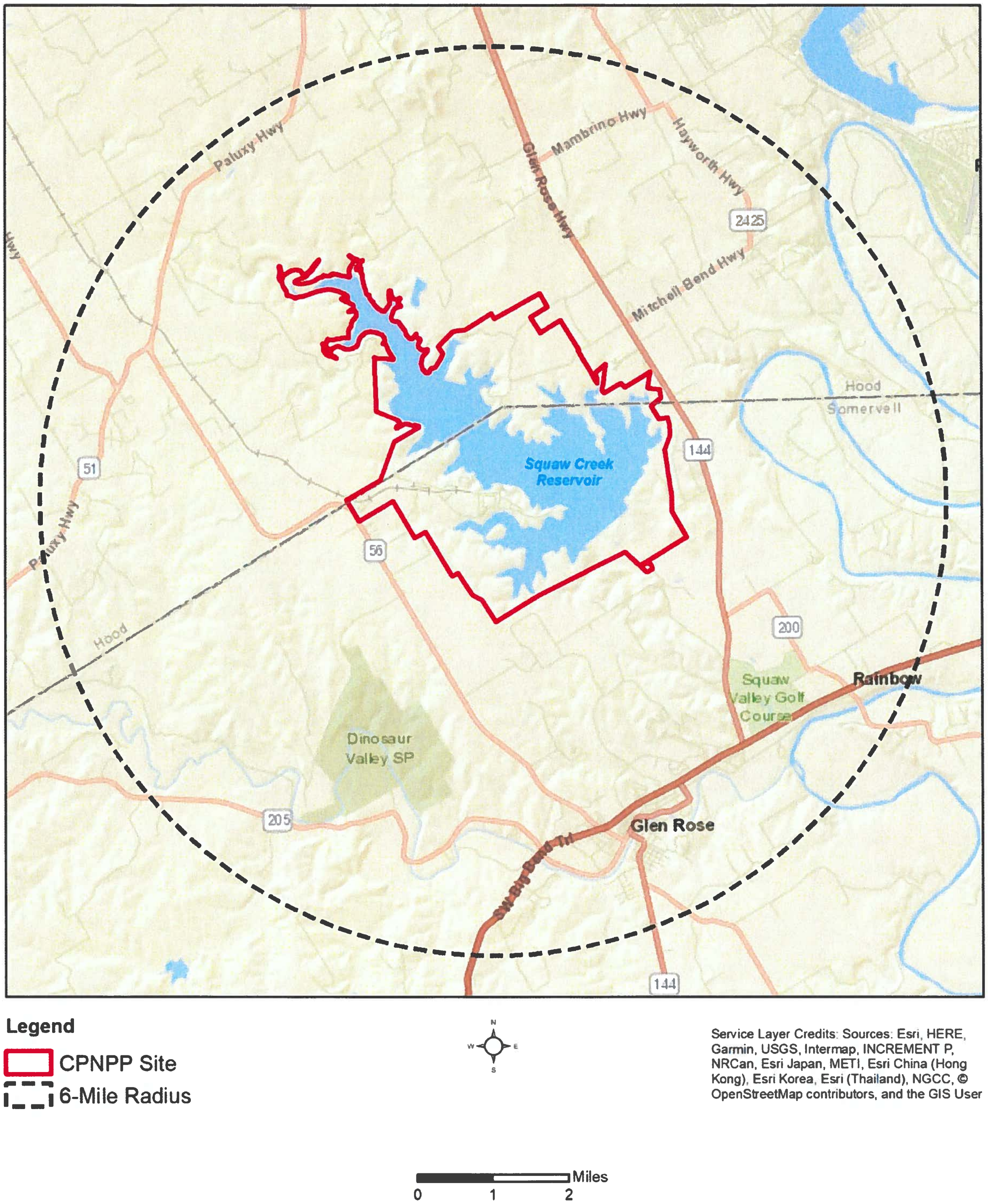


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User

MISC 21-048
CP-202100203

Harding, Randy

From: Massey,Joel (DSHS) <Joel.Massey@dshs.texas.gov>
Sent: Tuesday, April 13, 2021 8:23 AM
To: Sewell, Steven
Cc: Evans, Todd; Harding, Randy
Subject: Environmental impact assessment request
Attachments: Comanche Peak Power Plant.pdf

EXTERNAL EMAIL

Good morning Mr. Sewell,

I have received the attached request (post-marked April 5, 2021) for a response regarding an environmental impact report concerning the possibility of thermophilic organisms at the Comanche Peak Nuclear Power Plants and an assessment of human exposure risk.

The Texas Department of State Health Services does not routinely conduct environmental impact assessments or environmental surveys or testing for thermophilic organisms, especially when there are no known reports of outbreaks in the human population of reportable disease caused by these organisms in the recent past related to this facility. The Texas Commission for Environmental Quality, or perhaps a private contractor, might be better equipped to assist you in achieving your desired objective.

Best regards,

Joel Massey, MD, MPH
Medical Director, Public Health Region 2/3
1301 S. Bowen Rd. Ste 200
Arlington, TX 76013
(817) 264-4501 (office)
(817) 264-4506 (fax)

TEXAS Health and Human Services | Texas Department of State Health Services

Visit www.dshs.texas.gov/coronavirus/tools/vaccine-comm.aspx for more information on COVID-19 vaccination.

CP-202100400
MISC-21-069

TEXAS
Health and Human
Services

Texas Department of State Health Services

John Hellerstedt, M.D.
Commissioner

June 10, 2021

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322North FM 56 / E30
Glen Rose, Texas 76043

Mr. Harding,

I have received the attached request to respond to an environmental impact report concerning the possibility of thermophilic organisms at the Comanche Peak Nuclear Power Plants and an assessment of human exposure risk.

The Texas Department of State Health Services does not routinely conduct environmental impact assessments or environmental surveys or testing for thermophilic organisms, especially when there are no known reports of outbreaks in the human population of reportable disease caused by these organisms in the recent past related to this facility. Therefore, DSHS is not able to provide a letter of concurrence. The Texas Commission for Environmental Quality, might be better equipped to assist you achieve your desired objective. I have also consulted with the DSHS Radiation Control Program, and they have no further input related to this request.

Thank you for your concern about environmental health regarding this facility and surrounding property and persons.

Respectfully,

Joel Massey M.D.

Joel Massey, MD, MPH
Regional Medical Director

P.O. Box 149347 • Austin, Texas 78714-9347 • Phone: 888-963-7111 • TTY: 800-735-2989 • *dshs.texas.gov*

CP-202200017
MISC 22-002

January 7, 2022

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Mr. Harding,

Texas Department of State Health Services (DSHS)- Public Health Region 2/3 received a request from Vistra Operations Company, LLC (CP-2021000009; TXX-21004; dated April 1, 2021) to provide input on the potential existence and concentration of the thermophilic microorganisms of concern in Squaw Creek Reservoir (SCR) and concurrence that the thermal discharge to the SCR during continued operation of the Comanche Peak Nuclear Power Plant would not increase public health risk from the thermophilic microorganisms of concern.

DSHS agrees that a pure administrative renewal of a contract would not have an environmental impact. DSHS does not conduct environmental impact assessments and would not assess the potential health impacts of the Squaw Creek Reservoir.

Respectfully,

Becky Earlie-Royer, Ph.D., M.P.H., C.H.E.S.®
Deputy Regional Director
Texas Department of State Health Services
Public Health Region 2/3 Headquarters
1301 S Bowen Rd Suite 200 Arlington, Texas 76013
(817) 264-4500 (main)
(817) 264-4506 (fax)
becky.earlieroyer@dshs.texas.gov

Attachment F: Coastal Zone Management Program Certification

Luminant

Steven K. Sewell
Senior Director,
Engineering & Regulatory Affairs

Comanche Peak
Nuclear Power Plant
(Vistra Operations
Company LLC)
P.O. Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.6113

CP-202100012
TXX-21007
March 4, 2021

Brian Carter, Director of Asset Enhancement
Texas General Land Office
1700 Congress Avenue
Austin, TX 78701-1495

Subject: Comanche Peak Nuclear Power Plant Units 1 and 2 License Renewal

Dear Mr. Carter:

Vistra Operations Company LLC (Vistra OpCo), a subsidiary of Vistra Corp, is seeking to renew the operating license for Comanche Peak Nuclear Power Plant Units 1 and 2 (CPNPP) for an additional 20 years (see Table 1).

Table 1. Comanche Peak Nuclear Power Plant Licensing Dates

Unit	License Expiration Date	Extended License Expiration Date
Unit 1	Feb. 8, 2030	Feb. 8, 2050
Unit 2	Feb. 2, 2033	Feb. 2, 2053

The CPNPP site is in Hood and Somervell counties, in north central Texas (see Figures 1 and 2). Vistra OpCo is contacting the Texas General Land Office (GLO) to request confirmation that CPNPP is located outside the Texas Coastal Zone and therefore is not required to provide a Coastal Management Program (CMP) consistency certification for CPNPP. This confirmation is sought on the basis that CPNPP's license renewal falls outside of the federal agency actions listed in 31TAC 506.12(a)(2)(F) as being subject to Texas's Coastal Management Program because CPNPP is not within the coastal management boundary.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. Vistra OpCo appreciates GLO's assistance in providing confirmation that CPNPP is not subject to the consistency requirement with regards to the Texas CMP. Please notify Vistra OpCo of concerns and any information GLO believes Vistra OpCo should consider in the preparation of the environmental report. GLO input is requested by April 22, 2021. Vistra OpCo plans to include this letter and GLO response provided in the environmental report.

Vistra OpCo requests that GLO send a letter response to Randy Harding (see contact information below). Should you or the GLO staff have any questions or comments, please contact Steven Sewell at 254-897-6113 (Steven.Sewell@luminant.com) or Todd Evans at 254-897-8987 (Todd.Evans@luminant.com).

Randy Harding (randy.harding@luminant.com)
Environmental Consultant
T 254-897-5137
C 254-396-2248

Comanche Peak Nuclear Power Plant
Attention: Randy Harding
6322 North FM 56 / E30
Glen Rose, Texas 76043

Sincerely,

Steven K. Sewell

<u>Enclosures:</u>
Figure 1. Comanche Peak Nuclear Power Plant Site
Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity

Figure 1. Comanche Peak Nuclear Power Plant Site

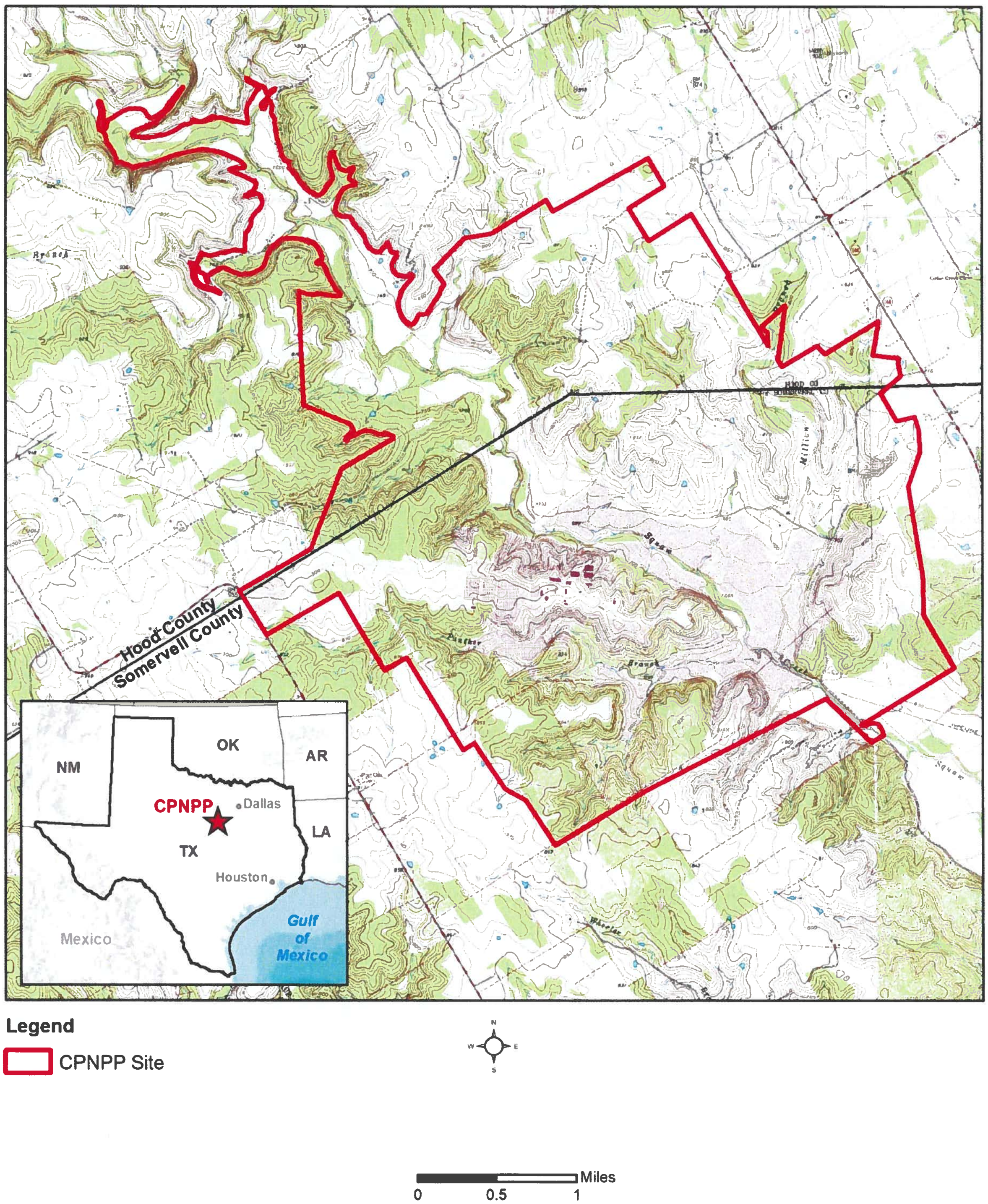
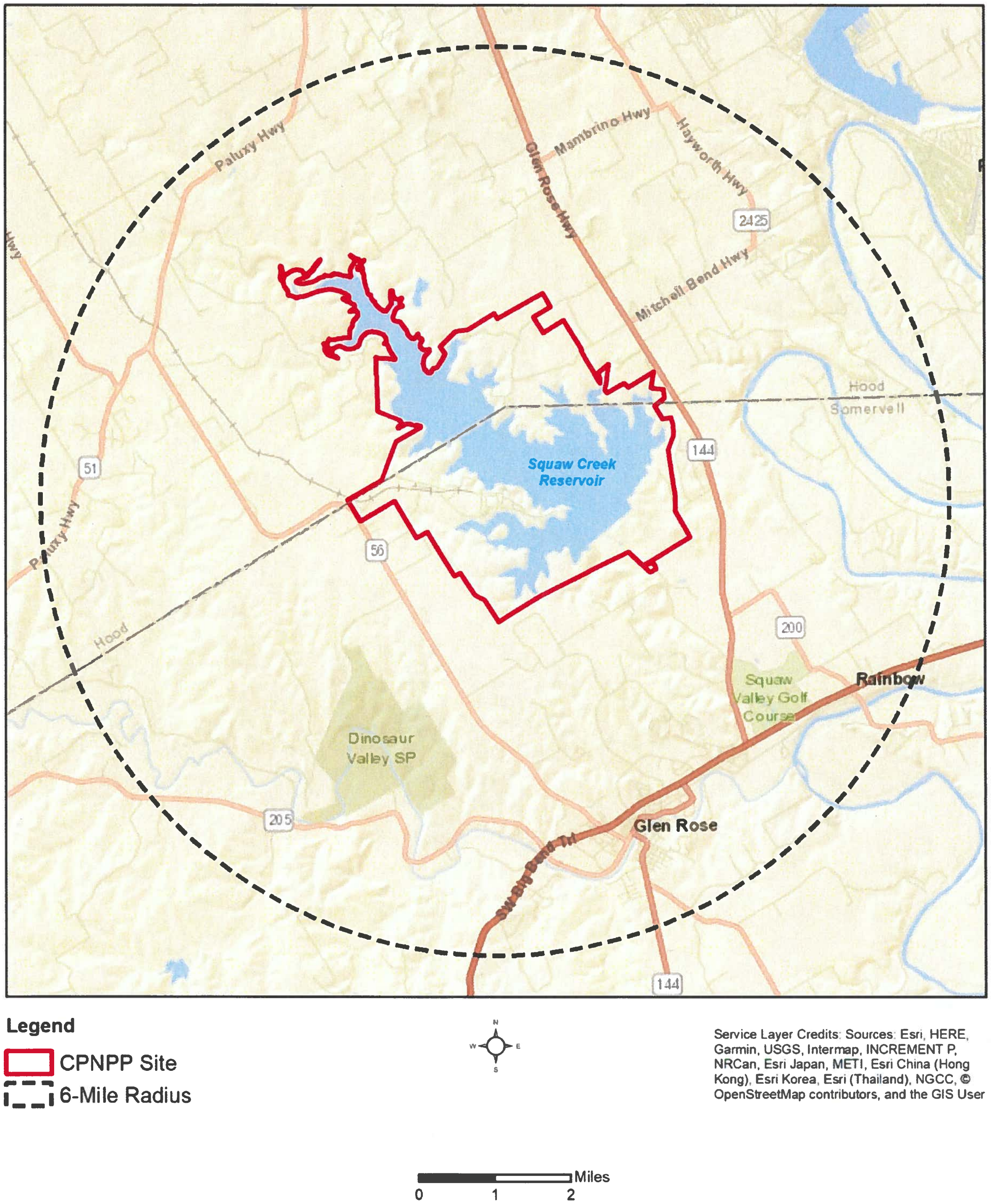


Figure 2. Comanche Peak Nuclear Power Plant 6-mile Vicinity



CP-202100328
MISC 21-064

Harding, Randy

From: Federal Consistency <Federal.Consistency@GLO.TEXAS.GOV>
Sent: Tuesday, March 9, 2021 4:06 PM
To: Sewell, Steven; Evans, Todd
Cc: Sheila Cerini
Subject: Comanche Peak Nuclear Power Plants License Renewal

EXTERNAL EMAIL

This email is to confirm receipt of the letter dated March 4, 2021 to Brian Carter at the Texas General Land Office. The statement is the letter is correct. This project site is not in the Coastal Zone and no certification is needed.

Please contact me with any additional questions.

Allison Buchtien
Federal Consistency
Texas General Land Office
federal.consistency@glo.texas.gov

Please send all Federal Consistency review requests to this email address.