April 14, 2009

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application

Part 3,

Environmental Report

Update Tracking Report

Revision 1

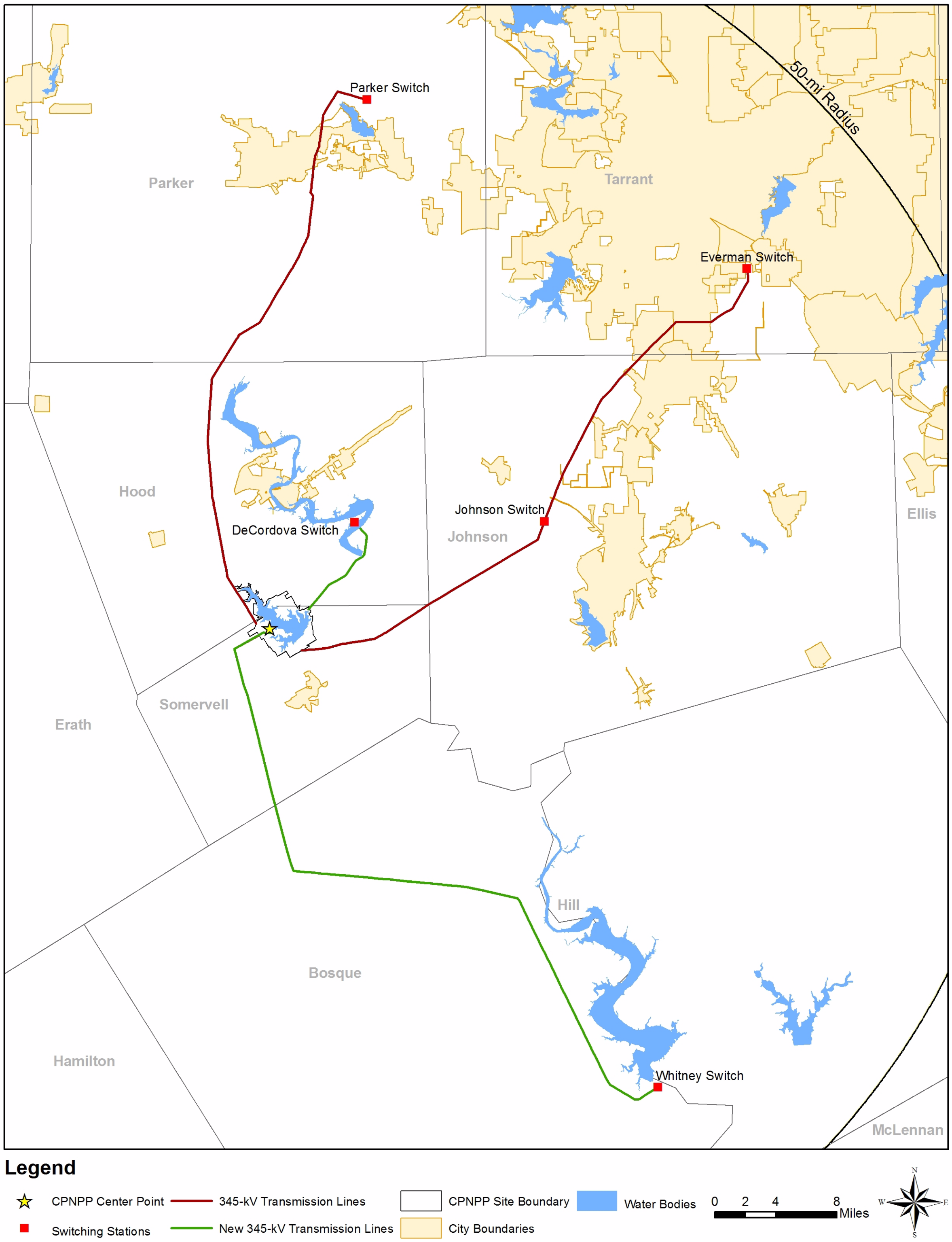
Revision History

Revision	Date	Update Description
0	3/31/2009	No technical changes in Rev.0 Editorial Changes in Chapters: Ch.1, 2, 3, 4, 5, 6, 7, 8, 9 and 10
1	4/19/2009	Updated Chapters: Ch. 1, 2, 3, 4, 5, 8, 9 Incorporated responses to following RAIs: No. -

Chapter 1

Chapter 1 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	1-xv	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00462	Table 1.3-2	1.3-5	Match to NUREG 1555	Change section titles of 4.7, 4.8, 5.11 and 5.13.	0
LU-02	Figure 1.1-5	_	Represent line from CPNPP to DeCordova as a new line.	Change color of line from CPNPP to DeCordova from red to green.	1
CTS-00693	Table 1.2-1	1.2-3 1.2-4 1.2-5 1.2-6 1.2-8 1.2-9	Table needs to accurately reflect the permit conditions and permits required.	Table 1.2-1 updated to reflect only those permits that apply.	1
CTS-00694	Table 1.2-1	1.2-3 1.2-4 1.2-5 1.2-6 1.2-8 1.2-9	Editorial	Adjust column setting and row to improve the readability	1
MET-25	Table 1.2-1	1.2-9	ER Site Audit NRC information need	Add TCEQ 30 TAC 116 State Construction Air Permit	1



LU-02

Figure 1.1-5 Electrical Transmission Corridors

TABLE 1.2-1 (Sheet 1 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

Agency	Authority	Requirements	License/Permit No.	Activity Comment
NRC	10 CFR 52	Applicant submits Construction and Operating License Application (COLA) to NRC		Applicant is required to submit an application to the NRC for a combined construction and operating license (COL).
NRC	10 CFR 52.79	Applicant submits an Environmental Report (ER)		Applicant is required to submit a complete ER, 10 CFR 52.80 (b), 72 FR 57447, Oct 9, 2007, 10 CFR 52.79, 10 CFR 51.45, 10 CFR 51.50.
USFWS TPWD		Consultation with Fish and Wildlife, Federal and State (FWS 2006)		Consultation concerning potential impacts to federally threatened and endangered species must be obtained and interference with any listed species must be resolved prior to disturbance.
FAA TDOT	14 CFR 77.13	Notice of construction for permanent structures		Permit for structures over 200 ft in height (containment buildings, permanent facilities, cooling towers, etc.). Thirty days prior to construction of the obstruction.
FAA TDOT	14 CFR 77.13	Notice of construction for temporary structures		Permit for structures over 200 ft in height (construction cranes, towers, etc.). Thirty days prior to construction of the obstruction.
TCEQ EPA	30 TAC 335 Applies only to Units 1 and 2	Notice of Registration for solid waste management	Solid Waste Reg. # 33306 EPA ID # TXD02332078	Transport, treatment, storage, and disposal of solid waste. Notice requires modification 3 months prior to any new solid waste not previously described.

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TABLE 1.2-1 (Sheet 2 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

Agency	Authority	Requirements	License/Permit No.	Activity Comment
TCEQ EPA	30 TAC 335 Applies only to Units 1 and 2	Notice of Registration for hazardous waste management	Hazardous Waste Reg. # 50356 EPA ID # TXD02332078	Transport, treatment, storage, and disposal of hazardous waste. Notice requires modification 3 months prior to any new hazardous waste not previously described. CTS-00694 CTS-00693
USACE TCEQ	Clean Water Act 404 Permit	Construction in a wetland or shoreline		Submit 24 months prior to dredging/filling activities in wetland if required. Depends on the 401 permit process.
EPA TCEQ	Clean Water Act Section 401	Construction in a wetland or shoreline		Submit 24 months prior to dredging/filling activities in wetland if required.
USACE BRA		Easement for cooling water intake and discharge structures and pipelines		Submit 24 months prior to construction activities. CTS-00693
TCEQ	Storm Water Pollution Prevention Plan (SWP3) Texas Water Code Chapter 26	Storm Water Pollution Prevention Plan (SWP3) for cConstruction activities	General Permit No. TXR 150000	Stormwater to surface water discharge associated with land disturbance and industrial activity during construction activities. Submit plan modification with Notice of Intent (NOI) for a disturbance of 5 acres or more. CTS-00693

TABLE 1.2-1 (Sheet 3 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

CTS-00694

Agency	Authority	Requirements	License/Permit No.	Activity Comment
TCEQ	Notice of Intent (NOI) Texas Water Code Chapter 26 (SWP3)	Pertains to General Permit relating to stormwater discharges from construction activities	General Permit No. TXR 150000	Submit NOI 3 months prior to disturbance of land.
TCEQ	Storm Water Pollution Prevention Plan (SWP3) Texas Water Code Chapter 26	Storm Water Pollution Prevention Plan (SWP3) for Operations of facility	Part III of General Permit No. TXR 050000	Submit plan modification concurrent with submittal of Stormwater Operations NOI.
TCEQ	Notice of Intent (NOI) Texas Water Code Chapter 26	Pertains to General Permit relating to stormwater discharges from operation activities	General Permit No. TXR 050000	Submit NOI 3 months prior to operations.

TABLE 1.2-1 (Sheet 4 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

CTS-00694

Agency	Authority	Requirements	License/Permit No.	Activity Comment
TCEQ	Texas Water Code Chapter 5 and 26 TPDES Industrial Wastewater Permit (Major Source Modification) Clean Water Act Section 402	Modification or additions to wastewater facilities	TPDES # WQ0001854000 Must be renewed but may require modification	Certification and licensing of municipal and domestic wastewater facilities. Submit 18 months prior to new construction or modification.
~~Somervell County Health Department~~ TCEQ	30 TAC 285	Submit ~~O~~on-site sewage treatment and design~~permit~~		Six months prior to construction. CTS-00693
PUC		Certificate of Convenience and Need Application		Certification that present and future public convenience and necessity require or will require the operation of such equipment or facility and that it will be constructed and operated in compatibility with the environment.
SHPO TRIBES	13 TAC 26 Archeological sites	Permission required prior to clearing of any lands (SHPO 2007)		Identification and evaluation of historic properties and any cultural sites of significance to Native American tribes (site, transmission corridors, pipeline corridors). CTS-00694

TABLE 1.2-1 (Sheet 5 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

CTS-00694

Agency	Authority	Requirements	License/Permit No.	Activity Comment
SHPO	Section 106 National Historic Preservation Act 36CFR800	Permission required prior to clearing of any lands (SHPO 2007)		Review and analysis of cultural and historical resources, including completion of NHPA Section 106 consultation. SHPO concurrence supports no new study needed at CPNPP site.
BRA		Use of surface water approved by local water authority		New surface water rights secured from Lake Granbury for transfer to CPNPP site and return to Lake Granbury.
TPWD	31TAC69	Scientific Collection Permit	Each Vendor maintains a permit for collection	Sampling contractors need to have permit in hand for species collection.
TCEQ	30TAC335	Landfill #6 Closure Plan		Plan to close landfill is needed 3 months prior to its being disturbed.
TCEQ	30TAC335	Landfill #6 Closure Certification Report		Report upon completion of excavation as to the results versus the plan.
TCEQ	30TAC116	Concrete batch plant air permit		Concrete batch plant air permit required 6 months prior to construction for operation of an on-site concrete plant.
TCEQ	30TAC122	Title V Operating Permit for diesel units	TCEQ Air Permit No. 19225 (not Title V permit) [Requires modification]	Diesel engines air permit for discharge to environment. Emergency diesels, fire pump diesels, auxiliary boilers, gas turbines, etc. Twelve months prior to initial firing of diesels.

TABLE 1.2-1 (Sheet 6 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

Agency	Authority	Requirements	License/Permit No.	Activity Comment
TCEQ	7TAC111	Air permit for burning debris in pit		After burn pit is constructed, the permit is required 3 months prior to any burn activities.
EPA	40 CFR 110/112	Spill Prevention Control and Countermeasures Plan (SPCCP)		Revise existing plan 6 months prior to construction if changes are indicated.
EPA	40 CFR 110/112	Spill Prevention Control and Countermeasures Plan (SPCCP) – Revision		A revision to the plan may be required if contractors store more than 1320 gallons of petroleum products.
~~County Agencies - Hood and Somervell~~		~~Building and Occupancy Permits~~		~~As required from Fire Marshall, Boiler Permit, HVAC, temporary or permanent buildings, construction activities.~~
TDOT County Agencies - Hood and Somervell		Road construction, road crossings, interruption of traffic flow		Affected areas involving old or new roads – changes or interruption of traffic.
~~Local Utility Authorities~~		~~Electric, potable water, gray water effluent, Sanitary discharge~~		~~New utility connections are required to support the site, permits are needed before the connection is performed.~~
TCEQ	30 TAC 106	Rock crusher operations		For rock debris going to be crushed, obtain a permit 6 months prior to operation.

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TABLE 1.2-1 (Sheet 7 of 7)
FEDERAL, STATE, AND LOCAL AUTHORIZATIONS

Agency	Authority	Requirements	License/Permit No.	Activity Comment	
					CTS-00694
NRC		Appendix B - Facilities Operating License Environmental Protection Plan, non-radiological		Changes required in the Environmental Protection Plan, non-radiological, to be modified pending final design reviews, approvals, and prior to operation of the facility.	
~~TCEQ~~	~~Clean Air Act~~	~~Prevention of Significant Deterioration (PSD) Permit~~		~~Demonstrate compliance with ambient air standards BACT requirements, Clean Air Mercury Rule, Clean Air Interstate Rule as applicable.~~	CTS-00693
TCEQ	30 TAC 321.255 30 TAC 210.23 30 TAC 309	Evaporation pond liner and size requirements		Certify evaporation pond meets requirements prior to use.	
Financial Lending Institutions, if needed		Phase I Environmental Site Assessment Phase II Intrusive Investigation		Conduct site assessment and report for submittal to lending institutions as applicable.	
TCEQ		Hazardous materials storage (SARA Title III)			CTS-00693
TCEQ		Toxic chemical release inventory reporting form			CTS-00693
	Disposal Facility	Radwaste disposal registration			
PUC of Texas		PUC approval of decommissioning plan			CTS-00693
TCEQ	30 TAC 116	State construction air permit			MET-25

Chapter 2

Chapter 2 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	2-xlii	Editorial correction	Change "MPT Main Power Transformer" to "MT Main Transformer".	0
CTS-00611	2.1	2.1-1	Erratum	Change "624,067" to "653,320"; "61,115" to "62,306"; "39,875" to "39,987"; "37,976" to "41,564"; "29,184" to "29,689" to match 2006 US Census instead of 2005 US Census.	0
CTS-00611	2.1.1	2.1-2	Updated reference required to provide 2006 data not 2005 data	Change (US Census 2005) to (US Census 2006) notated as US Census Bureau. "American FactFinder – Texas By Place GCT Population Estimates." US Census Bureau, Washington, DC. Available URL: Http://factfinder.census.gov/servlet/home/en/official - estimates.html, Accessed July 24, 2008.	0
CTS-00459	2.3.1.1.5	2.3-4	Erratum	Change "384 ac" to "400 ac".	0
CTS-00455	2.3.3.3.5	2.3-61	Editorial correction	Delete "No" and add "Other than CPNPP Units 1 and 2,".	0
CTS-00648	2.3.1.1.6	2.3-4	Erratum	Change "0.25 ac" to "0.78 ac".	0
MET-04	List of Tables	2-xvii and 2-xviii	Erratum	Add "Dallas" in front of "Fort Worth" and "Airport" after Fort Worth	1
MET-14	List of Tables	2-xix 2-xx	Increase information as discussed with the NRC.	Add tables: 2.7-129, 2.7-130, 2.7-131, 2.7-132, 2.7-133, 2.7-134, 2.7-135	1
LU-05	2.2.1.1	2.2-1	Erratum	Revise paragraph to clarify mineral rights.	1
LU-01	2.2.2	2.2-5	Increase information as discussed with the NRC.	Insert sentence and add "CDP" to Pecan Plantation to clarify Pecan Plantation is a housing development and not an incorporated town.	1

LU-11	2.2.2	2.2-5	Increase information as discussed with the NRC.	Insert sentence to clarify zoning along Lake Granbury.	1
LU-09	2.2.3	2.2-6	Increase information as discussed with the NRC.	Revised text to include information on Proctor Lake and adjust numbers accordingly.	1
LU-08	Figure 2.2-3		Increase information as discussed with the NRC.	Show location of state parks.	1
SOC-11	2.5.2.7.2.1	2.5-18	Increase information as discussed with the NRC.	Updated with current information and revised text to discuss public safety and medical services for Hood and Somervell counties.	1
SOC-11	2.5.2.7.2.1	2.5-19	Erratum	Update reference (The Nursing Home Project 2006) to (The Nursing Home Project 2006a).	1
SOC-11	2.5.2.7.2.2	2.5-19	Erratum	Update reference citation from TDPS 2004 to TDPS 2006	1
SOC-11	2.5.2.7.2.3	2.5-19	Increase information as discussed with the NRC.	Add new subsections to discuss Bosque, Erath, Johnson, and Tarrant counties public safety and medical services.	1
SOC-11	2.5.2.7.2.3	2.5-19	Increase information as discussed with the NRC.	Updated with current information and revised text to discuss public safety and medical services for Hood and Somervell counties. Update reference citation from TDPS 2004 to TDPS 2006	1
CR-04	2.5.3.6	2.5-25	Increase information as discussed with the NRC.	New subsection to include background for 2.5.3.	1
CR-04	2.5.6	2.5-29	Increase information as discussed with the NRC.	Add 13 new reference notations that are cited in the new Subsection 2.5.3.6.	1
SOC-13	2.5.4.4	2.5-28	Increase information as discussed with the NRC.	Revised Subsection to include information on subsistence populations.	1
SOC-11	2.5.6	2.5-32	Increase information as discussed with the NRC.	Update reference notation from (The Nursing Home Project 2006) to (The Nursing Home Project 2006a)	1

SOC-11	2.5.6	2.5-34	Increase information as discussed with the NRC.	Update reference notation from (TDPS 2004) information to (TDPS 2006) information.	1
SOC-11	2.5.6	2.5-36	Increase information as discussed with the NRC.	Revised to include 11 new reference notations.	1
MET-03	2.7.1.2.4	2.7-11	Erratum	Add “16” to number of day each year and “by county” to wind events to reconcile thunderstorm information.	1
MET-04	2.7.1.2.8	2.7-17	Erratum	Add “the” in front of “Dallas Fort Worth and Airport” after “Fort Worth” to correct the reference to Forth Worth Airport.	1
MET-13	2.7.2.1.2	2.7-19 and 2.7-23	Erratum	Replaced 2001 – 2006 with 2001 – 2004 and 2006 to describe which data years were used.	1
MET-04	2.7.2.1.4	2.7-23	Erratum	Add “Dallas” in front of Fort Worth Airport to correct the reference to Forth Worth Airport.	1
MET-11	2.7.2.1.7	2.7-25	Erratum	Change Table 2.7-34 to Table 2.3-23 to correct reference to the table.	1
MET-13	2.7.3.1	2.7-28	Erratum	Replaced 2001 – 2006 with 2001 – 2004 and 2006 to describe which data years were used.	1
MET-12	2.7.3.1	2.7-28	Erratum	Remove “control room” and replace with “low population zone” to correct reference to control room.	1
MET-13	2.7.3.2 And 2.7.4.2	2.7-30 and 2.7-31	Erratum	Replaced 2001 – 2006 with 2001 – 2004 and 2006 to describe which data years were used.	1
MET-14	2.7.4.3	2.7-33	Increase information as discussed with the NRC.	Insert new Subsection to include evaporate pond results.	1

MET-03	Table 2.7-11	2.7-68	Erratum	Change numbers in average per year (#/yr)	1
MET-13	Table 2.7-11	2.7-68	Erratum	Replaced 2006 with 7/31/2006 to describe which data years were used.	1
MET-13	Table 2.7-85	2.7-68	Erratum	Replaced 2001 – 2006 with 2001 – 2004 and 2006 to describe which data years were used.	1
MET-04	Table 2.7-86	2.7-150	Erratum	Add “Dallas” in front of “Fort Worth Airport” to correct the reference to Forth Worth Airport.	1
MET-04	Table 2.7-96	2.7-162	Erratum	Add “Dallas” in front of Fort Worth and “Airport” after “Fort Worth” to correct the reference to Forth Worth Airport.	1
MET-04	Table 2.7-99	2.7-165	Erratum	Add “Dallas” in front of “Fort Worth Airport” to correct the reference to Forth Worth Airport.	1
MET-14	Table 2.7-129 through Table 2.7-135		Increase information as discussed with the NRC.	Add Tables 2.7-129, 2.7-130, 2.7-131, 2.7-132, 2.7-133, 2.7-134, and 2.7-135.	1

LIST OF TABLES (Continued)

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2.2 LAND

The CPNPP is located on the Squaw Creek Reservoir (SCR) approximately 5.2 mi north of Glen Rose in Hood and Somervell Counties, Texas. CPNPP is accessible by rail and road. The CPNPP rail spur connects the site to the main line that runs through Tolar, approximately 9.3 mi northwest (BTS 2006). A farm to market road (FM 56) connects the site to U.S. Highway 67 (US 67) and FM 51. US-67 connects Cleburne to Stephenville after passing through Glen Rose. FM-51 connects Granbury to Paluxy. Access to the site and to SCR is limited to those persons granted access rights by Luminant.

This section describes, in general terms, the CPNPP site, the land in the vicinity of the site, and the land in the region of the site. The terms site, vicinity, and region are defined in Section 2.0.

2.2.1 THE SITE AND VICINITY

2.2.1.1 The Site

The 7950-ac site boundary parallels the shoreline of SCR to the north, east, and south. The west side of the property boundary is bordered by FM 56, and the remaining sides of the property are a mix of farmland and residential properties. The majority of the site is surrounded by chain link fencing and access to the site is restricted to authorized persons only.

Luminant owns the property and a portion of the mineral rights at the CPNPP site, directs land management activities, and is the named applicant for the CPNPP site. Some subsurface mineral rights on the CPNPP site are not owned by Luminant; however, deed restrictions prevent mineral owners within the perimeter of the exclusion area boundary (EAB) (Figure 2.1-1) from placing drilling rigs.~~but outside of the confines of SCR from placing vertical drilling rigs below the 240-m (800-ft) contour line.~~ Luminant has absolute authority to control ingress rights for mineral rights exploration in the site. LU-05

Neither Hood nor Somervell counties have zoning laws outside city limits. The CPNPP site is located outside the city limits of Glen Rose and Granbury, the only two cities that have zoning laws. The CPNPP is also outside the land-use plans of Glen Rose and Granbury. Hood and Somervell counties do not have comprehensive land-use plans.

Luminant's land-use plans for CPNPP are shown in Figure 2.1-1. There are existing structures and roadways at the CPNPP site (e.g. containment buildings, switchyard, and auxiliary buildings); some of which are utilized in support roles for the new reactors. Construction details are addressed in Chapter 4.

Based on U.S. Geological Survey (USGS) land categories and the latest data from the National Land Cover Dataset, the land-use designation within the site is shown in Table 2.2-1 and Figure 2.2-1. Approximately 1346.6 ha (3327.5 ac) of the site have been designated as open water and another 445.4 ha (1100.6 ac) are designated as grassland/herbaceous (USGS 2001).

According to the 2005 U.S. Department of Agriculture (USDA) soil survey data, approximately 1064 ac of prime farmland are located within the CPNPP site boundary, however the prime farmland is not utilized (USDA 2005). Figure 2.2-1 shows the location of prime farmland on-site.

inside the city limits (Granbury 2007). The zoning designation of approximately 8987 ac of land inside city limits is shown in Table 2.2-3 (Granbury 2007).

Land use around Lake Grandbury consists primarily of developed land with residential development located close to the shore and commercial development located along the US 377 corridor. Undeveloped land consists of grasslands and agricultural cropland. Eleven smaller towns and unincorporated communities are located within the vicinity of CPNPP and are listed below. The distance to each is calculated from the CPNPP center point. Pecan Plantation is a census designated place (CDP), which is an area delineated to provide census data for settled concentrations of population that are identifiable by name but are not legally incorporated. The CDP boundaries may change from one census to the next. LU-11 LU-01

City	Distance and Direction
Hill City	3.3 mi west
Rainbow	5.3 mi southeast
Neri	4.4 mi northeast
Glen Rose	5.2 mi south
Paluxy	7.0 mi south-southeast
Tolar	9.6 mi north-northwest
Brushy	6.1 mi north
Mambrino	5.7 mi north
Pecan Plantation CDP	7.9 mi east LU-01
Fort Spunky	8.8 mi east
Nemo	8.8 mi east-southeast

Glen Rose has zoning laws in place for all land inside city limits. The other listed towns and communities do not have zoning laws limiting development. Somervell and Hood counties do not have zoning laws limiting development in unincorporated areas.

2.2.2 TRANSMISSION CORRIDORS AND OFF-SITE AREAS

Three single-circuit transmission lines are located on existing ROWs and use existing tower structures (Figure 1.1-5). Two double circuit expansions require the construction of new towers on new or expanded transmission line ROW 160 ft wide. The first is a 45-mi line to Whitney and the second is a 17-mi line to DeCordova. No land-use impacts are anticipated from the transmission line construction activity located on existing ROWs as vegetation maintenance is already performed. Land use along the DeCordova ROW consists mainly of grassland, while the land use along the Whitney ROW consists of primarily grassland with some deciduous and evergreen forest. Table 2.2-4 shows the land-use acreages in transmission line ROW.

Additional water intake and discharge pipelines are expected to be constructed for CPNPP Units 3 and 4 extending from the plant to Lake Granbury (Figure 1.1-4). The pipelines are expected to occupy an existing 50-ft right-of-way and are expected to run parallel to the existing water pipelines. Additional intake and discharge structures are expected to be placed to the north and adjacent to the existing intake and discharge structures on Lake Granbury. As discussed in Subsection 2.4.1.2.2, no wetlands or habitat for threatened or endangered species are located on the pipeline ROW. Vegetation consists mainly of grassland and ashe juniper. Land-use impacts to the ROW during construction are discussed in Subsection 4.1.2.

2.2.3 THE REGION

There are 19 counties completely or partially within the 50-mi radius of the site center point, all of which are located in Texas. These counties include: (1) Dallas, (2) Stephens, (3) McLennan, (4) Ellis, (5) Hood, (6) Johnson, (7) Eastland, (8) Erath, (9) Somervell, (10) Hill, (11) Comanche, (12) Bosque, (13) Hamilton, (14) Jack, (15) Wise, (16) Palo Pinto, (17) Parker, (18) Tarrant, and (19) Coryell counties (BTS 2006). The largest cities in the region are Fort Worth (624,067 people), Haltom City (39,875 people), Burleson (29,613 people), and Cleburne (29,184 people) (US Census 2005).

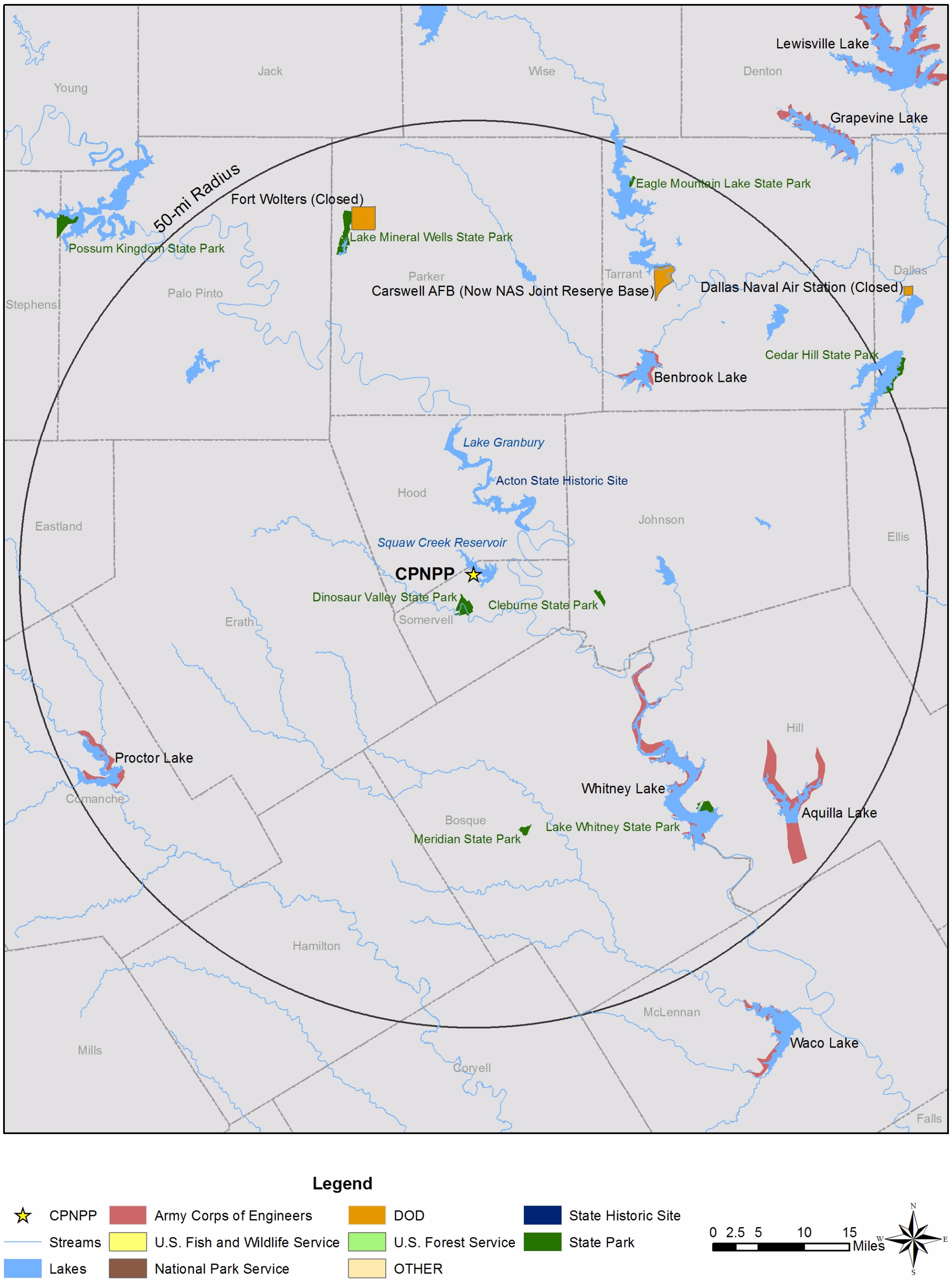
There are five interstate highways within the region of CPNPP: (1) I-20 (approximately 28 mi northwest); (2) I-35W (approximately 33 mi east); (3) I-35E (approximately 44 mi east); (4) I-30 (approximately 32 mi northeast); and (5) I-820 (approximately 33 mi northeast). I-35W and I-35E combine as I-35 north of Denton, Texas, and south of Dallas, Texas. I-35 connects Oklahoma City, Oklahoma to the cities of Dallas and San Antonio, Texas. I-820 is part of Loop 820 that navigates around Fort Worth, Texas (BTS 2006). Major transportation routes in the region are shown in Figure 1.1-1.

The Paluxy River runs from northern Erath County southeast to Somervell County where it joins the Brazos River. The Brazos River runs from northern Texas to the Gulf of Mexico, and passes through Hood and Somervell counties (BTS 2006). The Brazos River is not designated as a National Wild and Scenic River, and is only navigable downstream of the Lake Whitney Dam located 39 mi southeast (USGS 2007), (NWSRS 2007), (USACE 1999). However, 115 river mi of the river in Palo Pinto and Parker counties are designated the John Graves Scenic Riverway by the state of Texas (Reed ACP 2007). There are no ports within the 50-mi region (BTS 2006).

Based on USGS land-use categories and data, the land-uses designation within the 50-mi region are shown in Table 2.2-1 and Figure 2.2-4 (USGS 2001). The principle crops produced in the region according to the 2002 agricultural census are corn (4 million bu), sorghum and sorghum silage (3.4 million bu), and wheat (2.5 million bu). In addition, 5.8 million lb of peanuts are produced in the region.

Within the region of CPNPP, there are five~~four~~ separate federal land holdings as shown in Figure 2.2-2 (US Census 2000). Four~~Three~~ of these federal land holdings are lakes developed by the Army Corps of Engineers: (1) Benbrook Lake at 5169~~5183.9~~ ac; (2) Aquilla Lake at 17,294~~17,280~~ ac; ~~and~~ (3) Lake Whitney at 21,841~~21,824~~ ac~~.~~; and (4) Proctor Lake at 6505 ac. The remaining federal land holding is Naval Air Station (NAS) Fort Worth, Joint Reserve Base at Carswell. Commissioned on October 1, 1994, the base was previously known as Carswell Air Force Base and became NAS Fort Worth, Joint Reserve Base at Carswell. Covering 3240~~3264~~ LU-09

LU-09



LU-08

Figure 2.2-2 CPNPP Region Federal Lands

agricultural land. The AMUD treatment plant has a maximum capacity of 4,130,000 gpd and is currently operating at 1,900,000 gpd (TCEQ 2007b). Wastewater processing occurs at a facility in Granbury with a 2,000,000-gpd capacity that typically operates at approximately 1,000,000 gpd. Plans are being made for a new 10,000,000 gal treatment plant north of Granbury to serve the growing population. The City of Tolar receives its water from wells and has a maximum capacity of 280,000 gpd. The city is currently utilizing 75,000 gpd. The Tolar Wastewater Treatment Plant has a capacity of 100,000 gpd and is currently operating at 70 percent capacity. Plans for expansion of the plant are expected to be made within the next few years. Residents outside of these water systems are on different systems, which are outlined in the Table 2.5-20.

In Somervell County, the drinking water comes directly from the Trinity aquifer and is only treated with chlorine before it is distributed to the customers. The system has a maximum capacity of 1.426 mgd, and the community has an average daily consumption of 0.488 mgd. The City of Glen Rose has the largest wastewater treatment plant. At maximum capacity, the plant can handle 600,000 gpd but only operates at 320,000 gpd. The rest of the county operates on septic systems, meaning wastewater is treated on-site in privately owned septic systems. The City of Glen Rose water distribution system provides service to 1294 service connections (TCEQ 2007a).

There are no active landfills in Hood or Somervell counties. Solid waste from Somervell County is gathered at the IESI Somervell County Transfer Station while waste in Hood County is gathered at the IESI Granbury Transfer Station. In 2005, the IESI Somervell County Transfer Station handled 14,284 tons of waste while the IESI Granbury Transfer Station handled 16,153 tons. Waste at these stations is transported to the IEASI Weatherford Landfill in Parker County. The Weatherford Landfill is a Type 1 landfill and received 194,125 tons of waste in 2005 with an estimated 1,100,000 tons of space remaining (TCEQ 2006). The impacts of construction and operation of CPNPP Units 3 and 4 on water and wastewater are discussed in Subsections 4.4.2.3 and 5.8.2.3.1.1, respectively.

2.5.2.7.2 Police, Fire, and Medical Services

State law enforcement is conducted by the Texas Department of Public Safety (DPS). Subdivisions of the DPS included the Texas Highway Patrol, Criminal Law Enforcement, Emergency Managements, and the Texas Rangers, among others.

The Texas Rangers are a law enforcement group unique to Texas. One Ranger is typically responsible for three counties but has authority to act in any county in Texas. The Texas Rangers respond to cases of extortion and embezzlement, officer shootings, and other emergencies. Their authority supersedes that of county and municipal police organizations. Hood and Somervell counties are each under the authority of separate Rangers.

2.5.2.7.2.1 Hood County

The Hood County Sheriff's Department has jurisdiction everywhere in Hood County. In 2006~~4~~, the Hood County Sheriff's Department employed 37~~32~~ sworn officers and 78~~58~~ civilians (TDPS 2006~~4~~). Two other police departments exist in the county: Granbury Police Department and Tolar Police Department. The City of Granbury has 30 officers while Tolar employs one. The Granbury SOC-11

Police Department has plans in progress to augment their force with 30 – 35 citizen volunteers who are trained at the Citizens police academy in Granbury to aid the officers in disaster and emergency response, including response to situations at CPNPP.

There are a total of nine fire departments with 250 volunteers in Hood County. Each fire department is assigned one of nine response areas in the county but responds to larger emergencies anywhere in or even outside of the county. Each station has at least one 2000 gallon pumper truck. The City of Granbury is served by the Granbury Volunteer Fire Department (VFD). The department has 60 volunteers and operates out of two stations. The fire department owns four pumper trucks, one aerial ladder truck, one tanker, three brush trucks, and two rescue trucks. Granbury VFD, Tolar VFD, Indian Harbor VFD, and DeCordova/Acton VFD have a mutual aid agreement with CPNPP to respond to fires. Each department contributes one engine and a squad of approximately 10 people.

Hood County contains one hospital, Lake Granbury Medical Center. Lake Granbury Medical Center, located in Granbury has 59 beds with 36 doctors on active duty (Lake Granbury Medical Center 2007). The daily load is 16 beds and the maximum capacity is 59 beds. Four~~Three~~ SOC-11
nursing homes are located in Hood County: Granbury Care Center, with 181 beds; Granbury Villa, with 90 beds; and Trinity Mission Health and Rehab, with 104 beds; and Harbor Lakes SOC-11
Plaza Nursing and Rehabilitation Center, with 142 beds (The Nursing Home Project 2006a).

2.5.2.7.2.2 Somervell County

Somervell County is served mainly by the Somervell County Sheriff's Department, although the City of Glen Rose has a police chief. The Somervell Sheriff's Department employed 19 sworn officers in 2006~~4~~ (TDPS 2006~~4~~). SOC-11

Somervell County has a single fire department, the Somervell County Volunteer Fire, Rescue and EMS. The department is served by 40 people: 34 volunteers and 6 paid employees. The department has three engines, two tankers, one ladder truck, six brush trucks, one rescue vehicle, one command vehicle, and three ambulances. The department responds in case of an emergency at CPNPP.

Somervell County also contains a single hospital, Glen Rose Medical Center. which also has an associated nursing home. The hospital has 16 beds while the nursing home has 118 beds. Combined, both facilities employ 280 people. The daily load at the hospital is seven beds. During an emergency, the 16 beds could be augmented with 7 – 10 additional beds. One additional nursing home is located in Somervell County, Cherokee Rose Manor. Cherokee Rose Manor, located in Glen Rose, has a 102-bed capacity. The total number of nursing home beds in Hood and Somervell counties is 598.

2.5.2.7.2.3 Bosque County SOC-11

Bosque County is served mainly by the Bosque County Sheriff's Office which has 18 commissioned officers and 20 civilian workers. The cities of Clifton and Meridian have police departments (TDPS 2006). The city of Walnut Springs is serviced by the Bosque County Sheriff's Office and has 10 volunteer firefighters.

The only hospital in Bosque County is located in Clifton, the Goodall-Witcher Hospital, with 40 beds (AHD 2009). There are four nursing homes located in Bosque County, but none in Walnut Springs. The Clifton Lutheran Sunset Home with 180 beds, the Clifton Nursing and Rehabilitation with 112 beds, and the Goodall-Witcher Nursing Facility are all located in Clifton. Meridian Manor has 91 beds and is located in Meridian (The Nursing Home Project 2006b). SOC-11

2.5.2.7.2.4 Erath County

The Erath County Sheriff's Office has 23 commissioned officers and 27 civilian workers. The cities of Dublin and Stephenville have police departments as does the Tarleton State University (TDPS 2006). Stephenville has a single police station and employs 46 police officers and civilian personnel, approximately 25 percent of which are civilians (City of Stephenville 2007).

Stephenville has two fire stations with 28 paid firefighters and 16 volunteer firefighters (City of Stephenville 2007).

Stephenville is home to the county's only hospital, the Texas Health Harris Methodist Hospital Stephenville (AHD 2009) with 98 beds and more than 40 physicians (Texas Health Resources 2009a). Stephenville has four nursing homes: Canterbury Villa of Stephenville with 86 beds, Community Nursing and Rehabilitation Center with 73 beds, Mulberry Manor with 104 beds, and Stephenville Nursing home with 46 beds (The Nursing Home Project 2006c).

2.5.2.7.2.5 Johnson County

The Johnson County Sheriff's Office employs 116 commissioned officers and 135 civilian workers. There are six cities in Johnson County that have police departments, including Cleburne (TDPS 2006). The Cleburne Police Department has 55 commissioned officers and 22 civilian workers (City of Cleburne 2008c).

Cleburne has three fire stations with 49 paid firefighters and three fire chiefs.

Johnson County has two hospitals: Texas Health Harris Methodist Hospital Cleburne and Huguley Memorial Medical Center, located in Burleson (AHD 2009). The Texas Health Harris Methodist Hospital Cleburne has 137 beds and over 80 physicians, while Huguley Memorial Medical Center has 213 beds and more than 350 primary care and specialty physicians (Texas Health Resources 2009b) (Huguley Memorial Medical Center 2009). There are three nursing homes in Cleburne: Cleburne Rehabilitation and Health Center with 120 beds, Colonial Manor Nursing Home with 149, and Fireside Lodge Rehabilitation Center of Cleburne with 112 (The Nursing Home Project 2006b).

2.5.2.7.2.6 Tarrant County

The Tarrant County Sheriff's Office has 491 commissioned officers and 853 civilian workers. There are 32 cities in Tarrant County that have police departments, and three universities, one airport, and one hospital district (TDPS 2006) that have security forces. The Fort Worth Police Department has 1541 commissioned police officers and approximately 432 civilian workers. The department is divided into six bureaus: Executive Service, Administrative Service, Operational

Support, North/West Field Operations, South/East Field Operations, and Special Services (FWPD 2009). SOC-11

The city of Fort Worth has 42 fire stations spread out over the city and divided into 6 battalions. There are 904 firefighters and 45 civilian workers. Department vehicles include 37 engines, 10 quintuple combination pumpers, 4 trucks, 6 aircraft rescue units, and 13 brush units (City of Fort Worth 2009b).

Tarrant County has 18 hospitals, six of which are in Fort Worth: Baylor All Saints Medical Center at Fort Worth, John Peter Smith Hospital, Medical Centre Surgical Hospital, Plaza Medical Center of Forth Worth, Texas Health Harris Methodist Hospital Fort Worth, and Texas Health Harris Methodist Hospital Southwest Fort Worth. These six hospitals have a combined total of 2055 beds (AHD 2009). There are 33 nursing homes in Fort Worth (Texas Long Term Care 2008).

2.5.2.7.3 Social Services

Social services in the state of Texas are overseen by the Texas Department of Family and Protective Services (DFPS), which has an office in Granbury. The Texas DFPS provides services such as child and adult protective services, child care licensing, and assistance to adult or elderly disabled. The agency also manages community-based programs targeting the prevention of abuse, neglect, delinquency, and exploitation of children, disabled adults, or the elderly (Texas DFPS 2007). In 2005, Texas DFPS completed 160,069 child abuse and neglect investigations through Child Protection Services; 3,173 adoptions; 45,392 investigations of in-home adult abuse or neglect through Adult Protection Services; and 8,169 facility investigations for adult abuse or neglect (Texas DFPS 2005a). The total operating expenditures on all social programs by the Texas DFPS for the 2005 fiscal year was $899,357,894 (Texas DFPS 2005b).

2.5.2.8 Education

The following subsections discuss information about the local educational system throughout the region.

2.5.2.8.1 Public Schools – Pre-Kindergarten through Grade 12

There are 102 school districts that are either wholly or partially contained within the 50-mi radius of the CPNPP center point. According to data compiled from the National Center for Education Statistics, the schools of these districts that are located within the radius had more than 287,000 enrolled students for the 2004 – 2005 school year (NCES 2005a).

2.5.2.8.2 Hood and Somervell Counties

There are three school systems contained within Hood County: Granbury ISD, Lipan ISD, and Tolar ISD, each providing K-12 education. For the 2004 – 2005 school year, these districts had enrolled 6637, 281, and 591 students, respectively (NCES 2005b). Granbury ISD has twelve schools under its jurisdiction, Lipan ISD has one school, and Tolar ISD has two schools.

Both of these sites were re-visited in 2007 as part of an archeological survey of proposed water connection lines. 41HD14 received additional shovel testing to determine the presence and extent of remaining buried deposits. Both of these sites have been heavily impacted since their original recording by bulldozing and clearing in ROWs and soil erosion.

Two additional sites were recording during the 2008 survey. 41HD90 and 41HD91 are prehistoric archeological sites located between 41HD14 and 41HD15. 41HD90 is a small and extremely disturbed FCR scatter. 41HD91 is a small and heavily disturbed lithic scatter. Both sites have been heavily disturbed by land clearing activity for transmission line and water pipeline construction and maintenance. These sites are not eligible for listing in the NRHP.

Nubbin Ridge Cemetery is a Historic Texas Cemetery (HTC) located 3.4 mi northeast of the on-site APE and within 1.6-mi of the proposed off-site water pipeline route. The cemetery is fenced, in good condition, and well maintained.

2.5.3.6 Cultural and Historical Background Summary CR-04

Hood and Somervell Counties are located in North Central Texas. One of the major problems with associating the cultures of the study area with those of the greater region is in defining the region in general. Various researchers have called the area a part of West Texas, Northwest Texas, West Central Texas, North Central Texas, Lower Plains, etc. Locally, most people call the area "The Brazos Country." The original Southern Methodist University (SMU) archeological research (Skinner and Humphreys 1973) conducted on the Comanche Peak Steam Electric Station property identified a number of prehistoric and historic sites. See also Blaine et al. (1968) and Gallagher and Bearden (1976) for more examples of prehistoric sites in the area.

Detailed summaries of the prehistoric cultural background of the general area, including Collins (1998), Crook and Harris (1952), (Long 1963), Prewitt (1981), and (Prikryl 1990), provide broader generalized syntheses for the area. For in-depth regional definitions, "A Review of Central Texas Archeology," (Suhm 1960) provides a worthy summation. However, Michael B. Collins details various research issues that have contributed to Central Texas being ambiguously placed in other geographic designations (Collins 1998). Moreover, Collins (1995) addresses long-term research issues in Central Texas, as well as the difficulty of defining a Central Texas culture area, in “Forty Years of Archeology in Central Texas,” found in the 1995 Bulletin of the Texas Archeological Society. This article gives a more up-to-date synthesis of the area’s prehistory while considering both past research and the integrity of the archeological record.

The following is a brief summary of the prehistory and history of the region surrounding the Comanche Peak Nuclear Power Plant.

There are currently four major archeological periods recognized for Central Texas and the study area: the Paleo-Indian, Archaic, Late Prehistoric, and Historic periods.

Paleo-Indian Period

The Paleo-Indian period has been the focus of a great deal of research in Texas and throughout America. The Paleo-Indian period is recognized as the temporal span from 11,500 to 8,800 B.P (Collins 1995). Traditionally, Paleoindian culture has been narrowly defined as, simply, nomadic big-game hunters. However, the "...simple cultural sequence of big-game hunting 'cultures' . . . is no longer adequate to accommodate the diverse material culture assemblages, projectile point styles, and indicated subsistence behaviors now documented" (Collins 1995). CR-04

Clovis (approximately 11,200-10,900 B.P.) represents the earliest cultural horizon documented in Central Texas and throughout the contiguous United States, and it generally has the most diverse site types of the Paleo-Indian period (Collins 1995). Continued research and improved faunal data increasingly indicate a less nomadic lifeway for Clovis culture. "Overall, the Clovis lifeway seems to have been that of well-adapted, generalized hunter-gatherers with the technology to hunt big game but not the need to rely exclusively on it. Clovis material is widely distributed in Texas in a number of different environmental zones" (Collins 1998).

In Folsom times, subsistence patterns appear more specialized toward bison hunting. This is reflected not only in documented bison kill sites but also in tools such as Folsom points, end scrapers, and large ultra-thin bifaces (Collins 1995).

Dalton and San Patrice projectile point types occur near the end of the Early Paleoindian subperiod and continue to the late subperiod. The occurrence of San Patrice points is much more frequent than that for Dalton points, and neither are very common; thus, questions remain about the temporal placement and cultural significance of these point types. The Horn Shelter 2 site (containing both point types) indicates an Archaic-like, hunter-gatherer lifeway; it is posited that Dalton and San Patrice point types are transitional artifacts between the early and late Paleoindian subperiods (Collins 1998).

Wilson, Golondrina-Barber, and St. Mary's Hall projectile point style intervals are placed in the Late Paleoindian subperiod. The Wilson-Leonard site contains all these point styles, though the Wilson type is better represented. Dates for the Wilson component at the Wilson-Leonard site are ca. 10,000 to 9650 B.P. The point types and associated features, artifacts, a human burial, and faunal remains resemble Archaic characteristics more so than those of the Paleoindian period (Collins 1998). "The Archaic like character continues for the Golondrina-Barber and St. Mary's Hall components date between 9500 and 8000 B.P." (Collins 1998). For these point types, features continue to exhibit Archaic-like characteristics, though the sizes of associated burned rock features are smaller than those typical of their Archaic period counterparts. Thus, this Late Paleoindian subperiod appears to be transitional between the Early Paleoindian subperiod and the Archaic (Collins 1995).

Archaic Period

The Archaic period spans the time from ca. 8800 to 1200 or 1300 B.P. and includes three subperiods – early, middle, and late. The length of this period is indicative of the success of basic adaptation. Characteristic of Archaic period archeology is the abundant utilization of heated rock manifested in hearths, middens, ovens, scatters, and other features (Collins 1995).

In the early Archaic ca. 8800 to 6000 B.P., archeological evidence in Central Texas suggests a period when settlement patterns favored exploitation of live-oak savanna resources (Edwards Plateau) in which various nuts, berries, fruits, and geophytes, as well as smaller animals, comprise a reliable subsistence. The period's associated point style intervals include Angostura, Early Split Stem, and Martindale-Uvalde (Collins 1995).

Middle Archaic (6000 to 4000 B.P.) is marked by three style intervals: Bell-Andice-Calf Creek, Taylor, and Nolan-Travis (Collins 1995). The earliest interval of the Middle Archaic period has a more mesic climate, and the tool kit reflects bison hunting weaponry. The later Middle Archaic period sees the arrival of more xeric climates and the appearance of burned rock middens (Collins 1995). CR-04

The Late Archaic period (4000 to 1200 B.P.) continues with subsistence technology seen in the Middle Archaic, including the manifestation of burned rock middens. The point styles during the Late Archaic are among the most widely distributed dart points, and bison becomes a viable hunting prey again (Collins 1998). The period exhibits a wider range of point types and six point style intervals are postulated for the Late Archaic (Collins 1995).

Late Prehistoric

The Late Prehistoric period (often labeled as Neo-Indian, Neo-American, Post-Archaic, or Neo-Archaic) represents material culture changes at ca. 1200 B.P. This period contains both an early and late subperiod corresponding to the Austin and Toyah intervals (Collins 1995). The early subperiod of Late Prehistoric sees the continuation of basic hunting and gathering subsistence, including the presence of burned rock middens. The change most noted in transition from Late Archaic to early Late Prehistoric (Austin interval) is the prevalence of arrowpoints indicating a shift from atlatl/dartpoint technology to bow and arrow usage.

The late subperiod of the Late Prehistoric is associated with the Perdiz arrow point, though other distinictive archeological traits span the same time period across much of the state. The Toyah manifestation includes pottery, large thin bifaces, end scrapers, and prismatic blades, as well as Perdiz points. The question remains as to whether the Toyah manifestation reflects the expansion of a particular people across the state, or a distribution of ideas and technologies between peoples (Collins 1995).

Historic

The Historic Period begins with the arrival of European culture in America. The subperiod, early Historic in Central Texas, starts in the late 1600s. Indigenous populations and lifeways are confronted with the multiple consequences of European contact. European-introduced disease, the Spanish and French presence, the acquisition of horses by native peoples, and mounted Apache incursions southward surely mark drastic cultural changes and conflict.

The middle Historic period spans the time from 1730 to 1800 A. D. It sees the expansion and subsequent failure of Spanish Missions systems (Collins 1995). The Wichita and Comanche were at that time new residents of the northwest Texas/southwest Oklahoma region where they had established fortified villages along the Red River. Apaches had once raided Spanish settlements near San Antonio, but in light of increasing war with the Wichita and Comanches, they lobbied for Spanish protection along the San Saba River. Two missions were formed near Menard, Texas. In 1758, allied Wichita, Comanche, and Tawakonis attacked the Spanish mission, targeting Apaches and leading to subsequent retaliation by the Spanish (Smith 2000).

The Kiowa entered the Southern Plains around 1800, and were followed by the Cheyenne and Arapaho about 1840. The West Texas region was held primarily as a common hunting area by all of the Southern Plains tribes. The Comanche, in particular, considered the Brazos environs to be part of their homeland. CR-04

The first permanent Early Anglo settlements enter the Paluxy River and Squaw Creek valleys around 1853-1854, a period when the Brazos was referred to as the 'deadline' by settlers fearing Comanche and other native groups west of the river (Skinner and Humphreys 1973) and (Ewell 1895).

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 Honey-Eaters 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 (1846-50). Other settlers, mostly stock raisers 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 had been 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. The county was named after Lt. Gen. John Bell Hood of the Confederate Army. The county seat was to be named in honor of Confederate general Hiram Bronson Granbury. 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 (Callaway 2006).

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 the population, and 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 had been completed in 1887 (Callaway 2006). CR-04

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 20thcentury 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 (Callaway 2006).

From 1960 to 1980, the population increased from 5,443 to 17,714. Between 1970 and 1980, Hood County ranked sixth among all United States 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).

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 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 the 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, county proximity to the Dallas-Fort Worth area 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). CR-04

2.5.3.6.1 Historic Land Use Summary

Early land use on the CPNPP property consisted of farming and raising livestock. As early as 1853, some families began to settle the valleys of Squaw Creek and the Paluxy River within present day Somervell County. The earliest known settlement at the site is that of John Monroe Williams who settled in 1859, farming and raising livestock. Several of these earliest settlements were affected by a large flood of the Paluxy River and Squaw Creek in August of 1859 (Skinner and Humphreys 1973). The Location of the Williams Cabin is shown in Skinner and Humphreys (1973).

Farming and ranching continued to be the primary land uses, but the presence of trees and abundant limestone led to timber harvesting and small-scale quarrying. T. B. Chalmers attempted to establish a town along Squaw Creek, convincing a sawmill firm to locate at the new community, "...and they proceeded to saw up all the heavy timber that was available in the vicinity... Lots did not sell well and once the timber was logged out, the portable sawmill was moved elsewhere, thus snuffing out the life of Chalmers' planned Squaw Creek community" (Skinner and Humphreys 1973). Benjamin F. May settled on the property in 1877, and by 1882 began building a rock house. "The entire May family helped to quarry the limestone on the nearby hill" (Skinner and Humphreys 1973). Additional houses were constructed on May's property as his children became adults. These home sites include 41SV42, 41SV43, 41SV29, and a destroyed log structure.

Along with the homes of the May family, several other historic sites date from the late 1800s to early 1900s. Site 41HD65 (originally 41HD56) represents a turn of the century farmstead. The associated features included a house, windmill, stone-lined cellar, and stone-lined well. Site 41SV35 was a ranch complex dated from the late 1800s to the early 1900s. Site 41SV46 was a house site with a limestone block chimney, also from this period. Site 41SV53 represents a lime kiln from this period (Skinner and Humphreys 1973).

The Hopewell School Site (41SV30) "served . . . as an elementary school and sometime church from 1888 until 1942 when the school was incorporated into the Glen Rose Public Schools" (Skinner and Humphreys 1973). Also, Hopewell Cemetery, which includes the graves of people associated with the Hopewell Community, remains within the property to this day. A small, log-cabin-style post office was established at the Hopewell Community on May 24, 1901, but was discontinued just three years later. This structure is presently in the downtown square in Glen Rose.

County-wide data published through The Handbook of Texas Online gives broader data on land use for the county at large. The article notes that "...the county was still primarily agricultural and rural . . . Between 1940 and 1960 the number of farms was reduced by more than half, and agricultural production dropped" (Elam 2006). Also, "By the 1970s the chief agricultural products were cattle and hogs" (Elam 2006). CR-04

Agriculture and rural residency continued to be primary activities until 1973, when the property was acquired for the construction of Units 1 and 2. A portion of CPNPP property east of the Squaw Creek Dam spillway is presently used as cattle pasture. Subsequent to the creation of Squaw Creek Reservoir, Texas Utilities (now Luminant) has maintained a 475-acre park across from the plant. For additional information on current land use related to mineral rights and energy production, see ER Section 2.2.

2.5.4 ENVIRONMENTAL JUSTICE

This section identifies, describes, and locates low-income and minority populations.

2.5.4.1 Methodology

In RG 4.7, the NRC defines environmental justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Concern that minority and/or low-income populations might be bearing a disproportionate share of adverse health and environmental effects led President Clinton to issue an Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," in 1994 to address these issues. The order directs federal agencies to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. The Council on Environmental Quality has provided guidance for addressing environmental justice. Guidance from the NRC Office of Nuclear Reactor Regulation regarding "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues" (LIC-203, Revision 1) was used in this analysis.

The NRC guidance concluded that an 80-km (50-mi) radius, the CPNPP region, could reasonably be expected to contain potentially affected areas and that the state was an appropriate geographic area for comparative analysis. The methodology, contained in the guidance, was followed to identify the locations of minority and low-income populations within the region. Potential adverse effects are identified and discussed in Sections 4.4 and 5.8.

2.5.4.2 Minority Populations

The NRC Guidance and the U.S. Census Bureau defines a "minority" population as: American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; or Black races; Multiracial; and Hispanic ethnicity. Additionally, the NRC guidance requires that all other single minorities are to be treated as one population and analyzed (Other), and that the aggregate of all minority populations (Aggregate) is to be treated as one population and analyzed. The guidance indicates that a minority population exists if either of the following two conditions exist:

The two minority blocks near the site consist of small homes and trailers. Agriculture is limited to the keeping of goats, chickens, or gardens for personal use. The nearest residence is 0.9 mi from the CPNPP Units 3 and 4 center point. According to Table 5.3-6, the amount of salt deposition from the cooling towers at that distance and direction is 0.01 kg/km^2/month. Further information about salt deposition is found in Subsection 5.3.3.1.3. The residences closest to the site are located approximately 0.5 mi from FM 56.

2.5.4.3 Low-Income Populations

NRC guidance defines low-income households based upon statistical poverty thresholds. A block group is considered low-income if either of the following two conditions are met:

1. The low-income population in the census block groups or the environmental impact site exceeds 50 percent, or

2. The percentage of households below the poverty level in an environmental impact site is significantly greater (typically at least 20 percentage points) than the low-income population percentage in the geographic area chosen for comparative analysis.

The same geographic area used in Subsection 2.5.4.2 is used for this analysis. The census data for poverty status are used for this analysis. The US Census Bureau determines poverty status by comparing a person's total family income, family size, and composition to a poverty threshold matrix. The poverty matrix contains 48 thresholds arranged by family size and number of children. Anyone meeting the matrix criteria for poverty is counted as an individual in poverty. To calculate household poverty data, only the householder and related individuals are considered. Anyone who is not related by marriage or birth to the householder is not included. To achieve a more conservative estimate, the census-defined “individuals below poverty level” data were used rather than the “households below poverty level” data.

Using the state geographic area criteria, 176 census block groups (15.7 percent) of the 1119 census block groups within the region have low-income populations that meet the conditions described above (Figure 2.5-19). Table 2.5-25 shows the percentage census block groups in the region that have low-income populations that meet the criteria. Within the vicinity there are no block groups that meet the conditions as shown in Table 2.5-26.

2.5.4.4 Subsistence Populations

Based upon the demographic (local and regional) and environmental justice analyses set forth in NUREG-1555, Luminant is not aware of any unusual resource dependencies or practices, or other circumstances, that could result in disproportionate impacts to minority or low-income populations. Indeed, the foregoing analysis suggests that such disproportionate impacts are unlikely given the observed distribution of low-income and minority populations within the site, vicinity and region. SOC-13

Specifically, based on the U.S. Census data, Luminant identified no low-income populations within the site vicinity (Figure 2.5-19), where potential plant-related impacts (which have been found to be generally SMALL) would be expected to be most significant. Moreover, as reflected in Figures 2.5-18 and 2.5-19, minority and low-income populations were identified within the region and located principally within urban areas, where subsistence type dependence on natural resources (e.g., fish, game, agricultural products, and natural water sources) is less likely. To the extent that fishing, hunting, and agriculture occur in the vicinity of the CPNPP site, they appear to be recreational in nature. SOC-13

~~Letters have been sent, as of January 2007, to Native American councils representing tribes within the CPNPP region. No concerns have been expressed by the contacted Native American tribes to date.~~

2.5.4.5 Migrant Populations

Information on migrants is difficult to collect and evaluate. The most recent data source for this information is the 2002 Census of Agriculture. Farm operators were asked whether any hired or contract workers were migrant workers. A migrant worker is defined as a farm worker whose employment required travel that prevented the worker from returning to his permanent place of residence the same day. Migrants tend to work short-duration, labor-intensive jobs such as harvesting fruits and vegetables. Table 2.5-27 provides information on farms in the region that employ migrant labor (USDA 2002a), (USDA 2002b). Based on Table 2.5-27 migrant labor is not a significant part of agriculture in the CPNPP region with workers numbering less than one percent of the total permanent population in the same area. Thus, the presence of migrant workers is negligible.

2.5.5 NOISE

An ambient noise survey was conducted at the CPNPP site in February of 2007. CPNPP is currently an operational nuclear power facility. Noise sources during operation include heating, ventilation and air-conditioning systems, vents, transformers and electrical equipment, transmission lines and switch yards, water pumps, material-handling equipment, motors, public address systems, maintenance vehicles (fork lifts, tractors, trucks, etc.), warning sirens, trucks and vehicular traffic. Many of the noise sources are confined indoors, underground, or are used infrequently. A firearms shooting range is also located on-site, away from the main portion of the facility, but can create sporadic noise during times weapons are fired.

Other noise generated on-site is from natural sources such as wind through foliage, wildlife, and insects. Noise generated outside of the fence line from nearby off-site sources includes, residential activities (near locations 1 and 2), traffic along the western fence line (plant entrance), and boats near the swim beach at the northern fence line (location 15) (Figure 2.5-20).

Nearby locations with potential sensitivity to noise were identified from the ambient noise survey as well as site reconnaissance conducted in 2007. Receptors were reviewed within a 10-mi radius of the site and include the nearest residences and meeting places: location 23 (south fence line), location 1 and location 17 (near the east fence line), Post Oak Memorial Chapel and cemetery (location 25), Freedom Church (location 40), and Happy Hill Children’s Home (location 30). The nearest residence (location 1) is approximately 0.8 mi southwest of the center point. Recreation locations were also selected such as the swim beach on the north side of SCR, now closed to the public (location 2). No sensitive receptors, except for wildlife and migratory birds, were located within the fence line of the facility. The nearby residences are located across residential activities (near locations 1 and 2), traffic along the western fence line (plant entrance), and boats near the swim beach at the northern fence line (location 15) (Figure 2.5-20).

Nearby locations with potential sensitivity to noise were identified from the ambient noise survey as well as site reconnaissance conducted in 2007. Receptors were reviewed within a 10-mi radius of the site and include the nearest residences and meeting places: location 23 (south fence line), location 1 and location 17 (near the east fence line), Post Oak Memorial Chapel and cemetery (location 25), Freedom Church (location 40), and Happy Hill Children's Home (location 30). The nearest residence (location 1) is approximately 0.8 mi southwest of the center point. Recreation locations were also selected such as the swim beach on the north side of SCR, now closed to the public (location 2). No sensitive receptors, except for wildlife and migratory birds, were located within the fence line of the facility. The nearby residences are located across SCR and to the south-southwest of the fence line. Noise is attenuated with distance for the residences to the south-southwest because trees with foliage, ground cover, earthen berms, and other natural features act to 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 (location 2) as it would be by natural methods. All these residences are located at a substantial distance that is unaffected by proposed additional CPNPP noise.

The ambient noise survey was conducted within an 5-mi radius of the site and along extant transmission lines. The report concluded that the fence line (locations 1, 2, 3, and 15) and off-site 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 and 70 (traffic) dBA (daytime) and between 36 and 60 dBA (nighttime). Average equivalent sound levels (Leq) measured between 36 and 55 dBA (daytime) and from 37 to 55 (nighttime). These measurements for the day-night average (Ldn) are similar to expected levels for the day-night time average in a rural area ranging from 50 to 55 Ldn.

Subsection 2.5.3 references historic properties within a 10-mi radius of the site boundaries. Historic properties are located within 1.2 mi of an extant transmission line. Historic properties should not be impacted by operational noise from the site or extant transmission line noise. Historic properties are located at a sufficient distance from noise sources that noise levels would attenuate to below background levels or ambient noise levels at the historic sites.

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expected wind speed based on a 2-degree longitude and latitude box centered on the CPNPP site is given below with the associated probabilities.

Probability	Expected maximum tornado wind speed (mph)	Upper limit (95 percent) of the expected tornado wind speed (mph)
10^{-5}	168	176
10^{-6}	225	233
10^{-7}	275	283

In the area north of about the 34-degrees north latitude, there is a greater frequency of large tornadoes with wide paths and long trajectories.

Based on the approximately 56-year period of record from 1950 to 2006, the mean seasonal and annual number of tornado occurrences for the area around the site is (NOAA 2008):

Winter	0.14	Summer	0.37
Spring	1.73	Autumn	0.57
Annual	2.81		

Waterspouts are common along the southeast U.S. coast, especially off southern Florida and the Keys and can happen over seas, bays, and lakes worldwide. Water spouts are not expected to occur at the CPNPP site because the only nearby bodies of water are Squaw Creek Reservoir (SCR) and Lake Granbury. The small size of these lakes does not produce the conditions conducive to waterspouts.

2.7.1.2.4 Thunderstorms

Thunderstorms, from which damaging local weather can develop (tornadoes, hail, high winds, and flooding), occur about 16~~8~~ days each year based on data from the counties surrounding the site (NOAA 2008). The maximum frequency of thunderstorms and high wind events occurs from April to June, while the months November through February have few thunderstorms. The ~~monthly and regional~~ distribution of thunderstorms and high wind events are displayed by county in Table 2.7-11. MET-03

2.7.1.2.5 Lightning

Data on lightning strike density are becoming more readily available due to the National Lightning Detection Network (NLDN), which has measured cloud-to-ground (CG) lightning for the contiguous United States since 1989. Prior to the availability of these data, isokeraunic maps of thunderstorm days were used to predict the relative incidence of lightning in a particular region. A general rule, based on a large amount of data from around the world, estimates the earth flash mean density to be from 1 to 2 cloud-to-ground flashes per 10 thunderstorm days/km^{2}r (IAEA 2003). The annual mean number of thunderstorm days in the site area is conservatively precipitation and minimum temperatures as a surrogate for winter ice storms or as a measure of potential winter ice storms. Daily precipitation data were used in the analysis if the precipitation equaled or exceeded 0.25 in and the minimum temperature for that day and the previous day were below 33°F. The assumption was that if the minimum temperature were below 33°F for the previous and current day, then precipitation would likely occur as ice or freezing rain resulting in a winter ice storm (NCTCOG 2004). These results may have resulted in an over estimate of ice thickness when compared to actual observations. These results should provide an upper bound to the actual ice thickness.

The density of the snowpack varies with age and the conditions to which it has been subjected. Thus, the depth of the snowpack is not a true indication of the pressure the snowpack exerts on the surface it covers. Due to the variable density in snowpack, a more useful statistic for estimating the snowpack pressure is the water equivalent (in inches) of the snowpack.

Texas is not a heavy snow load region. ANSI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures,” (ASCE 2005) identifies that the ground snowload for the CPNPP area is 4 lbf/ft^2 based on a 50-year recurrence. This amount is converted to a 100-year recurrence weight of 4.9 lbf/ft^2 (psf) using a factor of 1.22 (1/0.82) taken from ANSI/ASCE 7-05 Table C7-3. Local snow measurements support this ANSI/ASCE 7-05 value.

To estimate the weight of the 100-year snowpack at the CPNPP site, the maximum reported snow depths at the Dallas Fort Worth Airport was determined. Table 2.7-2 shows that the greatest snow depth over the 30-year record is 8 in. The 100-year recurrence snow depth is 11.2 in using a factor of 1.4 to convert from a 30-year recurrence interval to 100-year interval (ASCE 2005). MET-04

Freshly fallen snow has a snow density (the ratio of the volume of melted water to the original volume of snow) of 0.07 to 0.15, and glacial ice formed from compacted snow has a maximum density of 0.91 (Huschke 1959). In the CPNPP site area, snow melts and evaporates quickly, usually within 48 hr, and before additional snow is added. The water equivalent of the snowpack can be considered equal to the water equivalent of the falling snow as reported hourly during the snowfall. A conservative estimate of the water equivalent of snowpack in the CPNPP site area would be 0.20 in of water per inch of snowpack. Then, the water equivalent of the 100-year return snowpack would be 11.2 in of snowpack x 0.2 in of water equivalent/inch of snowpack = 2.24 in of water.

Because 1 cubic inch of water is approximately 0.0361 pounds in weight, a 1-in water equivalent snowpack would exert a pressure of 5.20 pounds per square foot (0.0361 lb/cu in x 144 sq in). For the 100-year return snowpack, the water equivalent would exert a pressure of 11.7 pounds per square foot (5.20 lbm/sq ft/in x 2.24 in). This very conservative estimate is approximately twice the value provided in ANSI-ANS 7-05.

The 100-year return period snow and ice pack for the area in which the plant is located, in terms of snow load on the ground and water equivalent, is listed below:

- Snow Load = 11.7 lb/ft^2

2.7.2 LOCAL METEOROLOGY

2.7.2.1 Normal and Extreme Values of Meteorological Parameters

The CPNPP site is located approximately equidistant between Cleburne and Stephenville, west of the Brazos River. The site elevation is approximately 810 ft msl. The terrain slopes gradually from 300 to 700 ft msl southeast of the site to 1200 to 1800 ft msl northwest of the site (CPSES 2007).

2.7.2.1.1 General

In this section, the normal and extreme statistics of wind, temperature, water vapor, precipitation, fog, and atmospheric stability are described. Long-term data from proximal weather stations (Figure 2.7-7) have been used to supplement the shorter-term on-site data.

2.7.2.1.2 Surface Winds

Annually, the prevailing surface winds in the region are from the south to southeast while the average wind speed is about 10 mph based on site data from 2001-2004 and~~through~~ 2006. As MET-13 shown on Figures 2.7-8, 2.7-9, and 2.7-10, the annual resultant wind vectors for Dallas Fort Worth, Mineral Wells, and CPNPP are 149 degrees, 138 degrees, and 153 degrees, respectively. The annual average wind speeds for Dallas Fort Worth, Mineral Wells, and CPNPP are 10.3, 9.0, and 9.8 mph, respectively. In winter, there is a secondary wind direction maximum from the north to northwest due to frequent outbreaks of polar air masses (Mineral Wells and CPNPP wind rose Figures 2.7-62, 2.7-63, 2.7-64, 2.7-65, 2.7-66, 2.7-67, 2.7-68, 2.7-69, 2.7-70, 2.7-71, 2.7-72, 2.7-73, 2.7-74, 2.7-75, 2.7-76, 2.7-77, 2.7-78, 2.7-79, 2.7-80, 2.7-81, 2.7-82, 2.7-83, 2.7-84, 2.7-85, 2.7-86, 2.7-87, 2.7-88, 2.7-89, 2.7-90, 2.7-91, 2.7-92, 2.7-93, 2.7-94, 2.7-95, 2.7-96, 2.7-97, 2.7-98, 2.7-99, 2.7-100, 2.7-101, 2.7-102, 2.7-103, 2.7-104, 2.7-105, and 2.7-106).

Percentage frequencies of surface wind direction, by wind speed, at the Dallas Fort Worth airport for the years 1997 – 2006 are shown on a monthly and annual basis in Tables 2.7-20, 2.7-21, 2.7-22, 2.7-23, 2.7-24, 2.7-25, 2.7-26, 2.7-27, 2.7-28, 2.7-29, 2.7-30, 2.7-31 and 2.7-32. According to the annual table, surface wind directions at the Dallas Fort Worth airport are from the southeast, south-southeast, and south 43 percent of the time. These directions predominate during the individual months also, but to a lesser extent during November – March. The annual average wind speed (shown in Table 2.7-32) is 10.3 mph. The maximum average wind speed (12.7 mph) occurs in the spring, while the minimum (8.2 mph) occurs in the fall.

Percentage frequencies of surface wind direction, by wind speed, at the Mineral Wells Airport for the years 2001 – 2006 are shown on a monthly and annual basis in Tables 2.7-33, 2.7-34, 2.7-35, 2.7-36, 2.7-37, 2.7-38, 2.7-39, 2.7-40, 2.7-41, 2.7-42, 2.7-43, 2.7-44 and 2.7-45. According to the annual table, Table 2.7-45, surface wind directions at the Mineral Wells Airport are from the southeast, south-southeast, south, and south-southwest 41 percent of the time. These directions predominate during the individual months also, but to a lesser extent during November – March. The annual average wind speed (shown in Table 2.7-45) is 8.81 mph. The maximum average monthly wind speed (10.73 mph) occurs in the spring, while the minimum (7.32 mph) occurs in the late summer.

1902 – 2005 are shown on Figure 2.7-55. The range of the monthly mean maximum temperature over the period of record (1897 – 2005) for Dublin is shown on Figure 2.7-56, and the monthly mean and monthly mean minimum temperatures for Dublin are shown on Figures 2.7-57 and 2.7-58, respectively. The annual mean of the monthly mean maximum temperature for Dublin over the period of record (1897 – 2005) is shown on Figure 2.7-111. This figure shows that the annual mean of the monthly mean maximum temperature varied from approximately 73°F to 78°F over the last 111 years. The annual mean of the monthly mean for Dublin shown on Figure 2.7-112 shows that the annual mean has varied from about 62°F to 66°F over the last 45 years. The annual mean before 1960 was slightly higher. The variation of the annual mean of the monthly mean minimum temperature at Dublin (Figure 2.7-113) over the same time period (1897 – 2005) is less consistent showing a downward trend in temperature to a range of 51°F – 54°F in the last 45 years.

The monthly minimum, mean, and maximum temperatures for Weatherford for the 1896 – 2005 time period are shown on Figure 2.7-114. The annual average minimum, mean, and maximum temperatures for Weatherford over the period 1897 – 2005 are shown on Figure 2.7-115. The range of the monthly mean maximum temperature over the period of record (1897 – 2005) for Weatherford is shown on Figure 2.7-116, and the monthly mean and monthly mean minimum temperatures for Weatherford are shown on Figures 2.7-117 and 2.7-118, respectively. The annual mean of the monthly mean maximum temperature for Weatherford over the period of record (1897 – 2005) is shown on Figure 2.7-119. This figure shows that the annual mean of the monthly mean maximum temperature varied from approximately 74°F to 78°F over the last 70 years. The annual mean of the monthly mean for Weatherford, Figure 2.7-120, shows that the annual mean has varied from about 62°F to 66°F over the last 45 years. The annual mean before 1960 was slightly higher. The variation of the annual mean of the monthly minimum temperature at Weatherford (Figure 2.7-121) over the same time period (1897 – 2005) is less consistent showing a downward trend in temperature to a range of 49°F – 54°F in the last 45 years.

The monthly minimum, mean, and maximum temperatures at the site are shown in Table 2.7-85. The annual daily mean at the CPNPP site is 67°F, which is only slightly higher than the regional data. The monthly mean, minimum, and maximum temperatures at the CPNPP site over the time period of 2001-2004 and ~~–~~2006 are shown on Figure 2.7-122. The monthly mean, minimum, and maximum temperatures at Mineral Wells over the time period of 1971 – 2000 are shown on Figure 2.7-123. Comparison of the site data from Figure 2.7-122 with the Mineral Wells data in Figure 2.7-123 shows good general agreement but with relatively higher winter temperatures reported at the CPNPP site. These data are due to the shorter period of record at the CPNPP site. The daily mean, minimum, and maximum temperatures at Mineral Wells over the time period of 1971 – 2000 are shown on Figure 2.7-124. MET-13

2.7.2.1.4 Water Vapor

Monthly and annual average relative humidity for four different times of day is given in Table 2.7-86 from 10 years of record at the Dallas Fort Worth Airport weather station. Based on these data, the annual average relative humidity is estimated to be about 65 percent. Monthly and annual average relative humidity for four different times of day is given in Table 2.7-87 from 5 years of record at the Mineral Wells Airport. Based on these data, the annual average relative humidity at Mineral Wells is estimated to be about 69 percent. The monthly and annual mean dew point temperatures and extreme maximum and minimum dew point temperatures are shown in Table MET-04 in the early 1900s. The data for Weatherford in Figure 2.7-128 are considered to be more representative of the general regional conditions with an annual average of about 30 in.

Monthly, seasonal, and annual precipitation wind roses for Mineral Wells are presented in Figures 2.7-133, 2.7-134, 2.7-135, 2.7-136, 2.7-137, 2.7-138, 2.7-139, 2.7-140, 2.7-141, 2.7-142, 2.7-143, 2.7-144, 2.7-145, 2.7-146, 2.7-147, 2.7-148, and 2.7-149. These data are based on 6 years of data at Mineral Wells Airport. These data show that the highest incidence of precipitation occurred with winds from the north. The monthly, seasonal, and annual precipitation wind roses for CPNPP for the years 2001, 2003, and 2006 presented in Figures 2.7-150, 2.7-151, 2.7-152, 2.7-153, 2.7-154, 2.7-155, 2.7-156, 2.7-157, 2.7-158, 2.7-159, 2.7-160, 2.7-161, 2.7-162, 2.7-163, 2.7-164, 2.7-165, and 2.7-166 show the same pattern as the Mineral Wells data. The annual precipitation wind rose for Dallas Fort Worth Airport presented on Figure 2.7-167 also shows the maximum frequency of precipitation occurred with north winds.

Snow and sleet occur from December through March with an occasional snow flurry in late November or early April. Monthly and annual average totals of snow from 30 years of record at the Dallas Fort Worth Airport, Dallas Love Field, Mineral Wells, and Glen Rose are provided in Tables 2.7-2, 2.7-3, 2.7-4, and 2.7-5, respectively. These data give an annual expectancy of 2.5 in of snow. Extremes of snowfall at these selected stations were also previously presented in Tables 2.7-2, 2.7-3, 2.7-4, and 2.7-5.

2.7.2.1.6 Fog

Heavy fog reduces visibility to 0.25 mi or less. Average monthly and annual number of heavy fog days based on 10 years of data at the Dallas Fort Worth Airport is presented in Table 2.7-102. These data indicate that most (63 percent) of the heavy fog days occur in winter with a few occurrences during the remainder of the year. The annual average hours of fog were 16.2 hr. Average monthly and annual number of heavy fog days based on 6 years of data at the Mineral Wells Airport presented in Table 2.7-103 also show that winter produces the highest hours of fog, although the annual hours of fog at Mineral Wells is higher (46.7 hr).

2.7.2.1.7 Atmospheric Stability

Based on data for the period 2001 – 2004, and 2006 at the CPNPP site, the monthly and annual frequency distributions of stability classes are shown in Table 2.7-104. The stability classes are based on the standard Pasquill classification using the 10 – 60 m temperature differential. These data indicate that the frequency of stable classes reaches a peak during the fall and winter. The stable classes (F and G) only account for less than 10 percent of the total hours. The neutral (class D) and slightly stable (class E) account for almost 70 percent of the annual hours.

The CPNPP joint frequency distribution for each stability category is provided in Table 2.7-105. The upper bounds for each wind speed category are ≤0.5 m/s, ≤0.75 m/s, ≤1.0 m/s, ≤1.25 m/s, ≤1.5 m/s, ≤2.0 m/s, ≤3.0 m/s, ≤4.0 m/s, ≤5.0 m/s, ≤6.0 m/s, ≤8.0 m/s, and ≤16.0 m/s. For the years of data under consideration, there were no hourly recordings of wind speeds greater than 16.0 m/s. In this table, calms were classified as hourly average wind speeds below the vane or anemometer starting speed, whichever is higher. According to the meteorological tower instrumentation data given in Table 2.3~~7~~-34 of the CPNPP Units 1 and 2 FSAR (CPSES 2007), MET-11

2.7.3 SHORT-TERM ATMOSPHERIC DISPERSION ESTIMATES FOR ACCIDENT RELEASES

2.7.3.1 Objective

The on-site meteorological data record at CPNPP site for the period 2001-2004 and —2006, has been used to calculate dilution factors that can be anticipated in the event of an accidental release of radionuclides into the atmosphere. The 2-hr dilution factors are calculated at the exclusion area boundary (EAB); for longer time periods the factors are calculated at the outer boundary of the low population zone (LPZ). MET-13

The consequence of a design basis accident in terms of personnel exposure is a function of the atmospheric dispersion conditions at the site of the potential release. Atmospheric dispersion consists of two components: 1) atmospheric transport due to organized or mean airflow within the atmosphere and 2) atmospheric diffusion due to disorganized or random air motions. Atmospheric diffusion conditions are represented by relative air concentration (χ/Q) values. This section describes the development of the short-term diffusion estimates for the site boundary and the low population zonecontrol room. MET-12

2.7.3.2 Calculations

The efficiency of diffusion is primarily dependent on winds (speed and direction) and atmospheric stability characteristics. As stated in Regulatory Guide 1.145 and NUREG/CR-2858, dispersion is rapid within stability classes A – D and much slower for classes E – G. That is, atmospheric dispersion capabilities decrease with progression from class A to class G, with an abrupt reduction from class D to class E.

As indicated in NUREG/CR 2858, relative concentrations of released gases, χ/Q values, as a function of direction for various time periods at the exclusion area boundary (EAB) and the outer boundary of the low population (LPZ), were determined by the use of the computer code PAVAN. This code implements the guidance provided in Regulatory Guide 1.145. The χ/Q calculations are based on the theory that material released to the atmosphere would be normally distributed (Gaussian) about the plume centerline. As stated in NUREG/CR 2858 and Regulatory Guide 1.145, a straight-line trajectory is assumed between the point of release and all distances for which χ/Q values are calculated.

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, PAVAN provides the χ/Q values as functions of direction for various time periods at the exclusion area boundary (EAB) and the low population zone (LPZ). The meteorological data needed for this calculation included wind speed, wind direction, and atmospheric stability. The meteorological data used for this analysis was collected from the on-site monitoring equipment from 2001 to 2006. Data recovery for 2005 was below 90 percent. Consequently this year of data was not used. The five years of data (2001 - 2004 and 2006) were averaged and the joint frequency distributions are reported in Table 2.7-105. Other plant specific data included tower height at which wind speed was measured (10.0 m) and distances to the EAB (0.5 mi) and LPZ (2 mi). The distances to the EAB, LPZ, and from the release boundary to the EAB are given in Table 2.7-119.

in that sector during the total time. The sector χ/Q values and the maximum sector χ/Q value are determined by effectively "plotting" the χ/Q versus probability of being exceeded and selecting the χ/Q value that is exceeded 0.5 percent of the total time. This same method is used to determine the five percent overall site χ/Q value.

As stated in Regulatory Guide 1.145, the χ/Q value for the EAB or LPZ boundary evaluations would be the maximum sector χ/Q or the 5 percent overall site χ/Q, whichever is greater.

Regulatory Guide 1.145 divides release configurations into two modes, ground release and stack release. A ground release includes all release points that are effectively lower than two and one-half times the height of the adjacent solid structures. This is conservative because the building wake effect would tend to reduce the calculated χ/Q. All release point would be considered as ground releases.

PAVAN requires the meteorological data in the form of joint frequency distributions of wind direction and wind speed by atmospheric stability class. The meteorological data used were obtained from the CPNPP site meteorological data collected from 2001-2004 ~~to~~and 2006. MET-13

The stability classes were based on the classification system given in U.S. Nuclear Regulatory Commission Regulatory Guide 1.23, Table 1 as follows:

Classification of Atmospheric Stability

Stability Classification	Pasquill Stability Category	Ambient Temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T < -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

Joint frequency distribution tables were developed from the meteorological data with the assumption that if data required as input to the PAVAN program (i.e., lower level wind direction, lower level wind speed, and temperature differential) were missing from the hourly data record, all data for that hour were discarded. Also, the data in the joint frequency distribution tables were rounded for input into the PAVAN code.

Building area is defined as the smallest vertical-plane cross-sectional area of the reactor building, in square meters. Building height is the height above plant grade of the containment structure used in the building-wake term for the annual-average calculations. For conservatism, the containment area is used in the determination of building-wake effects. A conservative building cross-sectional area of 2500 m^2 and a building height of 69.9 m were used for building wake calculations.

The tower height is the height at which the wind speed was measured. Based on the lower measurement location, the tower height used was 10 m.

As stated in Regulatory Guide 1.145, a ground release includes all release points that are effectively lower than two and one-half times the height of adjacent solid structures. Therefore, as stated above, a ground-release was assumed.

The median (50 percent) frequency of χ/Q at the EAB and LPZ can be found in Table 2.7-121. Median atmospheric dispersion estimates are used in making realistic estimates of the environmental effects of potential radiological accidents.

2.7.3.3 Representativeness and Topographic Effects

The on-site data are considered to be conservatively representative of meteorological conditions at the site. Topographic effects at the site were discussed in Subsection 2.7.2.2.3. The results were indicative of a flat terrain with no appreciable effects on short-term diffusion estimates.

2.7.4 LONG-TERM ATMOSPHERIC DISPERSION ESTIMATES FOR ROUTINE RELEASES

2.7.4.1 Objective

The on-site meteorological record is used to provide realistic estimates of annual average atmospheric dilution factors to a distance of 50 mi from the plant for use in calculating the dispersion through air pathways of radionuclides released in routine plant operations.

For a routine release, the concentration of radioactive material in the surrounding region depends on the amount of effluent released, the height of the release, the momentum and buoyancy of the emitted plume, the wind speed, atmospheric stability, airflow patterns of the site, and various effluent removal mechanisms. Annual average relative concentration, χ/Q, and annual average relative deposition, D/Q, for gaseous effluent routine releases were calculated.

2.7.4.2 Calculations

The average annual dilution factors that are applicable to routine venting or other routine gaseous-effluent releases have been evaluated from the data record using the technique presented in Regulatory Guide 1.111.

As stated in NUREG/CR-2919, the XOQDOQ Computer Program that implements the assumptions outlined in Regulatory Guide 1.111 developed by the U.S. Regulatory Commission (NRC), was used to generate the annual average relative concentration, χ/Q, and annual average relative deposition, D/Q. Values of χ/Q and D/Q were determined at points of maximum potential concentration outside the site boundary, at points of maximum individual exposure, and at points within a radial grid of sixteen 22.5-degree sectors and extending to a distance of 50 mi. Radioactive decay and dry deposition were considered.

Meteorological data for the period from 2001-2004 ~~through~~and 2006 were used, and receptor locations were determined from the locations given in the current land-use census. An assumed MET-13 (centered on true north, north-northeast, northeast, etc.) and extending to a distance of 80 km (50 mi) from the station were determined. A set of data points were located within each sector at increments of 0.4 km (0.25 mi) to a distance of 1.6 km (1 mi) from the plant, at increments of 0.8 km (0.5 mi) from a distance of 1.6 km (1 mi) to 8 km (5 mi), at increments of 4 km (2.5 mi) from a distance of 8 km (5 mi) to 16 km (10 mi), and at increments of 8 km (5 mi) thereafter to a distance of 80 km (50 mi). Estimates of χ/Q (undecayed and undepleted; depleted for radioiodines) and D/Q radioiodines and particulates is provided at each of these grid points.

The results of the analysis, based on five years of on-site data, are presented in Table 2.7-122, Table 2.7-123, Table 2.7-124, Table 2.7-125, Table 2.7-126, Table 2.7-127, and Table 2.7-128.

Annual average undecayed and undepleted dilution factors to a distance of 50 mi from the plant are shown in Table 2.7-122. The maximum value at the actual EAB is 5.5 x 10^{-6} s/m^3 and occurs north-northwest of the plant at a distance of 0.37 mi. There are no higher values beyond the site boundary because for ground level releases, concentrations monontonically decrease from the release point to all locations downwind. Annual average undecayed and undepleted dilution and deposition factors for special off-site receptor locations are given in Table 2.7-124.

2.7.4.3 Evaporation Pond MET-14

An additional CPNPP Units 3 and 4 gaseous release source is the evaporation pond (EP). The purpose of the EP is to prevent tritium concentration in the Squaw Creek Reservoir (SCR) from exceeding the limit described in the existing CPNPP Offsite Dose Calculation Manual (ODCM) , Revision 26, due to tritium discharge from Units 3 & 4. The EP decrease the level of tritium discharge into the SCR by accepting liquid wastes, including tritium, from the liquid waste management system (LWMS) and evaporating the liquid wastes by natural processes. The atmospheric transport and dispersion of radioactive materials, in the form of aerosols, vapors, or gases, released from the EP are discussed below.

The χ/Q and D/Q values for the evaporation pond are determined at points of potential maximum concentration, outside the site boundary, at points of maximum individual exposure and at points within a radial grid of sixteen 22.5° sectors extending to a distance of 50 miles. Radioactive decay and dry deposition are considered. The atmospheric dispersion calculation uses meteorological data collected at CPNPP for the five-year period beginning January 1, 2001 and ending December 31, 2006, excluding January 1 through December 31 of 2005.

The evaporation pond is located approximately 0.4 mi southwest of CPNPP Units 3 and 4 power blocks. Given the distance from the power block, the effects of building wake are conservatively neglected in the atmospheric dispersion analysis. Consistent with the guidance of Regulatory Guide 1.111, a ground level release mode is used. The release elevation of the EP is 0.0 m relative to the plant grade. The evaporation pond has a surface area of approximately one acre. Although the evaporation pond is a diffuse area source, in the atmospheric dispersion evaluation, it is assumed to be a point source. This assumption is conservative since for a given release rate, a ground level point source has a higher concentration than a ground level diffuse area source at the release location and locations downwind. Near ground level releases usually produce concentrations that decrease from the release point to all locations downwind. Therefore, for distant receptors, the assumption of a point source results in conservatively high relative concentrations.

Distances from the center of the evaporation pond to the closest point on the EAB in each of the 16 compass directions are given in Table 2.7-129. The nearest receptor locations include residences or locations at which plants or animals that become food for the public may be exposed to either direct radiation or contamination. No milk or meat animals (cows or goats) were identified near the CPNPP based on the land use census presented in the CPNPP Annual Radiological Environmental Operating Report for 2006 (AREOR). For each of the 16 compass directions, the shortest distance from the center point of the evaporation pond to a receptor within a 45° angle centered on the compass direction was used. Because of this conservative methodology, the nearest garden is captured in both the ENE and E sectors instead of just the ENE sector (the direction relative to Units 1 & 2 given in the ODCM). The distances from the center point of the evaporation pond to the nearest receptor in each sector are given in Table 2.7-130. The XOQDOQ software (NUREG/CR-2919) was used to determine the EP atmospheric dispersion values. MET-04

From Table 2.7-248, the highest χ/Q and D/Q values for the EAB occur in the south sector and are 5.2×10^{-5} s/m3 and 2.7×10^{-7} m^{-2}, respectively. The maximum χ/Q value is not bounded by the EAB (annual average) value of 1.6×10^{-5} s/m3 given in Table 2.0-1 of the US-APWR Design Control Document (DCD). Table 2.0-1 also gives an EAB (annual average) D/Q value of 4.0×10^{-8} m^{-2}. The maximum site D/Q value is also not bounded by the DCD value. Table 2.7-131 gives the annual average χ/Q and D/Q values for no decay, undepleted, as well as 2.26 day decay, undepleted and 8.00 day decay, depleted.

There are no meat animals identified in the area surrounding the CPNPP site. Therefore, it is assumed that the χ/Q and D/Q values at any location of meat animals within five miles of the plant would be bounded by values determined at other receptors, and no specific χ/Q or D/Q values are provided.

2.7.5 REFERENCES

(ALA 2004) Extreme Ice Thicknesses from Freezing Rain. American Lifelines Alliance, a public-private partnership between the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). September 2004. www.americanlifelinesalliance.org.

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(ASCE 2005) Minimum Design Loads for Buildings and Other Structures. American Society of Civil Engineers, ANSI/ASCE 7-05.

(CPSES 2007) Final Safety Analysis Report (FSAR), Amendment 101. Comanche Peak Steam Electric Station, Texas Utilities Generation Company (TXU). Comanche Peak Steam Electric Station. Glen Rose, Texas. February 1, 2007.

TABLE 2.7-11
THUNDERSTORMS AND HIGH WIND EVENTS

Month	Bosque (#)	Erath (#)	Hood (#)	Johnson (#)	Somervell (#)	All Five Areas (#)	Average per Year (#/yr)
Jan	1	2	1	1		5	~~0.21~~0.19
Feb		2	2	6		10	~~0.42~~0.39
Mar	7	6	5	2	2	22	~~0.92~~0.86
Apr	10	15	6	19	7	57	~~2.38~~2.22
May	15	24	19	26	11	95	~~3.96~~3.70
Jun	14	22	21	23	13	93	~~3.88~~3.62
Jul	4	2	2	8	1	17	~~0.71~~0.66
Aug	3	2	8	15	5	33	~~1.38~~1.29
Sep	3	5	8	5	3	24	~~1.00~~0.94
Oct	6	5	6	13	2	32	~~1.33~~1.25
Nov	3		1	4	1	9	~~0.38~~0.35
Dec	1	2	2	6	1	12	~~0.50~~0.47
Total	67	87	81	128	46	409	~~17.04~~15.73
Percent	16.4%	21.3%	19.8%	31.3%	11.2%	100%	

MET-03

NOTES:

1. Storms listed at different sites in the same county on the same day were counted as separate events.
2. Data obtained for the period January 1, 1950 – July 31, 2006. Prior to 1981, the yearly storm averages were markedly less frequent, suggesting less thorough storm data collection. Consequently, the average/year was based on 1981 through 7/31/2006 data ~~(~24 years)~~. MET-13
3. CPNPP site is in Somervell County. The other counties listed surround Somervell County.
4. (NCDC 2008a) Data recorded in the NCDC Storm Event database. 1950 – 2005.

TABLE 2.7-85
CPNPP NORMAL TEMPERATURES

	Daily Minimum	Daily Mean	Daily Maximum
JAN	22.3	49.6	89.0
FEB	19.2	48.9	84.6
MAR	32.9	58.3	93.0
APR	49.4	69.2	100.2
MAY	47.5	75.2	98.9
JUN	65.0	80.3	100.2
JUL	72.7	84.9	103.1
AUG	66.6	85.1	105.0
SEP	56.8	77.4	97.8
OCT	42.3	68.4	93.2
NOV	28.0	58.0	88.0
DEC	18.6	50.8	78.5
Annual	43.4	67.2	94.3

NOTE:

1. CPNPP site data 2001-2004 –and 2006. MET-13

TABLE 2.7-86
RELATIVE HUMIDITY DALLAS FORT WORTH AIRPORT
FOR 4 TIME PERIODS PER DAY

MET-04

1997 – 2006

Time	00:00 - 06:00	06:00 - 12:00	12:00 - 18:00	18:00 - 24:00
Jan	76%	72%	56%	66%
Feb	78%	74%	58%	67%
Mar	76%	69%	54%	65%
Apr	76%	67%	52%	63%
May	80%	70%	55%	66%
Jun	80%	70%	54%	65%
Jul	72%	62%	44%	55%
Aug	69%	60%	43%	54%
Sep	72%	63%	45%	58%
Oct	77%	69%	52%	65%
Nov	78%	71%	54%	67%
Dec	75%	69%	53%	65%
Annual	76%	68%	52%	63%

NOTES:

1. (USHCN 2007) Station No. 03927.

TABLE 2.7-96
RAINFALL FREQUENCY DISTRIBUTION
DALLAS FORT WORTH AIRPORT

MET-04

NUMBER OF HR PER MONTH, AVERAGE YR

Rainfall (inch/hr)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.01-0.019	9	12	12	6	5	7	2	4	4	10	11	10
0.02-.099	16	25	15	10	11	15	4	7	8	14	16	18
0.10-0.249	5	6	6	5	6	4	2	3	3	6	4	6
0.25-0.499	1	2	2	2	2	2	1	1	1	2	2	2
0.50-0.99	0	1	1	1	2	1	1	1	0	1	0	0
1.00-1.99	0	0	1	0	1	0	0	0	0	0	0	0
2.0 & over	0	0	0	0	0	0	0	0	0	0	0	0
Total	32	45	35	24	26	29	10	15	16	34	33	37

NOTES:

1. Instances of "trace" precipitation were not counted in determining hours of precipitation.
2. (USHCN 2007) Station No. 03927.
3. Period of record is 10 years (1997 – 2006).

TABLE 2.7-99
PERCENT OF TOTAL OBSERVATIONS (BY MONTH) OF INDICATED WIND DIRECTIONS AND PRECIPITATION
DALLAS FORT WORTH AIRPORT

MET-04

Sector	January	February	March	April	May	June	July	August	September	October	November	December	Total
N	2.06	2.59	1.56	0.75	1.23	0.98	0.65	0.50	0.75	1.57	2.06	1.90	16.60
N-NE	0.76	1.12	0.80	0.56	0.53	0.45	0.20	0.37	0.56	0.61	0.81	1.09	7.87
NE	0.28	0.78	0.59	0.20	0.34	0.25	0.03	0.16	0.31	0.55	0.72	0.65	4.86
E-NE	0.67	0.81	0.78	0.39	0.30	0.41	0.05	0.28	0.25	0.45	0.64	0.78	5.80
E	1.06	1.18	1.42	0.59	0.67	0.59	0.27	0.36	0.64	0.62	0.51	0.64	8.56
E-SE	0.87	0.95	0.90	0.55	0.47	0.89	0.36	0.33	0.42	0.64	0.51	0.73	7.62
SE	0.64	1.11	0.95	0.84	0.65	1.00	0.41	0.31	0.23	0.90	0.69	0.55	8.28
S-SE	0.53	0.70	0.86	0.98	0.75	1.08	0.31	0.31	0.27	1.39	0.62	0.47	8.26
S	0.94	1.20	0.61	1.04	1.06	1.15	0.42	0.47	0.30	1.18	0.59	0.61	9.57
S-SW	0.27	0.19	0.31	0.30	0.28	0.34	0.19	0.25	0.12	0.22	0.20	0.22	2.88
SW	0.08	0.16	0.22	0.20	0.09	0.16	0.12	0.19	0.08	0.11	0.09	0.12	1.62
W-SW	0.08	0.14	0.14	0.16	0.09	0.11	0.08	0.11	0.08	0.16	0.11	0.17	1.42
W	0.09	0.14	0.25	0.30	0.16	0.19	0.05	0.23	0.22	0.22	0.19	0.30	2.32
W-NW	0.41	0.20	0.30	0.17	0.09	0.08	0.02	0.03	0.14	0.25	0.30	0.19	2.17
NW	0.42	0.41	0.64	0.37	0.27	0.19	0.09	0.08	0.20	0.55	0.67	0.53	4.41
N-NW	0.97	0.97	0.69	0.31	0.51	0.20	0.28	0.16	0.48	0.76	1.23	1.17	7.73
Total	10.12	12.64	11.01	7.72	7.50	8.06	3.54	4.13	5.05	10.18	9.95	10.12	100

NOTES:

1. Instances of "trace" precipitation were counted as precipitation.
2. (USHCN 2007) Station No. 03927.
3. Period of record is 10 years (1997 – 2006).

TABLE 2.7-129 DISTANCES, IN METERS, FROM THE CENTER POINT OF THE EVAPORATION POND TO THE NEAREST BOUNDARY OF THE EAB IN EACH SECTOR

MET-14

Sector	EAB Distance
S	122
SSW	122
SW	145
WSW	156
W	203
WNW	295
NW	486
NNW	822
N	1205
NNE	1436
NE	1697
ENE	1413
E	874
ESE	434
SE	255
SSE	185

MET-14

TABLE 2.7-130 DISTANCES, IN METERS, FROM THE CENTER POINT OF THE EVAPORATION POND TO THE NEAREST RECEPTOR (RESIDENCE OR GARDEN) IN EACH SECTOR

Sector	Nearest Residence	Nearest Garden
S	1073	-
SSW	493	-
SW	493	-
WSW	493	-
W	1328	-
WNW	1328	-
NW	3472	-
NNW	3723	-
N	3927	-
NNE	3927	-
NE	4621	-
ENE	4621	5265
E	4680	5265
ESE	2995	-
SE	2565	-
SSE	1073	-

MET-14

TABLE 2.7-131 (Sheet 1 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR NO DECAY, UNDEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

SECTOR	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	5.60E-06	1.62E-06	7.94E-07	4.87E-07	2.49E-07	1.56E-07	1.10E-07	8.20E-08	6.44E-08	5.23E-08	4.35E-08
SSW	4.50E-06	1.30E-06	6.36E-07	3.89E-07	1.99E-07	1.25E-07	8.75E-08	6.56E-08	5.15E-08	4.18E-08	3.48E-08
SW	3.31E-06	9.40E-07	4.57E-07	2.79E-07	1.42E-07	8.84E-08	6.16E-08	4.61E-08	3.61E-08	2.92E-08	2.43E-08
WSW	3.20E-06	9.11E-07	4.44E-07	2.71E-07	1.38E-07	8.61E-08	6.00E-08	4.48E-08	3.51E-08	2.84E-08	2.36E-08
W	4.60E-06	1.33E-06	6.53E-07	4.00E-07	2.05E-07	1.29E-07	9.07E-08	6.82E-08	5.36E-08	4.36E-08	3.64E-08
WNW	7.44E-06	2.16E-06	1.06E-06	6.50E-07	3.35E-07	2.12E-07	1.50E-07	1.13E-07	8.92E-08	7.28E-08	6.10E-08
NW	1.52E-05	4.44E-06	2.19E-06	1.34E-06	6.97E-07	4.43E-07	3.14E-07	2.38E-07	1.89E-07	1.55E-07	1.30E-07
NNW	1.89E-05	5.52E-06	2.72E-06	1.67E-06	8.65E-07	5.50E-07	3.90E-07	2.95E-07	2.34E-07	1.92E-07	1.61E-07
N	1.32E-05	3.81E-06	1.86E-06	1.14E-06	5.91E-07	3.75E-07	2.66E-07	2.01E-07	1.59E-07	1.30E-07	1.09E-07
NNE	1.21E-05	3.51E-06	1.72E-06	1.06E-06	5.53E-07	3.55E-07	2.54E-07	1.94E-07	1.55E-07	1.28E-07	1.08E-07
NE	1.07E-05	3.13E-06	1.52E-06	9.39E-07	4.92E-07	3.17E-07	2.27E-07	1.74E-07	1.39E-07	1.15E-07	9.73E-08
ENE	8.34E-06	2.42E-06	1.17E-06	7.24E-07	3.82E-07	2.47E-07	1.78E-07	1.37E-07	1.10E-07	9.10E-08	7.72E-08
E	4.43E-06	1.29E-06	6.27E-07	3.87E-07	2.04E-07	1.32E-07	9.49E-08	7.28E-08	5.84E-08	4.83E-08	4.10E-08
ESE	5.92E-06	1.73E-06	8.41E-07	5.20E-07	2.73E-07	1.76E-07	1.27E-07	9.71E-08	7.78E-08	6.43E-08	5.45E-08
SE	7.68E-06	2.24E-06	1.09E-06	6.74E-07	3.53E-07	2.27E-07	1.63E-07	1.24E-07	9.94E-08	8.20E-08	6.93E-08
SSE	4.38E-06	1.26E-06	6.16E-07	3.77E-07	1.93E-07	1.22E-07	8.56E-08	6.44E-08	5.07E-08	4.13E-08	3.45E-08

TABLE 2.7-131 (Sheet 2 of 3) MET-14

ANNUAL AVERAGE χ/Q (S/M^3) FOR NO DECAY, UNDEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

SECTOR	5	7.5	10	15	20	25	30	35	40	45	50
S	3.70E-08	1.99E-08	1.29E-08	7.01E-09	4.59E-09	3.31E-09	2.54E-09	2.03E-09	1.67E-09	1.41E-09	1.21E-09
SSW	2.96E-08	1.60E-08	1.04E-08	5.68E-09	3.73E-09	2.70E-09	2.08E-09	1.67E-09	1.38E-09	1.17E-09	1.00E-09
SW	2.06E-08	1.11E-08	7.15E-09	3.91E-09	2.57E-09	1.86E-09	1.44E-09	1.15E-09	9.54E-10	8.08E-10	6.97E-10
WSW	2.00E-08	1.07E-08	6.92E-09	3.77E-09	2.47E-09	1.79E-09	1.37E-09	1.10E-09	9.08E-10	7.67E-10	6.60E-10
W	3.10E-08	1.68E-08	1.09E-08	6.00E-09	3.95E-09	2.87E-09	2.21E-09	1.77E-09	1.47E-09	1.24E-09	1.07E-09
WNW	5.20E-08	2.85E-08	1.87E-08	1.04E-08	6.93E-09	5.06E-09	3.92E-09	3.16E-09	2.62E-09	2.23E-09	1.93E-09
NW	1.11E-07	6.16E-08	4.07E-08	2.29E-08	1.53E-08	1.12E-08	8.73E-09	7.06E-09	5.88E-09	5.01E-09	4.34E-09
NNW	1.38E-07	7.62E-08	5.04E-08	2.83E-08	1.89E-08	1.39E-08	1.08E-08	8.73E-09	7.27E-09	6.19E-09	5.36E-09
N	9.37E-08	5.19E-08	3.44E-08	1.94E-08	1.30E-08	9.59E-09	7.48E-09	6.07E-09	5.07E-09	4.32E-09	3.76E-09
NNE	9.28E-08	5.25E-08	3.53E-08	2.04E-08	1.39E-08	1.03E-08	8.12E-09	6.64E-09	5.58E-09	4.79E-09	4.18E-09
NE	8.39E-08	4.78E-08	3.23E-08	1.88E-08	1.28E-08	9.58E-09	7.56E-09	6.19E-09	5.21E-09	4.48E-09	3.92E-09
ENE	6.68E-08	3.84E-08	2.62E-08	1.54E-08	1.06E-08	7.95E-09	6.31E-09	5.19E-09	4.39E-09	3.79E-09	3.32E-09
E	3.54E-08	2.03E-08	1.38E-08	8.04E-09	5.52E-09	4.14E-09	3.27E-09	2.69E-09	2.27E-09	1.95E-09	1.71E-09
ESE	4.70E-08	2.68E-08	1.82E-08	1.06E-08	7.23E-09	5.40E-09	4.27E-09	3.50E-09	2.95E-09	2.54E-09	2.22E-09
SE	5.97E-08	3.39E-08	2.28E-08	1.32E-08	8.99E-09	6.70E-09	5.28E-09	4.32E-09	3.63E-09	3.12E-09	2.72E-09
SSE	2.94E-08	1.60E-08	1.05E-08	5.81E-09	3.85E-09	2.81E-09	2.17E-09	1.75E-09	1.46E-09	1.24E-09	1.07E-09

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TABLE 2.7-131 (Sheet 3 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR NO DECAY, UNDEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

DIRECTION	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	8.40E-07	2.61E-07	1.11E-07	6.48E-08	4.37E-08	2.06E-08	7.24E-09	3.34E-09	2.04E-09	1.42E-09
SSW	6.73E-07	2.08E-07	8.87E-08	5.18E-08	3.50E-08	1.65E-08	5.86E-09	2.73E-09	1.67E-09	1.17E-09
SW	4.85E-07	1.48E-07	6.25E-08	3.63E-08	2.44E-08	1.14E-08	4.03E-09	1.88E-09	1.16E-09	8.10E-10
WSW	4.71E-07	1.44E-07	6.09E-08	3.53E-08	2.37E-08	1.11E-08	3.89E-09	1.80E-09	1.10E-09	7.69E-10
W	6.91E-07	2.15E-07	9.20E-08	5.40E-08	3.65E-08	1.73E-08	6.18E-09	2.89E-09	1.78E-09	1.24E-09
WNW	1.12E-06	3.51E-07	1.52E-07	8.97E-08	6.12E-08	2.94E-08	1.07E-08	5.10E-09	3.17E-09	2.23E-09
NW	2.31E-06	7.28E-07	3.18E-07	1.90E-07	1.30E-07	6.34E-08	2.35E-08	1.13E-08	7.09E-09	5.02E-09
NNW	2.88E-06	9.05E-07	3.95E-07	2.35E-07	1.61E-07	7.84E-08	2.90E-08	1.40E-08	8.76E-09	6.20E-09
N	1.98E-06	6.18E-07	2.69E-07	1.60E-07	1.10E-07	5.34E-08	1.99E-08	9.67E-09	6.09E-09	4.33E-09
NNE	1.82E-06	5.77E-07	2.57E-07	1.56E-07	1.08E-07	5.38E-08	2.08E-08	1.04E-08	6.66E-09	4.80E-09
NE	1.62E-06	5.14E-07	2.30E-07	1.40E-07	9.76E-08	4.89E-08	1.91E-08	9.63E-09	6.21E-09	4.49E-09
ENE	1.25E-06	3.98E-07	1.80E-07	1.10E-07	7.74E-08	3.93E-08	1.56E-08	8.00E-09	5.20E-09	3.79E-09
E	6.68E-07	2.13E-07	9.59E-08	5.87E-08	4.11E-08	2.07E-08	8.19E-09	4.16E-09	2.70E-09	1.96E-09
ESE	8.95E-07	2.85E-07	1.28E-07	7.82E-08	5.46E-08	2.74E-08	1.08E-08	5.43E-09	3.51E-09	2.54E-09
SE	1.16E-06	3.68E-07	1.65E-07	9.99E-08	6.95E-08	3.47E-08	1.35E-08	6.74E-09	4.33E-09	3.13E-09
SSE	6.53E-07	2.02E-07	8.68E-08	5.10E-08	3.46E-08	1.65E-08	5.97E-09	2.83E-09	1.76E-09	1.24E-09

MET-14

TABLE 2.7-132 (SHEET 1 OF 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR A 2.26 DAY DECAY, UNDEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

SECTOR	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	5.59E-06	1.61E-06	7.93E-07	4.86E-07	2.48E-07	1.56E-07	1.09E-07	8.15E-08	6.39E-08	5.18E-08	4.31E-08
SSW	4.50E-06	1.29E-06	6.34E-07	3.88E-07	1.98E-07	1.24E-07	8.69E-08	6.51E-08	5.11E-08	4.14E-08	3.45E-08
SW	3.31E-06	9.38E-07	4.56E-07	2.78E-07	1.41E-07	8.79E-08	6.12E-08	4.56E-08	3.57E-08	2.89E-08	2.39E-08
WSW	3.20E-06	9.09E-07	4.43E-07	2.70E-07	1.37E-07	8.55E-08	5.95E-08	4.44E-08	3.47E-08	2.80E-08	2.33E-08
W	4.59E-06	1.33E-06	6.52E-07	3.99E-07	2.04E-07	1.28E-07	9.00E-08	6.75E-08	5.30E-08	4.31E-08	3.59E-08
WNW	7.43E-06	2.15E-06	1.06E-06	6.48E-07	3.34E-07	2.11E-07	1.49E-07	1.12E-07	8.82E-08	7.19E-08	6.01E-08
NW	1.51E-05	4.43E-06	2.18E-06	1.34E-06	6.94E-07	4.41E-07	3.12E-07	2.36E-07	1.87E-07	1.53E-07	1.28E-07
NNW	1.89E-05	5.51E-06	2.71E-06	1.66E-06	8.59E-07	5.45E-07	3.85E-07	2.91E-07	2.30E-07	1.88E-07	1.58E-07
N	1.32E-05	3.81E-06	1.86E-06	1.14E-06	5.89E-07	3.73E-07	2.64E-07	2.00E-07	1.58E-07	1.29E-07	1.08E-07
NNE	1.20E-05	3.50E-06	1.71E-06	1.05E-06	5.47E-07	3.50E-07	2.50E-07	1.90E-07	1.51E-07	1.24E-07	1.05E-07
NE	1.07E-05	3.11E-06	1.51E-06	9.32E-07	4.87E-07	3.12E-07	2.23E-07	1.70E-07	1.36E-07	1.12E-07	9.40E-08
ENE	8.33E-06	2.42E-06	1.17E-06	7.21E-07	3.79E-07	2.45E-07	1.76E-07	1.35E-07	1.08E-07	8.96E-08	7.59E-08
E	4.42E-06	1.29E-06	6.24E-07	3.85E-07	2.02E-07	1.31E-07	9.37E-08	7.18E-08	5.75E-08	4.74E-08	4.01E-08
ESE	5.92E-06	1.72E-06	8.38E-07	5.17E-07	2.72E-07	1.75E-07	1.25E-07	9.59E-08	7.67E-08	6.32E-08	5.34E-08
SE	7.67E-06	2.24E-06	1.09E-06	6.72E-07	3.51E-07	2.26E-07	1.61E-07	1.23E-07	9.82E-08	8.09E-08	6.83E-08
SSE	4.38E-06	1.26E-06	6.15E-07	3.76E-07	1.93E-07	1.21E-07	8.51E-08	6.39E-08	5.03E-08	4.09E-08	3.41E-08

TABLE 2.7-132 (Sheet 2 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR A 2.26 DAY DECAY, UNDEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

MET-14

SECTOR	5	7.5	10	15	20	25	30	35	40	45	50
S	3.66E-08	1.96E-08	1.26E-08	6.79E-09	4.39E-09	3.13E-09	2.38E-09	1.88E-09	1.53E-09	1.28E-09	1.09E-09
SSW	2.93E-08	1.57E-08	1.01E-08	5.47E-09	3.55E-09	2.54E-09	1.93E-09	1.53E-09	1.25E-09	1.04E-09	8.87E-10
SW	2.03E-08	1.08E-08	6.94E-09	3.73E-09	2.42E-09	1.73E-09	1.31E-09	1.04E-09	8.47E-10	7.07E-10	6.01E-10
WSW	1.97E-08	1.05E-08	6.69E-09	3.58E-09	2.31E-09	1.64E-09	1.24E-09	9.80E-10	7.96E-10	6.63E-10	5.61E-10
W	3.05E-08	1.64E-08	1.06E-08	5.73E-09	3.71E-09	2.65E-09	2.01E-09	1.59E-09	1.29E-09	1.08E-09	9.15E-10
WNW	5.12E-08	2.79E-08	1.82E-08	9.95E-09	6.51E-09	4.67E-09	3.56E-09	2.83E-09	2.31E-09	1.93E-09	1.64E-09
NW	1.10E-07	6.04E-08	3.97E-08	2.21E-08	1.46E-08	1.05E-08	8.09E-09	6.46E-09	5.31E-09	4.46E-09	3.82E-09
NNW	1.35E-07	7.36E-08	4.81E-08	2.65E-08	1.73E-08	1.24E-08	9.48E-09	7.53E-09	6.16E-09	5.15E-09	4.39E-09
N	9.25E-08	5.09E-08	3.35E-08	1.86E-08	1.24E-08	8.97E-09	6.90E-09	5.52E-09	4.55E-09	3.83E-09	3.28E-09
NNE	8.97E-08	5.00E-08	3.31E-08	1.85E-08	1.23E-08	8.87E-09	6.80E-09	5.42E-09	4.44E-09	3.72E-09	3.18E-09
NE	8.07E-08	4.52E-08	3.00E-08	1.69E-08	1.12E-08	8.09E-09	6.20E-09	4.94E-09	4.05E-09	3.39E-09	2.89E-09
ENE	6.55E-08	3.73E-08	2.52E-08	1.45E-08	9.79E-09	7.22E-09	5.62E-09	4.54E-09	3.76E-09	3.19E-09	2.74E-09
E	3.46E-08	1.96E-08	1.31E-08	7.49E-09	5.03E-09	3.68E-09	2.84E-09	2.28E-09	1.88E-09	1.59E-09	1.36E-09
ESE	4.60E-08	2.60E-08	1.74E-08	9.89E-09	6.63E-09	4.85E-09	3.75E-09	3.01E-09	2.48E-09	2.09E-09	1.79E-09
SE	5.87E-08	3.30E-08	2.21E-08	1.25E-08	8.41E-09	6.17E-09	4.78E-09	3.85E-09	3.18E-09	2.69E-09	2.31E-09
SSE	2.90E-08	1.57E-08	1.02E-08	5.59E-09	3.66E-09	2.64E-09	2.02E-09	1.60E-09	1.32E-09	1.10E-09	9.42E-10

TABLE 2.7-132 (Sheet 3 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR A 2.26 DAY DECAY, UNDEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

MET-14

DIRECTION	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	8.39E-07	2.60E-07	1.10E-07	6.43E-08	4.33E-08	2.03E-08	7.01E-09	3.17E-09	1.89E-09	1.28E-09
SSW	6.72E-07	2.08E-07	8.81E-08	5.14E-08	3.46E-08	1.62E-08	5.65E-09	2.57E-09	1.54E-09	1.05E-09
SW	4.84E-07	1.48E-07	6.21E-08	3.59E-08	2.40E-08	1.12E-08	3.86E-09	1.75E-09	1.04E-09	7.09E-10
WSW	4.70E-07	1.44E-07	6.04E-08	3.49E-08	2.34E-08	1.08E-08	3.71E-09	1.66E-09	9.85E-10	6.65E-10
W	6.90E-07	2.14E-07	9.12E-08	5.34E-08	3.60E-08	1.69E-08	5.91E-09	2.68E-09	1.60E-09	1.08E-09
WNW	1.12E-06	3.49E-07	1.51E-07	8.88E-08	6.03E-08	2.87E-08	1.02E-08	4.72E-09	2.84E-09	1.94E-09
NW	2.31E-06	7.26E-07	3.16E-07	1.88E-07	1.29E-07	6.22E-08	2.27E-08	1.06E-08	6.49E-09	4.48E-09
NNW	2.87E-06	8.99E-07	3.90E-07	2.32E-07	1.58E-07	7.58E-08	2.72E-08	1.26E-08	7.56E-09	5.17E-09
N	1.97E-06	6.15E-07	2.67E-07	1.59E-07	1.09E-07	5.24E-08	1.91E-08	9.04E-09	5.54E-09	3.84E-09
NNE	1.81E-06	5.71E-07	2.53E-07	1.52E-07	1.05E-07	5.13E-08	1.90E-08	8.94E-09	5.44E-09	3.73E-09
NE	1.61E-06	5.08E-07	2.26E-07	1.36E-07	9.43E-08	4.64E-08	1.73E-08	8.16E-09	4.96E-09	3.40E-09
ENE	1.25E-06	3.96E-07	1.78E-07	1.09E-07	7.61E-08	3.82E-08	1.48E-08	7.26E-09	4.55E-09	3.19E-09
E	6.65E-07	2.11E-07	9.48E-08	5.77E-08	4.02E-08	2.00E-08	7.65E-09	3.70E-09	2.29E-09	1.59E-09
ESE	8.93E-07	2.83E-07	1.27E-07	7.70E-08	5.36E-08	2.66E-08	1.01E-08	4.88E-09	3.02E-09	2.09E-09
SE	1.16E-06	3.67E-07	1.63E-07	9.87E-08	6.85E-08	3.39E-08	1.28E-08	6.21E-09	3.86E-09	2.69E-09
SSE	6.52E-07	2.02E-07	8.63E-08	5.06E-08	3.42E-08	1.62E-08	5.76E-09	2.66E-09	1.61E-09	1.11E-09

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TABLE 2.7-133 (Sheet 1 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR AN 8.00 DAY DECAY, DEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

SECTOR	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	5.30E-06	1.48E-06	7.07E-07	4.26E-07	2.11E-07	1.29E-07	8.85E-08	6.51E-08	5.01E-08	4.00E-08	3.28E-08
SSW	4.26E-06	1.18E-06	5.66E-07	3.40E-07	1.69E-07	1.03E-07	7.07E-08	5.20E-08	4.01E-08	3.20E-08	2.63E-08
SW	3.14E-06	8.58E-07	4.07E-07	2.44E-07	1.20E-07	7.31E-08	4.98E-08	3.65E-08	2.81E-08	2.23E-08	1.83E-08
WSW	3.03E-06	8.31E-07	3.96E-07	2.37E-07	1.17E-07	7.11E-08	4.85E-08	3.55E-08	2.73E-08	2.17E-08	1.78E-08
W	4.35E-06	1.21E-06	5.82E-07	3.50E-07	1.74E-07	1.07E-07	7.33E-08	5.40E-08	4.17E-08	3.34E-08	2.74E-08
WNW	7.04E-06	1.97E-06	9.44E-07	5.69E-07	2.84E-07	1.75E-07	1.21E-07	8.95E-08	6.94E-08	5.57E-08	4.59E-08
NW	1.43E-05	4.05E-06	1.95E-06	1.18E-06	5.91E-07	3.67E-07	2.54E-07	1.89E-07	1.47E-07	1.18E-07	9.79E-08
NNW	1.79E-05	5.04E-06	2.42E-06	1.46E-06	7.34E-07	4.55E-07	3.15E-07	2.34E-07	1.82E-07	1.46E-07	1.21E-07
N	1.25E-05	3.48E-06	1.66E-06	1.00E-06	5.01E-07	3.10E-07	2.15E-07	1.59E-07	1.24E-07	9.98E-08	8.25E-08
NNE	1.14E-05	3.21E-06	1.53E-06	9.23E-07	4.68E-07	2.93E-07	2.05E-07	1.53E-07	1.20E-07	9.72E-08	8.08E-08
NE	1.01E-05	2.85E-06	1.36E-06	8.20E-07	4.17E-07	2.61E-07	1.83E-07	1.37E-07	1.08E-07	8.75E-08	7.28E-08
ENE	7.89E-06	2.21E-06	1.04E-06	6.33E-07	3.24E-07	2.04E-07	1.44E-07	1.08E-07	8.54E-08	6.96E-08	5.81E-08
E	4.19E-06	1.18E-06	5.58E-07	3.38E-07	1.73E-07	1.09E-07	7.66E-08	5.76E-08	4.54E-08	3.69E-08	3.08E-08
ESE	5.60E-06	1.58E-06	7.49E-07	4.54E-07	2.32E-07	1.46E-07	1.02E-07	7.69E-08	6.05E-08	4.91E-08	4.10E-08
SE	7.27E-06	2.05E-06	9.73E-07	5.90E-07	2.99E-07	1.88E-07	1.31E-07	9.85E-08	7.73E-08	6.27E-08	5.22E-08
SSE	4.14E-06	1.15E-06	5.49E-07	3.30E-07	1.64E-07	1.01E-07	6.92E-08	5.10E-08	3.95E-08	3.16E-08	2.60E-08

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TABLE 2.7-133 (Sheet 2 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR AN 8.00 DAY DECAY, DEPLETED FOR EACH 22.5° SECTOR AT THE DISTANCES (MILES) SHOWN AT THE TOP

SECTOR	5	7.5	10	15	20	25	30	35	40	45	50
S	2.75E-08	1.40E-08	8.59E-09	4.32E-09	2.65E-09	1.80E-09	1.31E-09	1.00E-09	7.91E-10	6.41E-10	5.30E-10
SSW	2.20E-08	1.12E-08	6.92E-09	3.49E-09	2.15E-09	1.47E-09	1.07E-09	8.21E-10	6.49E-10	5.27E-10	4.36E-10
SW	1.53E-08	7.75E-09	4.76E-09	2.40E-09	1.48E-09	1.01E-09	7.38E-10	5.65E-10	4.47E-10	3.63E-10	3.01E-10
WSW	1.49E-08	7.51E-09	4.60E-09	2.31E-09	1.42E-09	9.65E-10	7.03E-10	5.37E-10	4.24E-10	3.43E-10	2.84E-10
W	2.30E-08	1.18E-08	7.27E-09	3.68E-09	2.27E-09	1.55E-09	1.13E-09	8.67E-10	6.86E-10	5.56E-10	4.61E-10
WNW	3.86E-08	2.00E-08	1.25E-08	6.40E-09	3.98E-09	2.74E-09	2.01E-09	1.55E-09	1.23E-09	9.99E-10	8.29E-10
NW	8.26E-08	4.32E-08	2.72E-08	1.41E-08	8.82E-09	6.11E-09	4.51E-09	3.48E-09	2.77E-09	2.26E-09	1.88E-09
NNW	1.02E-07	5.32E-08	3.34E-08	1.73E-08	1.08E-08	7.43E-09	5.47E-09	4.21E-09	3.34E-09	2.72E-09	2.26E-09
N	6.96E-08	3.64E-08	2.29E-08	1.19E-08	7.50E-09	5.21E-09	3.86E-09	2.98E-09	2.38E-09	1.95E-09	1.63E-09
NNE	6.85E-08	3.65E-08	2.33E-08	1.23E-08	7.81E-09	5.46E-09	4.06E-09	3.15E-09	2.52E-09	2.06E-09	1.72E-09
NE	6.18E-08	3.32E-08	2.12E-08	1.13E-08	7.19E-09	5.04E-09	3.75E-09	2.92E-09	2.34E-09	1.92E-09	1.60E-09
ENE	4.95E-08	2.69E-08	1.74E-08	9.39E-09	6.05E-09	4.28E-09	3.22E-09	2.52E-09	2.04E-09	1.68E-09	1.42E-09
E	2.62E-08	1.42E-08	9.12E-09	4.90E-09	3.14E-09	2.21E-09	1.66E-09	1.30E-09	1.04E-09	8.59E-10	7.21E-10
ESE	3.48E-08	1.87E-08	1.20E-08	6.44E-09	4.12E-09	2.90E-09	2.17E-09	1.69E-09	1.36E-09	1.12E-09	9.39E-10
SE	4.43E-08	2.37E-08	1.52E-08	8.08E-09	5.15E-09	3.62E-09	2.71E-09	2.11E-09	1.70E-09	1.40E-09	1.17E-09
SSE	2.18E-08	1.12E-08	6.99E-09	3.57E-09	2.22E-09	1.53E-09	1.12E-09	8.63E-10	6.86E-10	5.59E-10	4.64E-10

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TABLE 2.7-133 (Sheet 3 of 3)

ANNUAL AVERAGE χ/Q (S/M^3) FOR AN 8.00 DAY DECAY, DEPLETED AT EACH 22.5° SECTOR FOR EACH SEGMENT (MILES) SHOWN AT THE TOP

DIRECTION	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	7.53E-07	2.23E-07	9.00E-08	5.06E-08	3.30E-08	1.46E-08	4.53E-09	1.83E-09	1.01E-09	6.44E-10
SSW	6.03E-07	1.78E-07	7.19E-08	4.04E-08	2.64E-08	1.17E-08	3.66E-09	1.49E-09	8.28E-10	5.30E-10
SW	4.35E-07	1.27E-07	5.07E-08	2.83E-08	1.84E-08	8.10E-09	2.51E-09	1.03E-09	5.70E-10	3.65E-10
WSW	4.22E-07	1.23E-07	4.93E-08	2.75E-08	1.79E-08	7.85E-09	2.42E-09	9.81E-10	5.41E-10	3.45E-10
W	6.19E-07	1.83E-07	7.45E-08	4.20E-08	2.75E-08	1.23E-08	3.85E-09	1.58E-09	8.74E-10	5.59E-10
WNW	1.01E-06	2.99E-07	1.23E-07	6.99E-08	4.61E-08	2.08E-08	6.67E-09	2.78E-09	1.56E-09	1.00E-09
NW	2.07E-06	6.21E-07	2.58E-07	1.48E-07	9.83E-08	4.48E-08	1.47E-08	6.19E-09	3.50E-09	2.27E-09
NNW	2.58E-06	7.71E-07	3.20E-07	1.83E-07	1.21E-07	5.52E-08	1.80E-08	7.53E-09	4.24E-09	2.74E-09
N	1.77E-06	5.27E-07	2.18E-07	1.25E-07	8.28E-08	3.78E-08	1.24E-08	5.28E-09	3.00E-09	1.96E-09
NNE	1.63E-06	4.91E-07	2.08E-07	1.21E-07	8.11E-08	3.77E-08	1.28E-08	5.52E-09	3.17E-09	2.07E-09
NE	1.45E-06	4.37E-07	1.86E-07	1.09E-07	7.31E-08	3.42E-08	1.17E-08	5.10E-09	2.93E-09	1.92E-09
ENE	1.12E-06	3.39E-07	1.46E-07	8.59E-08	5.83E-08	2.77E-08	9.68E-09	4.33E-09	2.54E-09	1.69E-09
E	5.98E-07	1.81E-07	7.76E-08	4.56E-08	3.09E-08	1.46E-08	5.06E-09	2.24E-09	1.30E-09	8.62E-10
ESE	8.02E-07	2.43E-07	1.04E-07	6.08E-08	4.11E-08	1.93E-08	6.65E-09	2.93E-09	1.70E-09	1.12E-09
SE	1.04E-06	3.14E-07	1.33E-07	7.78E-08	5.24E-08	2.45E-08	8.36E-09	3.66E-09	2.12E-09	1.40E-09
SSE	5.85E-07	1.73E-07	7.04E-08	3.98E-08	2.61E-08	1.17E-08	3.73E-09	1.55E-09	8.69E-10	5.61E-10

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TABLE 2.7-134 (Sheet 1 of 3)

ANNUAL AVERAGE D/Q (M^{-2}) AT EACH 22.5° SECTOR
FOR EACH DISTANCE (MILES) SHOWN AT THE TOP

DIRECTION	0.25	0.5	0.75	1	1.5	2	2.5	3	3.5	4	4.5
S	4.26E-08	1.44E-08	7.40E-09	4.54E-09	2.26E-09	1.37E-09	9.28E-10	6.73E-10	5.12E-10	4.03E-10	3.26E-10
SSW	2.87E-08	9.70E-09	4.98E-09	3.06E-09	1.52E-09	9.25E-10	6.25E-10	4.53E-10	3.44E-10	2.71E-10	2.20E-10
SW	1.98E-08	6.71E-09	3.44E-09	2.11E-09	1.05E-09	6.39E-10	4.32E-10	3.13E-10	2.38E-10	1.88E-10	1.52E-10
WSW	1.68E-08	5.69E-09	2.92E-09	1.80E-09	8.95E-10	5.43E-10	3.67E-10	2.66E-10	2.02E-10	1.59E-10	1.29E-10
W	1.96E-08	6.62E-09	3.40E-09	2.09E-09	1.04E-09	6.31E-10	4.26E-10	3.09E-10	2.35E-10	1.85E-10	1.50E-10
WNW	3.08E-08	1.04E-08	5.35E-09	3.29E-09	1.64E-09	9.93E-10	6.72E-10	4.87E-10	3.70E-10	2.92E-10	2.36E-10
NW	7.05E-08	2.39E-08	1.23E-08	7.52E-09	3.75E-09	2.27E-09	1.54E-09	1.11E-09	8.47E-10	6.67E-10	5.40E-10
NNW	1.02E-07	3.46E-08	1.77E-08	1.09E-08	5.43E-09	3.29E-09	2.23E-09	1.61E-09	1.23E-09	9.67E-10	7.83E-10
N	8.95E-08	3.03E-08	1.55E-08	9.54E-09	4.76E-09	2.89E-09	1.95E-09	1.41E-09	1.08E-09	8.47E-10	6.86E-10
NNE	3.61E-08	1.22E-08	6.27E-09	3.85E-09	1.92E-09	1.16E-09	7.87E-10	5.70E-10	4.34E-10	3.42E-10	2.77E-10
NE	2.21E-08	7.46E-09	3.83E-09	2.35E-09	1.17E-09	7.12E-10	4.81E-10	3.49E-10	2.65E-10	2.09E-10	1.69E-10
ENE	1.66E-08	5.60E-09	2.88E-09	1.77E-09	8.81E-10	5.34E-10	3.61E-10	2.62E-10	1.99E-10	1.57E-10	1.27E-10
E	7.39E-09	2.50E-09	1.28E-09	7.88E-10	3.93E-10	2.38E-10	1.61E-10	1.17E-10	8.87E-11	6.99E-11	5.66E-11
ESE	1.39E-08	4.70E-09	2.42E-09	1.48E-09	7.39E-10	4.48E-10	3.03E-10	2.20E-10	1.67E-10	1.32E-10	1.07E-10
SE	2.60E-08	8.78E-09	4.51E-09	2.77E-09	1.38E-09	8.37E-10	5.66E-10	4.10E-10	3.12E-10	2.46E-10	1.99E-10
SSE	3.47E-08	1.17E-08	6.02E-09	3.70E-09	1.84E-09	1.12E-09	7.56E-10	5.48E-10	4.16E-10	3.28E-10	2.66E-10

TABLE 2.7-134 (Sheet 2 of 3)

ANNUAL AVERAGE D/Q (M^{-2}) AT EACH 22.5° SECTOR
FOR EACH DISTANCE (MILES) SHOWN AT THE TOP

MET-14

DIRECTION	5	7.5	10	15	20	25	30	35	40	45	50
S	2.70E-10	1.32E-10	8.30E-11	4.19E-11	2.54E-11	1.70E-11	1.22E-11	9.16E-12	7.12E-12	5.69E-12	4.64E-12
SSW	1.82E-10	8.91E-11	5.59E-11	2.82E-11	1.71E-11	1.15E-11	8.21E-12	6.17E-12	4.80E-12	3.83E-12	3.13E-12
SW	1.26E-10	6.16E-11	3.86E-11	1.95E-11	1.18E-11	7.92E-12	5.68E-12	4.26E-12	3.32E-12	2.65E-12	2.16E-12
WSW	1.07E-10	5.23E-11	3.28E-11	1.66E-11	1.00E-11	6.73E-12	4.82E-12	3.62E-12	2.81E-12	2.25E-12	1.84E-12
W	1.24E-10	6.07E-11	3.81E-11	1.93E-11	1.17E-11	7.82E-12	5.60E-12	4.21E-12	3.27E-12	2.61E-12	2.13E-12
WNW	1.95E-10	9.57E-11	6.00E-11	3.03E-11	1.84E-11	1.23E-11	8.82E-12	6.62E-12	5.15E-12	4.11E-12	3.36E-12
NW	4.47E-10	2.19E-10	1.37E-10	6.95E-11	4.20E-11	2.82E-11	2.02E-11	1.52E-11	1.18E-11	9.42E-12	7.69E-12
NNW	6.48E-10	3.17E-10	1.99E-10	1.01E-10	6.09E-11	4.08E-11	2.93E-11	2.20E-11	1.71E-11	1.37E-11	1.11E-11
N	5.67E-10	2.78E-10	1.74E-10	8.81E-11	5.33E-11	3.58E-11	2.56E-11	1.92E-11	1.50E-11	1.20E-11	9.76E-12
NNE	2.29E-10	1.12E-10	7.04E-11	3.56E-11	2.15E-11	1.44E-11	1.03E-11	7.76E-12	6.04E-12	4.82E-12	3.94E-12
NE	1.40E-10	6.85E-11	4.30E-11	2.17E-11	1.32E-11	8.82E-12	6.32E-12	4.75E-12	3.69E-12	2.95E-12	2.41E-12
ENE	1.05E-10	5.15E-11	3.23E-11	1.63E-11	9.88E-12	6.62E-12	4.74E-12	3.56E-12	2.77E-12	2.21E-12	1.81E-12
E	4.68E-11	2.29E-11	1.44E-11	7.27E-12	4.40E-12	2.95E-12	2.12E-12	1.59E-12	1.24E-12	9.86E-13	8.05E-13
ESE	8.81E-11	4.32E-11	2.71E-11	1.37E-11	8.29E-12	5.56E-12	3.98E-12	2.99E-12	2.33E-12	1.86E-12	1.52E-12
SE	1.64E-10	8.06E-11	5.06E-11	2.56E-11	1.55E-11	1.04E-11	7.43E-12	5.58E-12	4.34E-12	3.47E-12	2.83E-12
SSE	2.20E-10	1.08E-10	6.75E-11	3.41E-11	2.07E-11	1.39E-11	9.93E-12	7.45E-12	5.80E-12	4.63E-12	3.78E-12

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TABLE 2.7-134 (SHEET 3 OF 3)
ANNUAL AVERAGE D/Q (M^{-2}) AT EACH 22.5° SECTOR
|FOR EACH SEGMENT (MILES) SHOWN AT THE TOP

DIRECTION	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	7.68E-09	2.37E-09	9.45E-10	5.16E-10	3.28E-10	1.41E-10	4.37E-11	1.73E-11	9.25E-12	5.72E-12
SSW	5.17E-09	1.60E-09	6.36E-10	3.48E-10	2.21E-10	9.49E-11	2.94E-11	1.17E-11	6.23E-12	3.86E-12
SW	3.58E-09	1.11E-09	4.40E-10	2.40E-10	1.53E-10	6.56E-11	2.04E-11	8.06E-12	4.31E-12	2.67E-12
WSW	3.04E-09	9.38E-10	3.73E-10	2.04E-10	1.30E-10	5.57E-11	1.73E-11	6.85E-12	3.66E-12	2.26E-12
W	3.53E-09	1.09E-09	4.34E-10	2.37E-10	1.51E-10	6.47E-11	2.01E-11	7.96E-12	4.25E-12	2.63E-12
WNW	5.56E-09	1.72E-09	6.83E-10	3.73E-10	2.37E-10	1.02E-10	3.16E-11	1.25E-11	6.69E-12	4.14E-12
NW	1.27E-08	3.93E-09	1.56E-09	8.55E-10	5.43E-10	2.33E-10	7.24E-11	2.87E-11	1.53E-11	9.48E-12
NNW	1.84E-08	5.70E-09	2.27E-09	1.24E-09	7.87E-10	3.38E-10	1.05E-10	4.16E-11	2.22E-11	1.37E-11
N	1.62E-08	4.99E-09	1.99E-09	1.09E-09	6.89E-10	2.96E-10	9.18E-11	3.64E-11	1.94E-11	1.20E-11
NNE	6.52E-09	2.01E-09	8.01E-10	4.38E-10	2.78E-10	1.20E-10	3.71E-11	1.47E-11	7.84E-12	4.85E-12
NE	3.98E-09	1.23E-09	4.90E-10	2.68E-10	1.70E-10	7.30E-11	2.27E-11	8.98E-12	4.79E-12	2.97E-12
ENE	2.99E-09	9.24E-10	3.68E-10	2.01E-10	1.28E-10	5.48E-11	1.70E-11	6.74E-12	3.60E-12	2.23E-12
E	1.33E-09	4.12E-10	1.64E-10	8.95E-11	5.69E-11	2.44E-11	7.58E-12	3.00E-12	1.60E-12	9.93E-13
ESE	2.51E-09	7.75E-10	3.09E-10	1.69E-10	1.07E-10	4.60E-11	1.43E-11	5.66E-12	3.02E-12	1.87E-12
SE	4.68E-09	1.45E-09	5.76E-10	3.15E-10	2.00E-10	8.59E-11	2.66E-11	1.06E-11	5.64E-12	3.49E-12
SSE	6.26E-09	1.93E-09	7.69E-10	4.20E-10	2.67E-10	1.15E-10	3.56E-11	1.41E-11	7.53E-12	4.66E-12

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TABLE 2.7-135 (Sheet 1 of 2)
X/Q AND D/Q VALUES AT EACH RECEPTOR LOCATION

RELEASE	DIRECTION	DIST. (MI)	X/Q (SEC/M^3) NO DECAY, UNDEPLETED	X/Q (SEC/M^3) 2.26 DAY DECAY, UNDEPLETED	X/Q (SEC/M^3) 8 DAY DECAY, DEPLETED	D/Q (M^{-2})
EAB	S	0.08	5.20E-05	5.10E-05	5.00E-05	2.30E-07
EAB	SSW	0.08	4.10E-05	4.10E-05	4.10E-05	1.60E-07
EAB	SW	0.09	2.20E-05	2.20E-05	2.20E-05	8.50E-08
EAB	WSW	0.1	1.90E-05	1.90E-05	1.80E-05	6.60E-08
EAB	W	0.13	1.60E-05	1.60E-05	1.60E-05	5.30E-08
EAB	WNW	0.18	1.30E-05	1.30E-05	1.30E-05	4.90E-08
EAB	NW	0.3	1.10E-05	1.10E-05	1.00E-05	5.30E-08
EAB	NNW	0.51	5.30E-06	5.30E-06	4.80E-06	3.30E-08
EAB	N	0.75	1.90E-06	1.90E-06	1.70E-06	1.60E-08
EAB	NNE	0.89	1.30E-06	1.30E-06	1.10E-06	4.70E-09
EAB	NE	1.05	8.60E-07	8.50E-07	7.50E-07	2.10E-09
EAB	ENE	0.88	9.00E-07	8.90E-07	7.90E-07	2.20E-09
EAB	E	0.54	1.10E-06	1.10E-06	1.00E-06	2.20E-09
EAB	ESE	0.27	5.20E-06	5.20E-06	4.90E-06	1.20E-08
EAB	SE	0.16	1.70E-05	1.70E-05	1.70E-05	5.10E-08
EAB	SSE	0.11	1.80E-05	1.80E-05	1.80E-05	1.10E-07
Residence	S	0.67	9.70E-07	9.70E-07	8.70E-07	9.00E-09
Residence	SSW	0.31	3.10E-06	3.10E-06	2.90E-06	2.10E-08

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TABLE 2.7-135 (Sheet 2 of 2)
X/Q AND D/Q VALUES AT EACH RECEPTOR LOCATION

RELEASE	DIRECTION	DIST. (MI)	X/Q (SEC/M^3) NO DECAY, UNDEPLETED	X/Q (SEC/M^3) 2.26 DAY DECAY, UNDEPLETED	X/Q (SEC/M^3) 8 DAY DECAY, DEPLETED	D/Q (M^{-2})
Residence	SW	0.31	2.30E-06	2.30E-06	2.10E-06	1.50E-08
Residence	WSW	0.31	2.20E-06	2.20E-06	2.10E-06	1.20E-08
Residence	W	0.83	5.50E-07	5.50E-07	4.90E-07	2.90E-09
Residence	WNW	0.83	9.00E-07	9.00E-07	8.00E-07	4.60E-09
Residence	NW	2.16	3.90E-07	3.90E-07	3.20E-07	2.00E-09
Residence	NNW	2.31	4.40E-07	4.30E-07	3.60E-07	2.60E-09
Residence	N	2.44	2.80E-07	2.70E-07	2.20E-07	2.00E-09
Residence	NNE	2.44	2.60E-07	2.60E-07	2.10E-07	8.20E-10
Residence	NE	2.87	1.90E-07	1.80E-07	1.50E-07	3.80E-10
Residence	ENE	2.87	1.50E-07	1.40E-07	1.20E-07	2.80E-10
Residence	E	2.91	7.60E-08	7.50E-08	6.00E-08	1.20E-10
Residence	ESE	1.86	2.00E-07	2.00E-07	1.60E-07	5.10E-10
Residence	SE	1.59	3.20E-07	3.20E-07	2.70E-07	1.20E-09
Residence	SSE	0.67	7.60E-07	7.60E-07	6.80E-07	7.30E-09
Garden	ENE	3.27	1.20E-07	1.20E-07	9.50E-08	2.20E-10
Garden	E	3.27	6.40E-08	6.30E-08	5.00E-08	1.00E-10

Chapter 3

Chapter 3 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	3-xix	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00452	3.3.1.1	3.3-2	Editorial correction	Change “average” to “estimated”.	0
CTS-00452	3.3.1.2	3.3-2	Editorial correction	Change “average” to “estimated”.	0
CTS-00452	3.3.1.3	3.3-3	Editorial correction	Change “average” to “estimated”.	0
CTS-00452	3.3.1.3	3.4-5	Editorial correction	Remove “monthly average”.	0
CTS-00660	3.4.2.1	3.4-6	Editorial correction	Add a sentence about passive screens of the intake system.	0
CTS-00495	Table 3.4-1	3.4-8	Editorial correction	Superscript the number to represent scientific notation as opposed to a whole number	0
CTS-00612	3.5.1.1.2	3.5-5	To reflect DCD terminology	Add “containment Vessel” before reactor so that it reads: containment vessel reactor coolant drain tank, and change the acronym (RCDT) to (CVDT)	0
CTS-00612	3.5.1.1.2	3.5-6	Erratum	Change the acronym (RCDT) to (CVDT)	0
CTS-00613	3.5.1.5	3.5-8	Editorial correction	Remove “gaseous or airborne” and add “liquid” after radioactive	0
CTS-00468	3.5.4	3.5-16	Erratum	Change “179 gpm” to “7 gpm”.	0

CTS-00614	3.5.4	3.5-16	Erratum	Change “119.79 gallons per hour (gal/hr)” to “approximately 2 gpm”.	0
CTS-00615	3.7.1	3.7-1	Editorial correction	Change “CPNPP Units 3 and 4 Switching Station (CPNPP Units 3 and 4 Switching Station)” to “Plant Switching Station”.	0
CTS-00649	3.7.1	3.7-1	Editorial correction	Change “plant switching station” to “Plant Switching Station”.	0
CTS-00615	3.7.2	3.7-2	Editorial correction	Change “CPNPP Units 3 and 4 Switching Station” to “Plant Switching Station”.	0
CTS-00615	3.7.2	3.7-2	Editorial correction	Change “Main Power Transformer (MPT)” to “Main Transformer (MT)”.	0
CTS-00616	3.7.2	3.7-3	Editorial correction	Change “MPT” to “MT”	0
CTS-00615	3.7.2	3.7-3	Editorial correction	Change “CPNPP Units 3 and 4 Switching Station” to “Plant Switching Station”.	0
CTS-00617	3.9.4	3.9-11	Erratum	Change “four” to “five”.	0
CTS-00617	3.9.4	3.9-11	Erratum	Change “94” to “74”.	0
CTS-00617	3.9.4	3.9-11	Erratum	Change “50” to “37”.	0
CTS-00618	3.9.4.1.1	3.9-12	Erratum	1st paragraph Change “five” to “four”. Change “three” to “one”. Change “three” to “one”. Change “304” to “309”.	0
CTS-00618	3.9.4.1.2	3.9-12	Erratum	Change area dimensions from “167” to “180”, and from “321” to “355”	0
CTS-00618	3.9.4.1.2	3.9-12	Erratum	Change “three” to “four”.	0

CTS-00691	Table 3.8-4	3.8-14	Update the proprietary status of information	Remove “Withheld from Public Disclosure Under 10 CFR 2.390 (a) (4)” from the title. Remove “Note: Luminant considers the location of alternative site proprietary.”	1

TABLE 3.8-4
PRIMARY AND ALTERNATIVE SITES FOR CPNPP UNITS 3 AND 4

Site	Location	TRAGIS Origin Location
CPNPP Units 3 and 4	Glen Rose, TX	Glen Rose, TX
Alternate Site A	Victoria, TX	Victoria, TX
Alternate Site B	Lufkin, TX	Jasper, TX
Alternate Site C	Waco, TX	Waco, TX

~~Note: Luminant considers the location of the alternate sites proprietary information.~~ CTS-00691

Chapter 4

Chapter 4 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	4-xvii	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00650	4.1.1.1	4.1-1	Erratum	Change “275 ac” to “675 ac”.	0
CTS-00650	4.1.1.1	4.1-1	Erratum	Add “the Blowdown Treatment Facility (BDTF) area,”	0
CTS-00459	4.1.1.1	4.1-1	Erratum	Change “384 ac” to “400 ac”.	0
CTS-00459	4.1.2	4.1-4	Erratum	Change “384 ac” to “400 ac”.	0
CTS-00459	4.2.1.1.5	4.2-3	Erratum	Change “384 ac” to “400 ac”.	0
CTS-00619	4.2.1.2	4.2-4	Editorial correction	Change “cooling water“ to “makeup water and blowdown”.	0
CTS-00620	4.2.1.4	4.2-5	Editorial correction	Change “cooling water” to “makeup water and blowdown system”.	0
CTS-00620	4.2.1.4.1	4.2-6	Editorial correction	Change “cooling water” to “makeup water and blowdown system”.	0
CTS-00621	4.2.1.4.1	4.2-6	Editorial correction	Change “cooling” to “makeup”.	0
CTS-00621	4.2.1.4.1	4.2-6	Editorial correction	Change “cooling water system” to “CWS and UHS”.	0
CTS-00622	4.2.2.1	4.2-9	Editorial correction	Change “cooling water system” and “raw water system” to “makeup water and blowdown system”, respectively.	0

CTS-00623	Table 4.2-1	4.2-14	Erratum	Change population count from “8186” to “6354” and average daily consumption from “0.383” to “0.362”.	0
CTS-00459	4.3.1	4.3-2	Erratum	Change “384 ac” to “400 ac”.	
CTS-00651	4.3.1	4.3-2	Update	Change acreages on page 4.3-2 of ER that describe area of soil disturbed during construction to agree with the new survey of the BDTF.	0
SOC-11	4.4.2.3	4.4-14	Increase information as discussed with the NRC.	Updated with current information and revised text to discuss public safety and medical services for Hood and Somervell counties.	1
SOC-11	4.4.2.3	4.4-15	Increase information as discussed with the NRC.	Delete paragraph to revise text to discuss public safety and medical services for Hood and Somervell counties.	1
SOC-11	4.4.4	4.4-20	Increase information as discussed with the NRC.	Revised to include 2 new reference notations.	1

serves Glen Rose and the rest of Somervell County has a maximum capacity of 600,000 gpd and is operating at 53 percent capacity. The total capacity for these plants is 2,700,000 gpd while the current usage is 1,348,000 gpd or 50 percent. As a conservative estimate, it is assumed that the entire 474,120 gpd produced by the increase in population is processed through the wastewater treatment plants, representing a 35-percent increase in plant utilization but only an 18-percent increase of capacity. Therefore, the wastewater treatment plants are able to accommodate the expected increase in population.

Potable water for construction is expected to be obtained from the newly-created Wheeler Branch Reservoir, which also supplies water for construction needs including concrete curing. The reservoir has a capacity of 1.3 billion gal with an annual yield of approximately 651,700,000 gal (SCWD 2007). The SCR supplies water for general cleanup, fire protection and dust control. An estimated 6560 gpd of potable water are expected to be used during peak construction, with an additional 184,000 gpd of general service water. Wastewater treatment is provided on-site. The physical impacts of on-site construction activity on water and wastewater treatment services are expected to be SMALL, with no mitigation required.

As discussed in Subsection 2.5.2.7.2, there are 6~~3~~8 police officers ~~and 250 firefighters~~ in Hood County, and 19 police officers and 40 firefighters in Somervell County. The national average ratio of full-time police officers per 1000 residents was 2.5 in 2003. The estimated population of Hood County in 2006 is 49,238 (Census 2006). The average number of officers per 1000 residents for a population that size is 1.8 (BJS 2003). Hood County had a ratio of 1.4 in 2006. Somervell County had an estimated population of 7773 in 2006 (Census 2006). The average number of officers per 1000 residents for a population that size is 2.2 (BJS 2003). Somervell County had a ratio of 2.4 in 2006. In 2014, the year of peak construction, due to population growth and the incoming workforce, the ratio in Hood County decreases to 1.3 and the ratio in Somervell County decreases to 2.0. This puts both counties below the national average for communities of their respective sizes. However, Hood County is already below the average based on the 2006 population. SOC-11

In 2008, the national average number of firefighters per 1000 in population served was 1.6 (Senter 2009). As discussed in Subsection 2.5.2.7.2, there are 250 firefighters in Hood County and 40 firefighters in Somervell County. The ratio of firefighters per population served in both Hood and Somervell counties in 2006 was 5.1 and 5.2, respectively. By 2014, the influx of construction workers and continuing population growth decrease the ratio in Hood County to 4.8 and the ratio in Somervell County to 4.3. Both of these numbers are still well above the national average. The CPNPP employs its own fire brigade who responds to all on-site emergencies however; CPNPP uses local firefighters when necessary for on-site emergencies.

Increases in population in the remaining counties of the economic region are not as large. The ratio of police officers per 1000 in population served in 2006 in Stephenville is 2.2. This decreases to 1.9 by peak construction with the incoming construction workers. The average number of officers for a city that size is 2.0, so police services in Stephenville remain at average levels (BJS 2003). The ratio in Cleburne decreases from 1.9 to 1.6. The average number of officers for a city the size of Cleburne is 1.8, so police staffing falls to slightly below average (BJS 2003). Walnut Springs does not have a police department but is serviced by the Bosque County Sheriff's Office. The city is pursuing a grant to form a police department of its own. The city has less than 1000 residents before the in-migration of workers, but has 1143 residents with the workers. The average number of police officers per 1000 residents for a city of just over 1000 residents is 2.3 (BJS 2003). If the sheriff's office numbers are used, the ratio in Walnut Springs decreases from 22 to 16, putting it far above the national average. SOC-11

The ratio of firefighters per 1000 in population served decreases from 2.7 to 2.4 in Stephenville with the incoming construction workers. Cleburne decreases from 1.8 to 1.5, which is just below the national average of 1.6. Walnut Springs decreases from 12 to 8.8, leaving it well above the national average.

As discussed in Subsection 4.4.2.1, the population increase in Fort Worth is not sufficient to affect public service levels.

~~The ratio of current residents to police officers in Hood County is 782:1 and the firefighter ratio is 197:1. The ratio of current residents to police officers in Somervell County is approximately 389:1 and the firefighter ratio is 194:1. With the increase due to construction, in population the resident-to-firefighter ratios become 204:1 and 241:1 in Hood and Somervell counties, respectively. The resident-to-police officer ratios become 811:1 and 508:1 in Hood and Somervell counties, respectively. The CPNPP employs its own fire brigade who responds to all on-site emergencies.~~

Based on the pattern of in-migration, the two counties most affected by the construction workforce are Hood and Somervell counties. Local police and fire officials that were contacted in Hood and Somervell counties stated that there are already plans to expand services due to population growth in the country. The construction plans for CPNPP Units 3 and 4 merely hasten the intended expansions of staffing and infrastructure. Historically, the vicinity was able to accommodate the public service needs of the 8694 construction workers for CPNPP Units 1 and 2 in the 1980s. The impact due to ~~4300~~the 5751 in-migrating workers and families should be proportionally less. Therefore, the impacts of construction activity on local police and firefighter departments are expected to be SMALL. SOC-11

Hood County is home to one hospital, Lake Granbury Medical Center, located in Granbury. The hospital contains 59 beds, with 36 doctors and 30 courtesy doctors (Lake Granbury Medical Center 2007). The hospital has plans for a $15 million expansion to begin in 2008 that doubles the current inpatient capacity and provides an additional operating room and support areas. The medical center also constructed a new primary care facility, Fall Creek Medical Plaza, that supports six physicians. Somervell County also has one hospital, Glen Rose Medical Center. Located in Glen Rose, the medical center has 16 beds with 80 staff members, including staff associated with the attached nursing home. Glen Rose Medical Center also has expansion plans beginning in 2008, with eight emergency room beds to be added. The CPNPP employs its own on-site emergency first-aid and medical services. The combined daily load at Lake Granbury Medical Center and Glen Rose Medical Center is 23 beds. With expansions complete, the medical centers have a combined capacity of 142 beds, well above the current demand. The construction workforce only increases the local population in Hood and Somervell counties by 5 and 16 percent, respectively. Thus, the medical facilities are more than adequate to accommodate the demands of the incoming population and the impacts of construction activity on local medical services are expected to be SMALL, and require no mitigation. SOC-11

Social services such as Medicaid and welfare are funded through the federal and state governments. The construction boom due to CPNPP is not anticipated to have an impact on these social services.

~~Both hospitals in the area have plans for expansion, bringing the combined number of hospital beds to 142. Given that current loads at the hospitals combine to total 23 beds, the medical facilities are able to handle the influx of the construction workers and their families. Because of the planned expansion of local medical services, the impacts of construction activity on local medical services are expected to be SMALL, and require no mitigation.~~ SOC-11

Traffic counts for roads within the vicinity of the CPNPP site are discussed in Subsection 2.5.2.2.3. Effects of construction on transportation are discussed in Subsection 4.4.1.3. Effects of construction on education are discussed Subsection 4.4.2.5.

4.4.2.4 Housing

Neither Hood County nor Somervell County has a comprehensive land-use plan. The city of Glen Rose is currently accepting proposals from consultants to develop a comprehensive plan. The city of Granbury has a comprehensive plan published in 2001, and in 2006 requested proposals to update the plan. Land-use planning and zoning laws within site and vicinity are described in Subsection 2.2.1. Land-use effects from construction of the CPNPP are described in Subsection 4.1.1.

Regional housing availability is described in Subsection 2.5.2.6. It is not known where CPNPP construction workers are anticipated to reside. A conservative assumption is used that the majority of CPNPP construction workers live in Somervell and Hood counties. However, a few may opt to live in some of the other surrounding counties.

Because the construction of CPNPP is not a permanent event, during the peak phase of construction, it is probable that not all construction workers move into the region and need housing. In 2000, Somervell and Hood counties had a total of 344 housing units for sale and 472 housing units available for rent. Property listings in Granbury and Glen Rose for September 2007 indicate 659 and 50 available housing units, respectively, including single family houses, townhomes, multi-family houses, mobile homes and rentals (NAR 2007).

For this analysis, a conservative assumption is made suggesting 3010 construction workers need housing during the peak construction phase, thus one housing unit per construction worker is required for a total of 3010 units.

The population in Hood County in 1970 was 6368, while the population in Somervell County was 2793. The 2006 estimated populations of 49,238 and 7773 for the two counties represent population increases of 773 percent and 278 percent, respectively. With the continued expansion of the Dallas-Fort Worth metropolitan area and the presence of lakefront property, population growth in Hood County is anticipated to remain rapid. A large number of housing developments are currently under development in Hood County, with several more in the planning stages. Population increase is not as prevalent in Somervell County with little housing development currently underway. Somervell County offers no apartments and housing prices are generally higher than in Hood County.

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(BJS 2003) Bureau of Justice Statistics. "Law Enforcement Management and Administrative Statistics: Local Police Departments, 2003." Available URL: http://www.ojp.usdoj.gov/bjs/pub/pdf/lpd03.pdf. Accessed March 16, 2009. SOC-11

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(Lake Granbury Medical Center 2007) Lake Granbury Medical Center. “About Us.” http://www.lakegranburymedicalcenter.com/body.cfm?id=13. (Accessed March 9, 2007).

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(US HUD 1996) United States Department of Housing and Urban Development, 24 CFR Part 51.103 Criteria and Standards, March 26, 1996.

(USDOT 2006) United States Department of Transportation, Federal Highway Administration, Effective Noise Control During Night Time Construction, March 7, 2006

(PG&E 2004) Construction Equipment Noise Ranges, City of Salinas, June 2002 and Typical Construction Equipment Noise Generation Levels, PG&E Diablo Canyon Steam Generation Project, January 2004.

Chapter 5

Chapter 5 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	5-xxii	Editorial correction	Change "MPT Main Power Transformer" to "MT Main Transformer".	0
CTS-00624	5.1.3.1.4	5.1-5	Erratum	Change "one mi" to "two mi".	0
CTS-00624	5.1.3.1.4	5.1-5	Editorial correction	Change "site boundary" to "property boundaries".	0
CTS-00625	5.1.2	5.1-2	Erratum	Change number of 345-kV transmission lines from "five" to "four".	0
CTS-00627	5.2.3.5	5.2-16	Editorial correction	Change the discussion regarding the cells and cubicles.	0
CTS-00628	Table 5.3-3	5.3-20	Editorial correction	Change the circulating water flow/tower and drift rate per tower numbers.	0
CTS-00629	Table 5.4-16	5.4-42	Erratum	Change "rad" to "person-rad".	0
MET-13	5.3.1	5.3-11	Increase information as discussed with the NRC.	Add "Six years of site meteorological data (2001 – 2006) were also used in the analysis.	1
SOC-11	5.8.2.3.1.2	5.8-11 and 5.8-12	Increase information as discussed with the NRC.	Update with current information and revise text to discuss public safety and medical services for Hood and Somervell counties. Update reference citation from TDPS 2004 to TDPS 2006	1
SOC-11	5.8.4	5.8-17	Increase information as discussed with the NRC.	Update reference notation (TDPS 2004) information to (TDPS 2006) information.	1

The NRC has identified several plume-related codes as acceptable methodologies. A model endorsed by NUREG-1555 was Carhart and Policastro. In NUREG-1555, the NRC accepted Carhart and Policastro's conclusion that their code predicts the plume rise within a factor of 2 about 75 percent of the time and visible plume length within a factor of 2.5 about 70 percent of the time. This model was embedded into the Electric Power Research Institute (EPRI) Seasonal/Annual Cooling Tower Impact Prediction Code (SACTI) in 1991.

As discussed earlier, the heat dissipation system for the CWS for the proposed project would use MDCTs. The height of the discharge for the MDCTs is 55.4 ft above site grade, and this height was used in the SACTI model.

Seasonal mixing height values used for the cooling tower assessment are from Stephenville, TX, the nearest upper air observation location. Further meteorological information is provided in Section 2.7.

To determine potential impact of solid deposition due to cooling tower plumes, the concentrations of salts and dissolved solids in the CWS circulating water must be input into the plume model. The source of circulating water makeup for the CWS is Lake Granbury. Table 5.3-3 indicates that a sodium concentration of 288 ppm was used for the CWS cooling tower assessment.

Six years of meteorological data from 2001 through 2006 were obtained from Mineral Wells airport, the closest first order station. Other inputs used in the analysis can be found in Table 5.3-3. Six years of site meteorological data (2001-2006) were also used in the analysis. MET-13

The cooling tower assessment gives specific information on assumptions and how the input data were utilized to generate the plume model.

5.3.3.1.1 Length and Frequency of Elevated Plumes

Table 5.3-4 describes the expected plume lengths by season and direction for the four MDCTs. The longest average plume lengths are predicted to occur during the winter months, and the shortest are predicted to occur during the summer months.

5.3.3.1.2 Frequency and Extent of Ground Level Fogging and Icing in the Site Vicinity

The cooling tower assessment performed for the proposed project shows that there are occurrences of ground level fogging and Rime icing in the north and south directions that are contained within a mile of the cooling tower. Fogging and icing are predicted to occur almost exclusively in the areas of shore line or lake surface. See Table 5.3-5 for annual by hour fogging or icing rates.

5.3.3.1.3 Solids Deposition (i.e., Drift Deposition) in the Site Vicinity

The MDCTs would use drift eliminators to minimize the amount of water lost from the towers via drift. Some droplets are, nevertheless, swept out of the tops of the cooling towers in the moving air stream. The drift droplets containing dissolved salt and particulates are swept out of the tops of the cooling towers. Initially, these droplets rise in the plume's updraft, but due to their high settling velocity, they eventually break away from the plume, then evaporate, settle downward, revenues for the same time period, the ad valorem taxes may be the largest portion of total tax revenues for some districts in Somervell County once the new units are operation.

Several types of taxes are generated by operations activities and purchases, and by the workforce expenditures within the vicinity. Employees of the CPNPP pay federal personal income taxes on their wages and salaries. Texas residents do not pay a state personal income tax. The counties in the region experience an increase in the amount of sales and use taxes collected. Additional sales and use taxes are generated by retail expenditures of the operating workforce.

Because the ad valorem taxes are paid to jurisdictions in Hood and Somervell counties, the impact of plant operation on the vicinity is anticipated to be LARGE and beneficial. The impacts of operations on tax revenue in the region is expected to be SMALL, based on the larger region population but beneficial due to the increased collections due to plant and worker expenditures.

5.8.2.3 Infrastructure and Public Services

Local public services potentially affected by the operation of Units 3 and 4 including (1) public safety, (2) social services, (3) education, (4) tourism, and (5) recreation are diescribed individually in Subsection 2.5.2. It is likely that operations workers and their families would concentrate in several communities with well-developed public services. Diversification of settlement would minimize the likelihood of any one community's services being overburdened.

5.8.2.3.1 Public Services

Public services types identified in this subsection include (1) water supply and wastewater facilities and (2) fire, police and medical services.

5.8.2.3.1.1 Water Supply and Wastewater Facilities

The CPNPP is not anticipating using groundwater as a safety-related or operational source of water. The CPNPP is using Lake Granbury for all operational water uses related to Units 3 and 4 cooling. Water for operation dust suppression and general use is obtained from SCR. An on-site wastewater facility provides sufficient capacity for wastewater treatment related to plant operation for all four units.

As stated in Subsection 5.8.2.1, an operational workforce of 550 increases the population in the 50-mi region by approximately 1100 people. Water systems in the vicinity are generally not operating at or near capacity (Subsection 2.5.2.7.1). Therefore, the water supply and wastewater treatment facilities servicing the CPNPP vicinity are considered sufficient to provide adequate service. Additional information regarding wastewater facilities is discussed in Subsection 2.5.2.7.1.

5.8.2.3.1.2 Police and Fire Protection Services

The Somervell County Sheriff's Department has sole jurisdiction over Somervell County (TDPS 2006~~4~~). As stated in Subsection 2.5.2.7.2, the total number of police officers in Somervell county is 19. The ~~ratio of residents to~~number of police officers per 1000 residents in Somervell County in 2006 is 2.4 and during the construction is 2.0~~389:1~~. The departing construction workers and SOC-11 incoming operational workforce and families would increase the police ratio to 2.2~~421:1~~. Hood SOC-11 County is served by the Hood County Sheriff's Department, Granbury Police Department, and Tolar Police Department (TDPS 2006~~4~~). These departments combined employ 68~~3~~ police SOC-11 officers, resulting in a ratio of 1.3 officers per 1000 residents during construction~~residents to police officers of 782:1~~. The operational workforce and families increase the police ratio to 1.4~~789:1~~. According to the U.S. military, the desired ratio of police officers to population is between 1 and 4 officers per 1000 citizens~~ (between 1000:1 and 250:1)~~, with cities needing SOC-11 higher levels than other areas (Broemmel, Clark, and Nielsen 2007). As discussed in Subsection 4.4.2.3, ~~T~~the United States currently has approximately 2.5~~3~~ police officers per 1000 residents~~ (435:1)~~. With the increase in residents in Somervell and Hood counties, the ratio of police officers to residents is still within the levels recommended by the U.S. military.

~~Within Somervell County there is one fire department with 40 paid and volunteer firefighters. The ratio of residents to firefighters is 194:1. The operational workforce and families increase this ratio to 200:1. In Hood County, there are nine fire departments with 250 volunteer firefighters for a ratio of residents to firefighters of 197:1. The operational workforce and families increase this ratio to 200:1. Additional information on police and fire protection services is discussed in Subsection 2.5.2.7.2.~~ SOC-11

In Johnson County, the ratio of police officers per 1000 residents in Cleburne decreases from 1.6 during construction to 1.5 during operations. Fort Worth likewise decreases from 2.3 to 2.2 due to the rapid population growth of the city. In Stephenville, the ratio decreases from 2.2 in 2014 to 1.9 in 2018. The ratio of sheriff's officers per 1000 residents in Walnut Springs increases from 16 to 20. This leaves all the cities but Walnut Springs below the national average, but still within the levels recommended by the U.S. military. Also, it is reasonable to assume that by 2018 additional staffing is obtained for the cities in response to the population growth, which would increase the ratios.

Within Somervell County there is one fire department with 40 paid and volunteer firefighters. The ratio of firefighters per 1000 residents is 4.3 during construction and increases to 4.7 by 2018. In Hood County, there are nine fire departments with 250 volunteer firefighters for a ratio of 4.8 during construction that increases to 5.0 during operations. The ratio of firefighters per 1000 residents in Cleburne decreases from 1.5 during construction to 1.4 during operations. The ratio in Fort Worth drops from 1.4 to 1.3, while the ratio in Stephenville decreases from 2.4 in 2014 to 2.3 in 2018. The ratio in Walnut Springs increases form 8.8 to 11 as the population does not increase rapidly enough to replace the construction workers that left the area prior to 2018. Thus, Hood County, Somervell County, Stephenville, and Walnut Springs remain well above the national average discussed in Subsection 4.4.2.3 while Cleburne and Fort Worth remain just under it.

As discussed above, it is reasonable to assume that additional personnel are added to the fire departments in the economic region from 2006 to 2018 in response to the rapid population growth in the area. This would increase the ratios for the counties and cities, resulting in a lessened impact.

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(US Census 2000a) U.S. Census Bureau. American FactFinder. Hood County Housing. http://factfinder.census.gov. Accessed on March 15, 2007.

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(US HUD 1996) United States Department of Housing and Urban Development, 24 CFR Part 51.103 Criteria and Standards, March 26, 1996.

(SCWD 2008) Somervell County Water District. "Phase I - Wheeler Branch Dam and Paluxy River Channel." http://scwd.us/?page_id=9. Accessed July 25, 2008.

Chapter 6

Chapter 6 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	6-xvi	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00630	6.3.1.1	6.3-2	Editorial correction	Change “SWS” to “ESWS”	0
CTS-00631	6.5.1	6.5-2	Editorial correction	Remove “nonradioactive”.	0
CTS-00631	6.5.1	6.5-2	Editorial correction	Change “service water” to “essential service water”	0
CTS-00499	6.7	6.7-3	Editorial correction	Add information for current results regarding humidity date, and remove discussions for future additions.	0
CTS-00499	6.7	6.7-3	Editorial correction	Clean up to match ER 6.4.1 wording for RH instrumentation.	0

Chapter 7

Chapter 7 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	7-xvii	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00470	7.2	7.2-7	Erratum	Change “5.87 x 10^{-1}” to “1.15”.	0

Chapter 8

Chapter 8 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	8-xvi	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
NP-03	8.1	8.1-6	Increase information as discussed with the NRC.	Revised text to address why the plants are not specifically discussed within the context of the need for power analysis.	1
NP-05	8.1	8.1-6	Increase information as discussed with the NRC.	Revised text to discuss the ERCOT assumptions driving generation capacity.	1
NP-09 NP-13	8.4.1	8.4-1	Increase information as discussed with the NRC.	Revised text to clarify that market participants determine how and when to retire or build new capacity.	1
NP-12	8.1	8.1-6	Increase information as discussed with the NRC.	Revised text to explain that market forces determine how to meet the forecast load.	1
NP-18	8.3.1	8.3-1	Increase information as discussed with the NRC.	Added a “pointer” to the definition of “mothballed capacity.”	1
NP-09	8.4.1	8.4-1	Increase information as discussed with the NRC.	Revised text to clarify how ERCOT does their analysis.	1
NP-18	8.4.1	8.4-1	Increase information as discussed with the NRC.	Revised text to provide information regarding mothballed generating capacity.	1
NP-03	8.4.1	8.4-1	Increase information as discussed with the NRC.	Revised text to address why the plants are not specifically discussed within the context of the need for power analysis and at specific points in time, given that the plants would not come on line until about 10 years in the future.	1
NP-09	8.4.1	8.4-2	Increase information as discussed with	Revised text to clarify how ERCOT does their	1

			the NRC.	analysis.	
NP-09	8.4.1	8.1-4	Increase information as discussed with the NRC.	Expands the discussion of reserve margin.	1
NP-12	8.4.1	8.4-5	Increase information as discussed with the NRC.	Expanded the discussion of reserve margin to indicate the decision to increase the number of plants rests with the market participants.	1
NP-01	8.4.5	8.4-7	Increase information as discussed with the NRC.	Revise text to discuss the 2007 ERCOT assessment and other information that has become available after the 2007 reference. Added subsection 8.4.5 entitled “ERCOT Update”	1
NP-01	8.4.6	8.4-7	Increase information as discussed with the NRC.	Revise references for the increased information.	1
NP-14	Table 8.4-1	8.4-8	Increase information as discussed with the NRC.	Revised table to include the load forecast and reserve margin.	1

ERCOT is the membership-based, not-for-profit corporation, overseen by the PUC, that manages the flow of electric power, ensures transmission reliability, and serves as the central hub for retail transactions. ERCOT is required by law to study the need for increased transmission and generation capacity and to report the study results to the PUC and the Legislature.

8.1.4 MARKET ECONOMIC FORCES NP-03 NP-05

Beyond compliance with operational procedures, ERCOT does not have authority over the business activities of its market participants. The economic forces of the market and signed agreements by the market participants provide the cooperative atmosphere in which the ERCOT system functions.

Since 1999, ERCOT market participants have made the economic decision to decommission 107 units with a total generation capacity of 5,099 MW. These decisions were based on economic parameters such as unit efficiency, age, capacity, cost of operation, outage frequency, outage duration, and fuel cost. Similarly, since 1999, the ERCOT market participants have made the economic decision to add 205 new units and to upgrade 2 units for a total generation capacity of 25,372 MW. These decisions were based on the same economic parameters that led to decommissioning the 107 older units. On a county-by-county basis, in accordance with the market economic forces, the decommissioned units were sometimes replaced by new units and sometimes they were not replaced by new units. NP-09 NP-13

By law, ERCOT must perform extensive annual and semi-annual studies, issue reports, make recommendations for transmission system needs and resource adequacy, and make legislative recommendations to further those objectives [See e. g., Tex. Util. Code Ann. §§ 39.155(b) and 39.904(k)]. ERCOT analyzes the region in the context of the competitive ERCOT market using load growth scenarios, industrial growth projections, regional transmission topology, sub-regional modeling, and new generation characteristics. The development of these reports is subject to vigorous market participant stakeholder input and review. ERCOT only forecasts the generation and transmission capacity that may be necessary to meet the forecast load. The market economic forces drive the market participants' decisions to increase or decrease their generation and transmission capacity. NP-12

8.1.5 REFERENCES

(ERCOT 2005) Electric Reliability Council of Texas. 2005 Annual Report. 2005. Financial Statement Section.

(ERCOT 2006a) Electric Reliability Council of Texas. 2006 Annual Report. 2006. http://www.ercot.com/news/presentations/2007/2006_Annual_Report.pdf. Accessed October 2007.

(ERCOT 2006b) Electric Reliability Council of Texas. 2006. Long-Term System Assessment For the ERCOT Region. Accessed October 2007.

(ERCOT 2007a) Electric Reliability Council of Texas. Governance. http://www.ercot.com/about/governance/index.html. Accessed October 2007.

8.3 POWER SUPPLY

This section presents an Electric Reliability Council of Texas (ERCOT) regional supply assessment, based on the ERCOT reports, assessments, and analyses, including those reported to the North American Electric Reliability Corporation (NERC). As discussed in previous sections and summarized in Section 8.4, ERCOT prepares regional need-for-power evaluations that are (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecast uncertainty.

Installed generation capacity in the ERCOT region is updated continuously as reflected in the Capacity, Demand and Reserves (CDR) in the ERCOT Region report. This report is summarized and published in May, with a mid-year update published in December. As of May 2007, there was an approximately 72,048 megawatt (MW) capacity expected to be available to the system in 2008 to address the summer peaks. The December update shows the amount as 72,416 MW available in 2008, and a total projection of 76,885 MW capacity available in 2013. These values do not include the potential impact of plant aging and potential plant retirement. These are shown on ERCOT Figure 8.3-8 and result in a potential replacement generation capacity of between 63 and 85 thousand MW by 2027, depending on whether 30, 40, or 50 year old plants are being retired. (ERCOT 2007b)

8.3.1 EXISTING GENERATING CAPACITY

Installed generation capacity in the ERCOT region is approximately 76,000 MW, which does not include approximately 5000 MW of "mothballed" natural gas-fired generation capacity; that is, units that have suspended operations from the grid for more than six months (refer to Subsection 8.4.1). This information is discussed in ERCOT's Report on Existing and Potential Electric System Constraints and Needs, December 2007, and is based on 2006 and 2007 data (ERCOT 2007a). In addition, the December 2007 update to the ERCOT 2007 CDR report provides a summary of the resources expected to be available each summer from 2008 – 2013 and is shown in Table 8.3-1. The focus is on the summer because the loads in ERCOT are substantially higher in the summer than the winter (ERCOT 2007). NP-18

As shown in Figure 8.3-1, 68 percent of installed generating capacity in ERCOT is fueled by natural gas, followed by 19 percent by coal, 6 percent by nuclear, and 5.8 percent by wind. It is important to note that nearly all new generation capacity added in the ERCOT system since 2000 is fueled by natural gas. A small portion is fueled by wind and other resources. Figure 8.3-2 shows the actual generation by fuel type. It is also important to note that the baseload units (coal and nuclear) provide more than twice their capacities share of total production, and the variable (wind) and peaking units (gas) only provide half their capacity. (ERCOT 2007a).

The existing ERCOT generation capacity by county, as shown in Figure 8.3-4, is based on information from the generating companies. This information includes switchable capacity (i.e., capacity capable of serving either ERCOT or another regional council), direct current (DC) ties to other regions, private network generation, and distributed generation that has registered with ERCOT (ERCOT 2007a). In addition, Table 8.3-1 shows that the majority of the supply comes from installed capacity. In the 2013 forecast, installed capacity is approximately 80.3 percent, private networks approximately 8.3 percent, and wind 0.6 percent, for a total of about 90 percent of the projected resources. The remaining 10 percent is principally switchable units and planned

8.4 ASSESSMENT OF NEED FOR POWER

This section assesses the need for power within the Electric Reliability Council of Texas (ERCOT) region. The summer peak demand and demand forecasts used in this assessment are discussed in more detail in Section 8.2. Installed capacity and planned additional capacity are discussed in Section 8.3. As discussed in this section, ERCOT prepares regional need-for-power evaluations that are systematic, comprehensive, subject to confirmation, and responsive to forecast uncertainty. As such, the evaluations provide sufficient data and analysis to serve as the basis for a need-for-power assessment and conclusion.

The preliminary report of the ERCOT annual demand forecast indicates the reserve margin is expected to be slightly above the 12.5 percent ERCOT target for 2008, but the margin declines below 12.5 percent by 2013 based on committed resources, as shown in Figure 8.4-2 (ERCOT 2007d).

8.4.1 RESERVE MARGIN CRITERION

The reserve margin is the percent by which the available generating capacity in the area exceeds the peak demand. In determining the need for power, ERCOT considers the reserve margin needed to ensure reliable system operation and supply of power. The reserve margin helps ensure that there are sufficient generating resources available to meet the load while providing allowance for generating facilities that may be unavailable due to planned or forced outages.

Figure 8.4-1 provides the ERCOT generation capacity by type and peak demand for 1997 – 2007. Figure 8.4-2 shows the ERCOT reserve margin significantly dropping below the 12.5 percent margin in 2013. (ERCOT 2007d) Figure 8.4-3 demonstrates a steady divergence between demand and capacity for the period 2012 – 2027. Figure 8.4-4 provides the potential ERCOT generation capacity needed from 2012 – 2027 (ERCOT 2007). Through 2007, the reserve margins remained above the 12.5 percent criterion set by ERCOT. From 1999 to 2004, a different methodology was used to calculate ERCOT's reserve margins. Variation in reserve margin for this period is due to variation in peak loads and not to the changes associated with these methodologies (Figure 8.4-2). The methodology approved by the ERCOT Board of Directors in 2005 considered switchable capacity, mothballed capacity, and wind capacity as they apply to the ERCOT competitive electric market. The methodology was directed to the generating capacity that would be capable of producing needed power during the summer peak load. The reserve margins, reported in the report on the Capacity, Demand, and Reserves (CDR) in the ERCOT region for 2008 – 2013, were calculated using this methodology (ERCOT 2007a).

The reserve margin is defined as (ERCOT 2007b):

$$\text{Reserve Margin} = \frac{\text{(Resources Available – Firm Load Forecast)}}{\text{(Firm Load Forecast)}}$$

The current generation reserve margin requirement for the ERCOT region is 12.5%, as approved by the ERCOT Board in August 2002. The following is a brief summary of the methodology for the reserve margin calculation (Comstock 2007). The terms used here are defined below. NP-09

Firm Load Forecast equals NP-09

Long-Term Forecast Model total summer peak demand

- minus loads acting as resources (LaaRs) serving as responsive reserve
- minus LaaRs serving as non-spinning reserve
- minus balancing up loads (BULs)

Available Resources equals

Installed capacity using the Summer Net Dependable Capability (SNDC) pursuant to ERCOT testing requirements (excluding wind generation)

- plus capacity from private networks
- plus Effective Load Carrying Capability (ELCC) of wind generation (i. e., 8.7% of name plate generation)
- plus reliability must run (RMR) units under contract
- plus 50% of non-synchronous ties
- plus SNDC of available switchable capacity as reported by the owners
- plus available mothballed generation
- plus planned generation with a signed generation interconnection agreement (SGIA) and a TCEQ air permit, if required
- plus ELCC of planned wind generation with SGIA
- minus switchable capacity unavailable to ERCOT
- minus retiring units

Loads acting as resources (LaaRs) are capable of reducing or increasing the need for electrical energy or providing ancillary services such as responsive reserve service or non-spinning reserve service. LaaRs must be registered and qualified by ERCOT, and will be scheduled by a qualified scheduling entity (ERCOT 2007f).

- Responsive reserve service is provided by operating reserves that ERCOT maintains to restore the frequency of the ERCOT system within the first few minutes of an event that causes a significant deviation from the standard frequency. These unloaded generation resources are online, capable of controllably reducing or increasing consumption under dispatch control and that immediately respond proportionally to frequency changes. The amount of capacity from unloaded generation resources or DC tie response is limited to the amount that can be deployed within 15 seconds. NP-09

- Non-spinning reserve service is provided by LaaRs that are capable of being interrupted within 30 minutes and that are capable of running or being interrupted at a specified output level for at least 1 hour.

Balancing up Loads (BULs) are also capable of reducing the need for electrical energy when providing balancing up load energy service, but are not considered resources as defined by the ERCOT Protocols (ERCOT 2007f). Refer to Subsection 8.4.2.

Summer Net Dependable Capability is the maximum sustainable capability of a generation resource as demonstrated by a performance test lasting 168 hours (ERCOT 2007a).

A private network is an electric network connected to the ERCOT transmission grid that contains loads that are not directly metered by ERCOT (i. e., loads that are typically netted with internal generation) (ERCOT 2007a).

Effective Load Carrying Capability – ERCOT selected Global Energy Decisions, Inc. (GED) to complete a new target reserve margin study. GED used their unit commitment and dispatch software (MarketSym) to analyze the impact of load volatility, wind generation, unit maintenance, and unit forced outages on expected unserved energy, loss of load probability, and loss of load events. GED ran the model with the base set of generating units and a generic thermal generator (550 MW) and determined the expected unserved energy. GED removed the generic thermal generator and added new wind generation until the same expected unserved energy was achieved. The amount of new wind generation will have the same effective loadcarrying capability as the 550 MW thermal generator. It was found that 6,300 MW of wind had the same load carrying capacity as 550 MW of thermal generation. Thus, the effective load carrying capacity (ELCC) of wind is 8.7% (Lasher 2007).

Reliability must run (RMR) service is provided under agreements for capacity and energy from resources which otherwise would not operate and which are necessary to provide voltage support, stability or management of localized transmission constraints under first contingency criteria (ERCOT 2007f)

Switchable capacity is defined as a generating unit that can operate in either the ERCOT market or the Southwest Power Pool (SPP) market, but not simultaneously. These switchable generating units are situated in close proximity to the transmission facilities of both ERCOT and SPP, which allows them to switch from one market to the other when it is economically appropriate.

Mothballed capacity includes generation resources for which generation entities have submitted a Notification of Suspension of Operations and for which ERCOT has declined to execute an RMR agreement. Available mothballed generation is the probability that a mothballed unit will return to service provided by the owner multiplied by the capacity of the unit. Return probabilities are considered protected information under the ERCOT Protocols (ERCOT 2007a). NP-18

Planned generation capacity is based on the interconnection study phase. A generation developer must go through a set procedure to connect new generation to the ERCOT grid. The first step is a high-level screening study to determine the effects on the transmission system of adding the new generation. The second step is the full interconnection study, which is a detailed study done by transmission owners to determine the effects of the new generation (ERCOT 2007a). The full interconnection study for CPNPP 3 and 4 is in the multi-tear review and approval process by ERCOT and the PUCT. NP-03

There is uncertainty associated with a number of the inputs to the ERCOT reserve margin calculation. The methodology considers these uncertainties to the extent possible in a formulaic approach while attempting to produce an equation to calculate an ERCOT reserve margin forecast that produces a reasonable estimate of such reserve margins and while not being overly cumbersome or complex. It is not possible to create an equation that can capture all of the impacts of market prices on capacity reserves. However, ERCOT believes that the approved methodology represents an accurate calculation of reserve margin (Comstock 2007).

~~where:~~

~~Resources Available = Summer net dependable capacity (excluding wind generation).~~

~~Plus 50 percent of direct current (DC) capacity~~
~~Plus 100 percent - X of "Switchable" capacity (X to be based on information provided to ERCOT by switchable capacity owners)~~
~~Plus 8.7 percent of wind generation (based on ERCOT analysis of historical data)~~
~~Plus 100 percent of planned generation with signed interconnection agreement or letter to ERCOT from resource owner (letter applies to non-opt-in entities [NOIEs] only – an electric cooperative or municipally-owned utility (MOU) that does not offer customer choice.)~~
~~Plus 8.7 percent of planned wind generation with signed Interconnection agreement or letter to ERCOT from owner (letter applies to NOIEs only)~~
~~Plus Y of "mothballed" units (Y to be based on ERCOT analysis of information provided by mothballed unit owners)~~
~~Minus 100 percent of retiring units (all forecast years)~~

~~Firm Load = Forecasted total summer peak demand – Demand-side resources~~

ERCOT has set a minimum planning reserve margin target of 12.5 percent that equates to a capacity margin of 11 percent. This result was based on a reliability study that concluded that the margin should provide about a one-day-in-ten-years loss-of-load expectation. This reserve margin should be sufficient to cover, among other uncertainties, the potentially 5.4 percent higher peak demand associated with 90th percentile temperatures. Table 8.4-1 presents the reserve margins reported in the 2007 CDR (ERCOT 2007a) calculated using the methodology described above. As shown, ERCOT's reserve margin remains above the 12.5% requirement set by the ERCOT Board of Directors through 2008. However, ERCOT predicts that by 2009, the reserve margin will fall below 12.5%. NP-09

Generation owners are required to provide ERCOT at least 90 days notice of extended planned shutdowns of generation so ERCOT can enter into Reliability Must-Run (RMR) contracts for those units to keep them available if needed for system reliability. ERCOT has contracts with one remaining plant totaling 169 MW of RMR capacity in the Laredo area that is needed to provide local voltage support and keep facility loadings below transmission limits. ERCOT has exit strategies to improve the transmission system so this RMR capacity can be phased out by the summer of 2011 (NERC 2007).

ERCOT has committed resources of approximately 2100 MW of fossil-fueled generating capacity with existing signed interconnection agreements expected to come online between 2007 and 2012. Almost 2000 MW of new wind generation is also expected between 2007 and 2012. The North American Electric Reliability Corporation (NERC) 2007 Long-Term Reliability Assessment reported 672 MW of fossil-fueled generating capacity and 950 MW of wind generation between 2006 and 2011, all with signed interconnection agreements (NERC 2007).

Based on the CDR, the generation reserve margin is expected to drop below the recommended level in a few years. This drop is attributable to the mothballing and retirement of older, less efficient generation facilities and to a robust state economy. ERCOT emphasized the need for additional generation or demand resources and called for additional diversity in the fuel mix to reduce the system's vulnerability to supply disruption and volatile pricing due to a heavy reliance on natural gas, approximately 71 percent of installed capacity (ERCOT 2006a). As shown in Table 8.4-1 and Figure 8.4-2, in 2013, ERCOT's reserve margin is projected to fall significantly below the 12.5 percent criterion set by the ERCOT Board of Directors.

The NERC 2007 Long Term Reliability Assessment indicates the capacity margin is expected to be slightly above the 12.5 percent target for 2008 at 12.6 percent, but declines below the minimum planning reserve margin target beginning in 2009 based on committed resources. Uncommitted resources in ERCOT include mothballed generation capacity (approximately 5000 MW) and planned generation. By 2016, the uncommitted planned generation is approximately 11,500 MW of nonwind generation, approximately 14,000 MW of nameplate capacity wind generation, and 6176 MW of nuclear generation (NERC 2007). ERCOT updates this forecast on a monthly basis as plants are added or mothballed, and the forecast is adjusted accordingly. By 2013, the amount below the reserve margin is dependent on how many 30, 40, and 50 year old plants are included in the assessment (ERCOT 2007a).

ERCOT cannot order new capacity to be installed to keep the reserve margin from falling below the required 12.5%, but publication of the various ERCOT reports and continuous collaboration between ERCOT and the market participants ensure that they are aware of the demand and capacity situation. If the PGCs do not voluntarily react to market economic forces and add generation capacity, the reserve margin could fall below the required minimum in the very near future. NP-12

8.4.2 LOAD PARTICIPATION PROGRAMS

The ERCOT Demand Side Working Group (DSWG) was created in 2001 as a task force by a directive of the Public Utility Commission of Texas (PUC) and was converted to a permanent working group in 2002. A broad range of commercial and industrial consumers, load serving entities and retail electric providers (REPs), transmission and distribution (T&D) service providers, and power generation companies (PGCs) participate in the DSWG meetings and initiatives. Their mission is to identify and promote opportunities for demand-side resources to

ERCOT develops peak demand and energy forecasts that reflect the outcome of differing economic and weather outlooks and uncertainties and, in cooperation with TSPs, selects a most probable scenario for planning purposes (ERCOT 2007d).

The long-term forecasting model resolves one measure of the uncertainty associated with extreme weather impacts on peak demands by using a more extreme weather profile to obtain the forecasts. It then uses a 90th and 10th percentile confidence band to bound contingencies. From 1999 to 2006, the ERCOT peak demand and energy consumption forecasts have been within +5 percent of the actual demand and consumption (ERCOT 2007).

8.4.4 CONCLUSIONS

As discussed above, taken collectively, the studies and reports performed or utilized by ERCOT and referenced in this chapter regarding power supply, demand, and projections satisfy the four criteria in NUREG-1555 and provide sufficient data and analysis to serve as the basis for a need-for-power assessment and conclusion. ERCOT has concluded that a significant amount of new generation is needed to meet the demand projected for 2016, along with maintaining the 12.5 percent reserve margin that is needed to maintain system reliability, regardless of which load scenario is under consideration (ERCOT 2006b).

In its 2006 Long-Term Reliability Assessment, NERC identified four key findings that could critically impact long-term reliability unless prompt actions are taken: (1) declining capacity margins, (2) lagging transmission construction, (3) fuel supply and delivery issues (focusing on natural gas), and (4) the aging industry workforce (NERC 2007). NERC concluded while some progress has been made, efforts to date have yet to substantially mitigate the risk of these issues to future reliability. Each of these four issues is highlighted again in the 2007 report as a key finding (NERC 2007). In summary, the ERCOT generation capacity and demand projections demonstrate a need for power based on a shrinking reserve margin that is expected to fall below the ERCOT system reliability goals by 2009.

8.4.5 ERCOT UPDATE NP-01

Chapter 8 of the Environmental Report was developed using 2007 ERCOT data. ERCOT demand and supply data is routinely updated and Luminant continues to monitor the updated ERCOT data. The 2008 ERCOT reports incorporate new projections for power supply (additional intermittent wind supply and efficiency projections) and slightly lower projections for demand (impacts of the economy). The effect of these changes reduced demand approximately 1% in the near-term (10-year look-ahead) and 14% over the long-term projection (20-year look-ahead). However, even with the changes in demand and supply forecast and only excluding plants over 50 years old, ERCOT still showed a need for over 15,000 MWe of supply in the short term and over 48,000 MWe by 2028. This would equate to the addition of over 30 plants the size of the planned units. The overall conclusion regarding the future need for baseload generation in the ERCOT market has not changed.

8.4.6 REFERENCES

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NP-01

TABLE 8.4-1 (Sheet 1 of 2)
ERCOT DEMAND, SUPPLY, AND RESERVE MARGIN

NP-14

2007 Report on the Capacity, Demand, and Reserves in the ERCOT Region

Summer Summary — December Update

Load Forcast:	2008	2009	2010	2011	2012	2013
Total Summer Peak Demand, MW	65.135	66,508	67,955	69,456	70,733	72,160
less LAARs Serving as Responsive Reserve, MW	1,125	1,125	1,125	1,125	1,125	1,125
less LAARs Serving as Non-Spinning Reserve, MW	0	0	0	0	0	0
less BULs, MW	0	0	0	0	0	0
Firm Load Forcast, MW	64,010	65,383	66,830	68,331	69,608	71,035
Resources:	2008	2009	2010	2011	2012	2013
Installed Capacity, MW	61,722	61,722	61,722	61,722	61,722	61,722
Capacity from Private Networks, MW	6405	6405	6405	6405	6405	6405
Effective Load-Carrying Capability (ELCC) of Wind Generation, MW	497	497	497	497	497	497
RMR Units under Contract, MW	169	169	169	0	0	0
Operational Generation, MW	68,793	68,793	68,793	68,624	68,624	68,624
50% of Non-Synchronous Ties, MW	553	553	553	553	553	553
Switchable Units, MW	2877	2877	2877	2877	2877	2877
Available Mothballed Generation, MW	510	419	594	558	522	522
Planned Units (not wind) with Signed IA and Air Permit, MW	0	836	3296	3296	4221	4221
ELCC of Planned Wind Units with Signed IA, MW	0	148	153	153	153	153
Total Resources, MW	72,733	73,625	76,266	76,061	76,950	76,950
less Switchable Units Unavailable to ERCOT, MW	317	317	0	0	0	0
less Retiring Units, MW	0	0	65	65	65	65
Resources, MW	72,416	73,308	76,201	75,996	76,885	76,885
Reserve Margin	13.1%	12.1%	14.0%	11.2%	10.5%	8.2%

TABLE 8.4-1 (Sheet 2 of 2)
ERCOT DEMAND, SUPPLY, AND RESERVE MARGIN

(Resources - Firm Load Forecast)/Firm Load Forecast

Other	5892	10,436	14,897	19,192	19,777	20,673	NP-14
— Mothballed Capacity, MW	4446	4537	4362	4567	4603	4603	
— 50% of Non-Synchronous Ties, MW	553	553	553	553	553	553	
Planned Units in Full Interconnection Study Phase, MW	893	5346	9982	14,072	14,621	15,517	

(ERCOT 2007a)

Chapter 9

Chapter 9 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	9-xx	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00632	9.2	9.2-9	Erratum	Change “peak” to “units”.	0
CTS-00687	9.3.4.1.3.2	9.3-14	Update the proprietary status of information	Remove (proprietary)	1
CTS-00688	9.3	9.3-30	Update the proprietary status of information	Remove “Attachment proprietary information” and add “Luminant Nuclear Power Plant Siting Report, February 09, 2009, with a modified” and remove the period after Project.	1
CTS-00689	Tables: 9.3-1A 9.3-3 9.3-4 9.3-5 9.3-6 9.3-7 9.3-8 9.3-9 9.3-10 9.3-11 9.3-12 9.3-13 9.3-14 9.3-15 9.3-16 9.3-17 9.3-18 9.3-19 9.3-20 9.3-21 9.3-22 9.3-23 9.3-24 9.3-25 9.3-26 9.3-27	9.3-33, 9.3-36, 9.3-37, 9.3-38, 9.3-39, 9.3-40, 9.3-41, 9.3-42, 9.3-43, 9.3-44, 9.3-45, 9.3-46, 9.3-47, 9.3-48, 9.3-49, 9.3-50, 9.3-51, 9.3-52, 9.3-53, 9.3-54, 9.3-55, 9.3-56, 9.3-58, 9.3-59, 9.3-60, 9. 3-61, 9.3-62, 9.3-63, 9.3-64,	Update the proprietary status of information	Remove “Withheld from Public Disclosure Under 10 CFR 2.390 (a) (4)” from the title.	1

		9.3-65 9.3-66, 9.3-67, 9.3-68, 9.3-69, 9.3-70, 9.3-71, 9.3-72, 9.3-73, 9.3-74			
CTS-00690	Figure 9.3-2	-	Editorial Correction	Remove box with "Proprietary Information – Withheld Under 10 CFR 2.399 (a) (4)" and provide figure.	1
ALT-09	9.2	9.2-28	Editorial Correction	Remove the sentence "The levelized cost of electricity produced from pulverized coal fired power plants is $0.033/kWh - $0.041/kWh"	1
ALT-09	9.2	9.2-30	Erratum	Replace $575 with $544	1

by-product produced by IGCC plants is sulfur, which is extracted during the gasification process and can be marketed rather than placed in a landfill. The IGCC units do not produce ash or scrubber wastes.

In terms of cost, because large-scale coal-fired energy projects approaching the size of the proposed CPNPP Units 3 and 4 exist, there is sufficient information available on the costs of constructing or operating a large coal-fired power project. From the available information, the costs of generating power equal to that of the proposed CPNPP Units 3 and 4 make pulverized-coal-fired power plants an economical alternative.

Capital costs for conventional pulverized-coal-fired power plants are estimated to range from $1562/kW – $2883/kW~~. The levelized cost of electricity produced from pulverized-coal-fired power plants is $0.033/kWh – $0.041/kWh~~ (NETL 2007). Because of limitations on unit sizes and lower fuel efficiencies, FBC is not a cost-effective alternative for the proposed CPNPP Units 3 and 4. Experience with IGCC indicates generation costs are more expensive than comparably sized pulverized coal plants because of the coal gasifier and other specialized equipment. The capital costs for coal-fired IGCC power plants are $1841/kW – $2496/kW and have levelized costs of electricity of $0.078/ kWh (NETL 2007). ALT-09

The United States has abundant low-cost coal reserves, and the price of coal for electric generation should increase at a relatively slow rate. Even with recent environmental regulation, coal capacity is expected to be an affordable technology for reliable, near-term development.

Based upon the evaluation criteria, pulverized-coal-fired power plants are considered to be a reasonable energy alternative to the proposed CPNPP Units 3 and 4. Pulverized-coal-fired power is a developed and proven technology that is utilized for energy generation in the ERCOT service area. There is the potential that pulverized-coal-fired power plants could provide baseload generating capacity and availability equal to the proposed CPNPP Units 3 and 4. Coal fuels would have greater environmental impacts that the proposed CPNPP Units 3 and 4. The costs of pulverized-coal-fired power plants are well-known and would make the use of this technology economically practical. Generating capacity from this technology equivalent to that capacity of the proposed CPNPP Units 3 and 4 is achievable within the time frame of the proposed project. An IGCC facility is not a reasonable alternative, because IGCC technology currently is not cost-effective and requires further research to achieve an acceptable level of reliability.

Given this potential feasibility as a competitive energy alternative, a more detailed evaluation of pulverized-coal-fired power is presented in Subsection 9.2.3.1. The discussion in Subsection 9.2.3.1 includes the plant size and land requirements, fuel quality and consumption estimates, waste management issues, emissions evaluation, economic costs evaluation, and potential environmental and health restrictions or impacts. As stated in the introductory paragraphs in Subsection 9.2.2, the use of this energy technology is considered to be consistent with U.S. national policy, which includes maintaining a diverse energy supply and the continued use of coal but with more efficient combustion and air emission controls.

Criterion 4 - No unusual environmental impacts or exceptional costs

A natural gas energy plant would have greater environmental impacts than the proposed CPNPP Units 3 and 4. SMALL to MODERATE impacts would be expected from a natural gas energy plant on land use, ecological resources, protected species, human health, aesthetics, cultural resources, water quality, waste management, air quality, and socioeconomics.

In terms of cost, because there are large-scale natural gas energy projects approaching the size of the proposed CPNPP Units 3 and 4, there is sufficient information available on the costs of constructing or operating a large natural gas power project. From the available information, the costs of generating power equal to that of the proposed CPNPP Units 3 and 4 make natural gas power plants an economic alternative. The capital costs for natural-gas-fired power plants are estimated at approximately $544~~575~~/kW. Electrical generation costs utilizing natural gas as fuel are in the range of $35/MWh to $48/MWh or $0.035/kWh to $0.048/kWh. ALT-09

Based upon the evaluation criteria, natural gas is reasonable energy alternative to the proposed CPNPP Units 3 and 4. Electrical power derived from natural gas is a developed and proven technology that is utilized for energy generation in the ERCOT service area. There is the potential that natural gas power plants could provide baseload generating capacity and availability equal to the proposed CPNPP Units 3 and 4. Natural gas would have greater environmental impacts than the proposed CPNPP Units 3 and 4. The costs of natural gas fuel plants are well-known and would make the use of this technology economically practical. Generating capacity from this technology equivalent to that capacity of the proposed CPNPP Units 3 and 4 is achievable within the time frame of the proposed project.

Given this potential feasibility as a competitive energy alternative, a more detailed evaluation of natural gas-fired power is presented in Subsection 9.2.3.2. The discussion in Subsection 9.2.3.2 includes the plant size and land requirements, fuel quality and consumption estimates, emissions evaluations, economic costs evaluation, and potential environmental and health restrictions or impacts. As stated in the introductory paragraphs in Subsection 9.2.2, the use of this energy technology is consistent with U.S. national policy, which includes maintaining a diverse energy supply and the use of domestic energy sources with lower greenhouse gas emissions than fuels like petroleum liquids.

9.2.3 ASSESSMENT OF ALTERNATIVE SOURCES AND SYSTEMS

Luminant has identified a broad range of strategies to generate baseload power. Subsection 9.2.2 discusses the pertinent options addressing the particular need for power to be addressed by the proposed CPNPP Units 3 and 4. This subsection further evaluates the environmental effects from the reasonable alternatives and compares them to the proposed CPNPP Units 3 and 4. For the reasons discussed in Subsection 9.2.2, these alternatives are coal and natural-gas-fired generation. The environmental impacts discussed in this subsection and summarized in Table 9.2-1 are representative of the alternate energy sources.

9.2.3.1 Coal-Fired Generation

Luminant has reviewed the NRC analysis of environmental impacts from coal-fired generation alternatives in NUREG-1437 that focused on combined-cycle plants and found the analysis to be

9.3-11, 9.3-12, and 9.3-13 (proprietary) provide a summary of the DRASTIC evaluations for the candidate sites. CTS-00687

Groundwater resources underlying the candidate sites are either currently used or are potential sources of drinking water. These resources are expected to be considered Class II aquifers according to the EPA classification guidelines. There are no sole-source aquifers at the candidate sites.

DRASTIC indexes for all typical hydrogeologic settings range from 65 to 223, as discussed in DRASTIC, page 82 (Aller, Bennett, Lehr, and Hackett 1987). This range of indexes was used to develop a ranking system to compare vulnerability of candidate sites depicted in Table 9.3-14. Table 9.3-15 compares the candidate sites in terms of their relative vulnerability.

9.3.4.1.3.3 Air Radionuclide Pathway

This criterion is designed to assess the candidate sites with respect to the potential for exposure to the public from routine airborne releases from a nuclear power plant. The criterion is composed of two suitability characteristics:

Topographic Effects

X/Q

None of the sites are believed to have significant potential for undesirable negative topographic effects on long-term dispersion. Site-specific meteorological data are not available for all of the candidate sites. Annual average wind speeds for the regions were used to calculate an estimated annual average X/Q function value.

Based on the available information, all sites meet the suitability criteria (0.5 mi value < 7.2×10^{-5} sec/m^3, 1.0 mi value < 1.5×10^{-5} sec/m^3). The potential effects from the air radionuclide pathway due to the proposed project are considered to be SMALL for all candidate sites.

9.3.4.1.3.4 Air-Food Ingestion Pathway

The purpose of the air-food ingestion pathway criterion was to assess the candidate sites in terms of the relative potential for exposure of humans to radioactive emissions through deposition of radioactive materials on food crops with subsequent consumption of foodstuffs by exposed individuals. One radionuclide exposure pathway involves the emission of radionuclides into the food chain of local crops and pastures. While the exposure of the public through food pathway exposures is negligible, sites with lower amounts of crop and pasture land use are considered to be more suitable. Sites with less crop production nearby are rated higher than those with larger agricultural industries.

General information regarding croplands and pastures near the sites, including air-food ingestion pathway ratings, is summarized in Table 9.3-16 The potential effects from the air-food ingestion pathway are considered to be SMALL for all candidate sites.

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TABLE 9.3-1A
ENVIRONMENTAL STANDARD REVIEW PLAN CHART USING MCCALLUM-TURNER 2007 WEIGHTED SCORES

Subject Area for Candidate Site Selection and Screening	CPNPP	Luminant A Coastal	Luminant B Pineland	Luminant C Trading House	M-T Report Reference #[(a)]
Land use, Including availability and areas requiring special consideration	28.5	17.1	11.4	28.5	3.4
Hydrology, water quality and water availability	41.5	24.9	41.5	41.5	4.1.1
Terrestrial resources (including endangered species)	38	38	30.8	38	2.2, 2.4
Aquatic biological resources, including endangered species	71.1	71.8	71.1	71.1	2.1, 2.3.1, 2.3.2
Socioeconomics (including aesthetics, archeological, and historic preservation and environmental justice)	52	41	41	46.5	3.1.1, 3.3.1
Transmission corridors (approximate length and general location, feasibility, and resources affected)	37.5	30	15	37.5	4.2.4
Population distribution and density	28.8	28.8	28.8	21.6	1.2
Industrial constraints as they affect site availability	11.8	11.8	29.5	17.7	1.1.4
Is this site a candidate site?	Yes	Yes	Yes	Yes	
Is this candidate site a good alternative to the proposed site?	Yes	Yes	Yes	Yes	
Ranking Total	309.2	263.4	269.1	302.4	

a)Numbers represent the weighted scoring from (McCallum-Turner 2007). The reference numbers are the sections which most closely reflect the subject categories from that report.

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TABLE 9.3-3
CANDIDATE SITE RISK FACTOR ANALYSIS

Site	Public Acceptance	Area Population	COL Application Timeframe
CPNPP Site	Nuclear operations currently exist at the site. Additional plant construction would not introduce new radiological concerns to the area.	The site is located in a relatively remote area without significant population centers nearby.	Data needed for the COL application (including meteorological, surfacewater and groundwater data) are readily available from the existing plant licensing basis. COL application schedule would not be delayed by data collection activities.
Luminant C-Trading House	New plant construction would introduce additional radiological concerns to the area, including potential dose pathways due to area agriculture.	The site is located near Waco, a significant population center.	Data needed for the COL application would have to be collected through data development programs, resulting in a longer timeframe required to complete the COL application.

TABLE 9.3-4
PROBABILISTIC GROUND MOTION VALUES IN %g

Site	PGA (%g) with 2% PE in 50 yr
CPNPP Site	3.78
Luminant A - Coastal	4.13
Luminant B - Pineland	6.46
Luminant C- Trading House	4.00

 CTS-00689

TABLE 9.3-5
LIST OF CLASS B FEATURES WITHIN 200-MI RADIUS OF EACH SITE

Site	Class	Feature	Distance from site (mi)
CPNPP Site	B	Gulf-margin faults	100 – 200 mi
Luminant A - Coastal	B	Gulf-margin faults	0 – 25 mi
Luminant B - Pineland	B	Gulf-margin faults	0 – 25 mi
Luminant C- Trading House	B	Gulf-margin faults	25 – 50 mi

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TABLE 9.3-6 (SHEET 1 OF 2)
PERTINENT FLOOD RELATED INFORMATION FOR THE CANDIDATE SITES

Site	Evaluation
CPNPP Site	Site elevation = 850 ft msl (Note: the ER now uses a figure of 830 ft msl). SCR typical water elevation = 775 ft. Site is located in Flood Zone X (outside 100/500-yr flood zone). No dams or other unique features are present upstream of the candidate site that may cause flooding concerns.
Luminant A - Coastal	Site elevation = 55 ft. Guadalupe River at Bloomington flood stage = 20 ft. San Antonio River at McFaddin, level = 35 ft. Site is located in Flood Zone X (outside 100/500-yr flood zone). The reservoir dam is located ~ 17 mi northwest of the candidate site. The reservoir was created as a cooling water source for a neighboring power plant; the dam is not a flood control dam. The capacity of the reservoir is approximately 35,000 ac-ft. The Coleto Creek Dam is a high hazard-potential dam meaning that dam failure would likely result in the loss of human life. Failure of this dam would flow into Coleto Creek and the Guadalupe River. No dams or flooding concerns are located on the San Antonio River within 50 mi upstream of the site. The site could experience adverse conditions from tropical storms impacting the Texas Gulf Coast. The elevation at the site would prevent any direct impact from Gulf of Mexico storm surge.
Luminant B - Pineland	Site elevation = 222 ft. The reservoir typical water elevation = 164 ft. Site is location outside of Flood Zone A (100-yr flood zone). Because of topography and local drainages, some areas of the site may approach the 100-yr flood zone boundary. No dams or other unique features are present upstream of the candidate site that may cause flooding concerns.

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TABLE 9.3-6 (SHEET 2 OF 2)
PERTINENT FLOOD RELATED INFORMATION FOR THE CANDIDATE SITES

Site	Evaluation
Luminant C- Trading House	Site elevation = 452 ft. The reservoir typical water elevation = 447 ft. Site is located in Flood Zone Z (outside 100/500-yr flood zone). Three small spillways are located upstream of the site on the reservoir (elevations 477 ft, 472 ft, and 462 ft). Breach of these spillways could cause some minor increase in reservoir elevations, but are not expected to present significant flooding hazards to the site.

TABLE 9.3-7 (SHEET 1 OF 2)
POTENTIAL HAZARDS LAND USES NEAR EACH SITE

Site	Evaluation
CPNPP Site	Airports (within 10 mi): 3.7 mi NW; 5.2 mi SE; 5.4 mi SW; 7.1 mi SW; 7.3 mi NE; 9.1 mi NE; 9.7 mi S.; 10.0 mi N. Rail: Nearest rail line potentially transporting hazardous cargo located 9.6 mi northwest (near Tolar). Rail spur provides access to CPNPP. Pipelines: There are four pipelines that cross the site. Two cross the very northern tip of SCR and two skirt the southwestern boundary. Military Installation: None located near site. Other: The site is co-located with two nuclear power plants (CPNPP Units 1 and 2). A fossil-fueled power plant is located 8.7 mi northeast.
Luminant A -Coastal	Airports (within 10 mi): 5.6 mi east and 7.8 mi southeast. Regional airport located 19.9 mi north. Rail: Nearest rail line potentially transporting hazardous cargo located 2.3 mi to northwest. Rail line also located 6.3 mi northeast. Pipelines: Pipeline easement through site; pipelines also located immediately adjacent to south, 3.1 mi southeast, 4.6 mi southeast, 5.3 mi northwest, 7.0 mi northeast, 7.5 mi northwest. Military Installation: None located near site. Other: transportation canal located 3.2 mi northeast (potential to transport hazardous cargo). Oil field located 3.7 mi southwest; Oil field located 6.3 mi northeast. Manufacturing plant located 8 mi north.

TABLE 9.3-7 (SHEET 2 OF 2)
POTENTIAL HAZARDS LAND USES NEAR EACH SITE

Site	Evaluation
Luminant B - Pineland	Airports (within 10 mi): 5.8 mi northeast.
	Rail: Nearest rail line potentially transporting hazardous cargo located 5.0 mi east.
	Pipelines: None identified.
	Military Installation: None located near site.
	Other: Hydroelectric plant located 8.0 mi southwest.
Luminant C - Trading House	Airports (within 10 mi): 0.3 mi southeast; 3.8 mi northwest; 7.7 mi northwest; and 8.5 mi southwest; 15.9 mi west.
	Rail: Nearest rail line potentially transporting hazardous cargo located 4.0 mi southwest.
	Pipelines: One pipeline within 1.5 mi of the site that extends around the eastern edge of the reservoir.
	Military Installation: Fort Hood military installation located 52 mi southwest of site.
	Other: The site is co-located with a fossil-fueled power plant. However, operation of a nuclear power plant at the site would coincide with shutdown of the fossil power plant.

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TABLE 9.3-8 (SHEET 1 OF 2)
COMPARISON OF WIND AND PRECIPITATION DATA FOR EACH OF THE CANDIDATE SITES

Site	Peak Gust Maximum wind speed (mph)	Tornado Frequency Strong violent tornadoes Average per 10,000 sq mi State average	Proximity to Coast/ Hurricane Threat	Hurricane direct hits on Texas Gulf region[a] (1851-2004)	Maximum 24-hr precip.
CPNPP Site	81 mph peak gust (DFW). 73 mph maximum wind speed (DFW). 51-76 mph fastest mile winds – 2 yr return versus 100 yr return (CPNPP).	139 overall state average. 29 5.2 per 10,000 sq mi. In/near tornado alley with >15 per 1000 sq mi; F5 in Waco.	Inland	N/A	8.48 in (Glen Rose).
Luminant A - Coastal	78 mph peak gust (Houston). 67 mph peak gust (Corpus Christi). 75 maximum wind speed (Victoria).	139 overall state average. 29 5.2 per 10,000 sq mi. 6–10 per 1000 sq mi[b].	Coast/semi-coast.	16	9.87 in (Victoria).

TABLE 9.3-8 (SHEET 2 OF 2)
COMPARISON OF WIND AND PRECIPITATION DATA FOR EACH OF THE CANDIDATE SITES

Site	Peak Gust Maximum wind speed (mph)	Tornado Frequency Strong violent tornadoes Average per 10,000 sq mi State average	Proximity to Coast/ Hurricane Threat	Hurricane direct hits on Texas Gulf region[a] (1851-2004)	Maximum 24-hr precip.
Luminant B - Pineland	63 mph (Shreveport, LA).	139 overall state average. 29 5.2 per 10,000 sq mi. 6–10 per 1000 sq mi[b].	Inland	N/A	9.04 in (Sam Rayburn Dam).
Luminant C - Trading House	58 mph (Waco). 78 mph (Houston). Maximum wind speed – 69 mph (Waco).	139 overall state average. 29 5.2 per 10,000 sq mi. In/near tornado alley with >15 per 1000 sq mi; F5 in Waco.	Inland	N/A	7.98 in (Bay City).

a) Hurricane that may strike more than one region in Texas would be counted separately for each region; i.e., individual regional totals may exceed state totals. Central Texas quadrant was assumed to be the coastal area between Galveston and Corpus Christi, containing the potentially affected Luminant A - Coastal site.

b) Luminant A - Coastal and Luminant B - Pineland sites seem to be in band of 6–10 per 1000 sq mi; CPNPP and Luminant C- Trading House sites next to/just inside tornado alley (southern tip) – one spot they appear to be near shows >15 tornadoes per 1000 sq mi with an F5 in Waco in 1953 – one of deadliest (Waco is approximately 10 mi west of the Luminant C- Trading House site).

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TABLE 9.3-9
ESTIMATED WIND SPEED AND X/Q

Site	Evaluation
CPNPP Site	Annual average wind speed = 9.0 – 9.9 mph. Estimated X/Q = 1.72E-5 sec/m^3 at 0.5 mi, 5.23E-6 sec/m^3 at 1.0 mi. CPNPP Final Safety Analysis Report (FSAR) for Units 1/2 reports X/Q = 2.5E-5 sec/m^3 at 0.5 mi (NNW) and 6.1E-6 sec/m^3 at 1.0 mi (NNW).
Luminant A - Coastal	Annual average wind speed = 9.0 – 9.9 mph. Estimated X/Q = 1.72E-5 sec/m^3 at 0.5 mi, 5.23E-6 sec/m^3 at 1.0 mi.
Luminant B - Pineland	Annual average wind speed = 7.0 – 7.9 mph. Estimated X/Q = 2.18E-5 sec/m^3 at 0.5 mi, 6.62E-6 sec/m^3 at 1.0 mi.
Luminant C - Trading House	Annual average wind speed = 9.0 – 9.9 mph. Estimated X/Q = 1.72E-5 sec/m^3 at 0.5 mi, 5.23E-6 sec/m^3 at 1.0 mi.

TABLE 9.3-10
DRASTIC EVALUATION FOR THE CPNPP SITE

Groundwater region = 6 (Non-glaciated Central Groundwater Region)
Groundwater subregion = K (Unconsolidated and Semi-consolidated Aquifers)
Underlying Basin = Trinity (outcrop)
Predicted groundwater classification = Class IIB
Potential evapotranspiration exceeds annual precipitation by 5-10 in/yr

DRASTIC Variable	Range and Source of Information	Weight	Rating	Number
Depth to Water	100+ ft bgs (Groundwater Level Reports).	5	1	5
Net Recharge	0–2 in/yr (DRASTIC).	4	1	4
Aquifer Media	Sand and gravel (DRASTIC).	3	8	24
Soil Media	Sandy loam (DRASTIC).	2	6	12
Topography	2-5% (USGS site topographic maps).	1	9	9
Impact Vadose Zone	Sand and gravel with significant silt and clay (DRASTIC).	5	6	30
Hydraulic Conductivity	300 - 700 gpd/ft^2 (DRASTIC).	3	4	12
			INDEX	96

TABLE 9.3-11
DRASTIC EVALUATION FOR THE LUMINANT A - COASTAL SITE

Groundwater region = 10 (Atlantic and Gulf Coastal Plain)
Groundwater subregion = Ba (River Alluvium with Overbank Deposits)
Underlying Basin = Gulf Coast Aquifer
Predicted groundwater classification = Class IIB
Potential evapotranspiration exceeds annual precipitation by 5-10 in/yr

DRASTIC Variable	Range and Source of Information	Weight	Rating	Number
Depth to Water	30–50 ft bgs (Groundwater Level Reports).	5	5	25
Net Recharge	7–10 in/yr (DRASTIC).	4	8	32
Aquifer Media	Sand and gravel (DRASTIC).	3	8	24
Soil Media	Silty loam (DRASTIC).	2	4	8
Topography	Less than 1% (USGS site topographic maps).	1	10	10
Impact Vadose Zone	Silt/Clay (DRASTIC).	5	3	15
Hydraulic Conductivity	700 – 1000 gpd/ft^2 (DRASTIC).	3	6	18
			INDEX	132

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TABLE 9.3-12
DRASTIC EVALUATION FOR THE LUMINANT B - PINELAND SITE

Groundwater region = 10 (Atlantic and Gulf Coastal Plain)
Groundwater subregion = Aa (Regional Aquifer)
Underlying Basin = Gulf Coast Aquifer
Predicted groundwater classification = Class IIB
Annual precipitation exceeds potential evapotranspiration by 10-15 in/yr

DRASTIC Variable	Range and Source of Information	Weight	Rating	Number
Depth to Water	30–50 ft bgs (Groundwater Level Reports).	5	5	25
Net Recharge	0–2 in/yr (DRASTIC).	4	1	4
Aquifer Media	Sand and gravel (DRASTIC).	3	8	24
Soil Media	Sandy loam (DRASTIC).	2	6	12
Topography	2–5% (USGS site topographic maps).	1	9	9
Impact Vadose Zone	Silt/Clay (DRASTIC).	5	3	15
Hydraulic Conductivity	300 – 700 gpd/ft^2 (DRASTIC).	3	4	12
			INDEX	101

TABLE 9.3-13
DRASTIC EVALUATION FOR THE LUMINANT C - TRADING HOUSE SITE

Groundwater region = 6 (Non-glaciated Central Groundwater Region)
Groundwater subregion = K (Unconsolidated and Semi-consolidated Aquifers)
Underlying Basin = Trinity (subcrop)
Predicted groundwater classification = Class IIB
Potential evapotranspiration exceeds annual precipitation by 5-10 in/yr

DRASTIC Variable	Range and Source of Information	Weight	Rating	Number
Depth to Water	100+ ft bgs (Groundwater Level Reports).	5	1	5
Net Recharge	0–2 in/yr (DRASTIC).	4	1	4
Aquifer Media	Sand and gravel (DRASTIC).	3	8	24
Soil Media	Sandy loam (DRASTIC).	2	6	12
Topography	0–2% (USGS site topographic maps).	1	10	10
Impact Vadose Zone	Sand and gravel with significant silt and clay (DRASTIC).	5	6	30
Hydraulic Conductivity	300 – 700 gpd/ft^2 (DRASTIC).	3	4	12
			INDEX	97

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TABLE 9.3-14
DRASTIC INDEXES USED TO DEVELOP A SYSTEM TO COMPARE VULNERABILITY OF CANDIDATE SITES

DRASTIC Index Range	Relative Vulnerability
65 – 80	Low
81 – 110	Low to Moderate
111 – 140	Moderate
141 – 170	High
171+	Very High

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TABLE 9.3-15
DRASTIC INDEX RANGES FOR CANDIDATE SITES

Candidate Site	DRASTIC Index	Relative Vulnerability
CPNPP Site	96	Low to Moderate
Luminant A - Coastal	132	Moderate
Luminant B - Pineland	101	Low to Moderate
Luminant C - Trading House	97	Low to Moderate

TABLE 9.3-16 (SHEET 1 OF 4)
COMPARISON OF AIR-FOOD INGESTION PATHWAYS

Site	Evaluation
CPNPP Site	As the candidate site is near the border of Somervell County and Hood County, statistics for both counties are considered in the evaluation. Agriculture (farmland) represents 84,262 ac out of 119,789 ac in Somervell County (70%). Out of the total farmland, 21,777 ac are planted in crop (26%). Other farmland is used for cattle (6,876 head), sheep (489 head), and poultry (421 layers). Agriculture (farmland) represents 202,131 ac out of 269,830 ac in Hood County (75%). Out of the total farmland, 75,814 ac are planted in crop (38%). Other farmland is used for cattle (30,059 head), sheep (606 head), and poultry (1386 layers and 210 broilers). Aerial imagery indicates that the candidate site is in the general vicinity of agricultural operations, and the actual impact to local crops, pastures, and livestock from radionuclide emission exposure would be greater than the county-wide percentages. Nuclear power plant operations are currently located near the site, and construction of an additional nuclear power plant would not introduce a pathway concern to the area.

TABLE 9.3-16 (SHEET 2 OF 4)
COMPARISON OF AIR-FOOD INGESTION PATHWAYS

Site	Evaluation
Luminant A - Coastal	As the candidate site is near the border of Victoria County and Calhoun County, statistics for both counties are considered in the evaluation. Agriculture (farmland) represents 513,828 ac out of 564,800 ac in Victoria County (91%). Out of the total farmland, 166,089 ac are planted in crop (32%). Other farmland is used for cattle (69,544 head), hogs (236 head), sheep (305 head), and poultry (731 layers). Agriculture (farmland) represents 247,827 ac out of 327,878 ac in Calhoun County (76%). Out of the total farmland, 94,647 ac are planted in crop (38%). Other farmland is used for cattle (23,892 head), sheep (96 head), and poultry (175 layers). Aerial imagery indicates that the candidate site is in the general vicinity of agricultural operations, and the actual impact to local crops, pastures, and livestock from radionuclide emission exposure would be greater than the county-wide percentages. The most predominant area wind direction is toward the northwest. Winds in this direction would have neither a beneficial nor detrimental effect on radioactive material deposition on farmland.

TABLE 9.3-16 (SHEET 3 OF 4)
COMPARISON OF AIR-FOOD INGESTION PATHWAYS

Site	Evaluation
Luminant B - Pineland	As the candidate site is near the border of San Augustine County and Sabine County, statistics for both counties are considered in the evaluation. Agriculture (farmland) represents 58,723 ac out of 337,837 ac in San Augustine County (17%). Out of the total farmland, 19,589 ac are planted in crop (33%). Other farmland is used for cattle (11,981 head) and poultry (12,837,054 broilers). Agriculture (farmland) represents 30,808 ac out of 313,773 ac in Sabine County (10%). Out of the total farmland, 11,627 ac are planted in crop (38%). Other farmland is used for cattle (7499 head) and poultry (3,110,000 broilers). Aerial imagery indicates that the candidate site is not in the immediate vicinity of agricultural operations (agricultural operations are concentrated ~ 12 mi north of the candidate site and ~ 12 mi southeast of the candidate site), and the actual impact to local crops, pastures, and livestock from radionuclide emission exposure would be slightly less than the county-wide percentages. The most predominant area wind direction is toward the north. Winds in this direction would have neither a beneficial nor detrimental effect on radioactive material deposition on farmland.

TABLE 9.3-16 (SHEET 4 OF 4)
COMPARISON OF AIR-FOOD INGESTION PATHWAYS

Site	Evaluation
Luminant C- Trading House	As the candidate site is near the border of McLennan County and Limestone County, statistics for both counties are considered in the evaluation. Agriculture (farmland) represents 578,473 ac out of 666,803 ac in McLennan County (81%). Out of the total farmland, 298,447 ac are planted in crop (55%). Other farmland is used for cattle (98,194 head), hogs (944 head), sheep (2649 head), and poultry (4049 layers and 544 broilers). Agriculture (farmland) represents 529,924 ac out of 581,683 ac in Limestone County (91%). Out of the total farmland, 205,322 ac are planted in crop (39%). Other farmland is used for cattle (117,280 head), hogs (142 head), and sheep (609 head). Aerial imagery indicates that the candidate site is in the general vicinity of agricultural operations, and the actual impact to local crops, pastures, and livestock from radionuclide emission exposure would be greater than the county-wide percentages. The most predominant area wind direction is toward the north. Winds in this direction would have neither a beneficial nor detrimental effect on radioactive material deposition on farmland.

TABLE 9.3-17
FEDERALLY-LISTED SPECIES THAT MAY POTENTIALLY BE FOUND IN THE VICINITY OF THE CPNPP SITE

Scientific Name	Common Name	Federal Status
Vireo atricapilla	Black capped vireo	E (also state endangered)
Dendroica chrysoparia	Golden-cheeked warbler	E (also state endangered)
Sterna antillarum athalassos	Interior least tern	E (also state endangered)
Grus americana	Whooping crane	E (also state endangered)
Canis lupus	Gray wolf	E (also state endangered)
Canis rufus	Red wolf	E (also state endangered)

PDL – Proposed for Delisting
T – Federally Threatened
E – Federally Endangered

TABLE 9.3-18
FEDERALLY-LISTED SPECIES THAT MAY BE POTENTIALLY FOUND IN THE VICINITY OF THE LUMINANT A - COASTAL SITE

Scientific Name	Common Name	Federal Status
Tympanuchus cupido attwateri	Attwater's Greater Prairie Chicken	E (also state endangered)
Pelecanus occidentalis	Brown pelican	E (also state endangered)
Sterna antillarum athalassos	Interior least tern	E (also state endangered)
Grus americana	Whooping crane	E (also state endangered)
Ursus americanus luteolus	Louisiana black bear	T (also state threatened)
Canis rufus	Red wolf	E (also state endangered)

PDL – Proposed for Delisting
T – Federally Threatened
E – Federally Endangered

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TABLE 9.3-19
FEDERALLY-LISTED SPECIES THAT MAY POTENTIALLY BE FOUND IN THE VICINITY OF THE LUMINANT B - PINELAND SITE

Scientific Name	Common Name	Federal Status
Charadrius melodus	Piping plover	T (also state threatened)
Picoides borealis	Red-cockaded woodpecker	E (also state endangered)
Ursus americanus luteolus	Louisiana black bear	T (also state threatened)
Canis rufus	Red wolf	E (also state endangered)

PDL – Proposed for Delisting
T – Federally Threatened
E – Federally Endangered

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TABLE 9.3-20
FEDERALLY-LISTED SPECIES THAT MAY POTENTIALLY BE FOUND IN THE VICINITY OF THE LUMINANT C - TRADING HOUSE SITE

Scientific Name	Common Name	Federal Status
Dendroica chrysoparia	Golden-cheeked warbler	E
Sterna antillarum athalassos	Interior least tern	E (also state endangered)
Grus americana	Whooping crane	E (also state endangered)
Canis rufus	Red wolf	E (also state endangered)

PDL – Proposed for Delisting
T – Federally Threatened
E – Federally Endangered

TABLE 9.3-21
COMPARISON OF WETLANDS FOR EACH OF THE CANDIDATE SITES

Site Wetland Information	CPNPP Site	Luminant A - Coastal	Luminant B - Pineland	Luminant C - Trading House
Wetland Acreage	128[a]	65[b]	214[a]	220[a]
Wetland Percentage	6.4%	3.2%	10.7%	11%

a) Denotes wetlands estimated from satellite/aerial images; estimated acreage within 2000-ac area.

b) Includes wetlands on proposed plant site only (see below).

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TABLE 9.3-22
COMPARISON OF THE CANDIDATE SITES IN TERMS OF WORKFORCE REQUIREMENTS

Site	Percent increase in total workforce	Percent increase in total construction workforce
CPNPP Site	0.1%	0.9%
Luminant A - Coastal	1.5% (0.7% if include Corpus Christi)	14.7% (or 6.7% if include Corpus Christi)
Luminant B - Pineland	1.1%	8.1%
Luminant C - Trading House	0.6%	5.6%

TABLE 9.3-23

ENVIRONMENTAL JUSTICE DATA FOR THE CANDIDATE SITES(A),(B)

Site	Population (2005)	White (%)	Minority (%)	Low Income (%)
CPNPP Site	4,061,000	1,716,000 (42%)	2,342,000 (58%)	641,000 (15.8%)
Luminant A - Coastal	277,000	147,000 (53.2%)	130,000 (46.8%)	48,000 (17.3%)
Luminant B - Pineland	304,000	216,000 (71.2%)	87,000 (28.7%)	56,000 (18.4%)
Luminant C - Trading House	682,000	407,000 (60%)	275,000 (40%)	107,000 (15.8%)

a) State Average for TX is 49.2% White, not Hispanic; with remaining 50.8% comprised of Hispanic or Latino origin; Black; American Indian/Alaskan, Asian, and Hawaiian; and 16.2% below poverty line. Note that state average for LA (two parishes in LA are included in Pineland area) for both minority and low income population is higher than TX).

b) White= white persons, not Hispanic, 2005 percentages; Hispanic= persons of Hispanic or Latina origin, 2005 percentages; remaining balance (to total 100%) consists of black persons, American Indian, Asian persons, and Native Hawaiian/Other Pacific persons.

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TABLE 9.3-24
TRANSMISSION ACCESS FOR THE CANDIDATE SITES

Site	Evaluation
CPNPP Site	The candidate site is an existing power plant location, and transmission access is currently available at the site.
Luminant A - Coastal	ERCOT 345 kV transmission line is located ~ 1.8 mi southeast of the candidate site.
Luminant B - Pineland	ERCOT 345 kV transmission line is located ~ 45 mi northwest of the candidate site. Entergy 500 kV transmission line is located ~ 25 mi southeast of candidate site. Construction of an additional transmission line (345 kV Houston-Lufkin line) is planned for the area.
Luminant C - Trading House	The candidate site is an existing power plant location, and transmission access is currently available at the site.

TABLE 9.3-25
REPRESENTATIVE LABOR RATES IN THE SITE VICINITY

Site/ Metropolitan Statistical Areas (MSA)	Average construction overall (mean hourly)	Pipefitter/Steamfitter[a] (mean hourly)
CPNPP Site Vicinity	$14.85	$18.97
Luminant A - Coastal Vicinity	$14.51	$17.91
Luminant B - Pineland Vicinity	$15.27	$18.57
Luminant C - Trading House Vicinity	$13.18	$16.09

a) Higher end hourly wage earning was used when comparing sheet metal workers and structural iron and steel workers; less than supervisors and electricians. Electrician category had highest mean hourly wage in many cases, but not all. It was not used as basis for comparison.

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TABLE 9.3-27 (SHEET 1 OF 3)
PRINCIPAL NON-ENVIRONMENTAL ATTRIBUTES BETWEEN THE CANDIDATE SITES

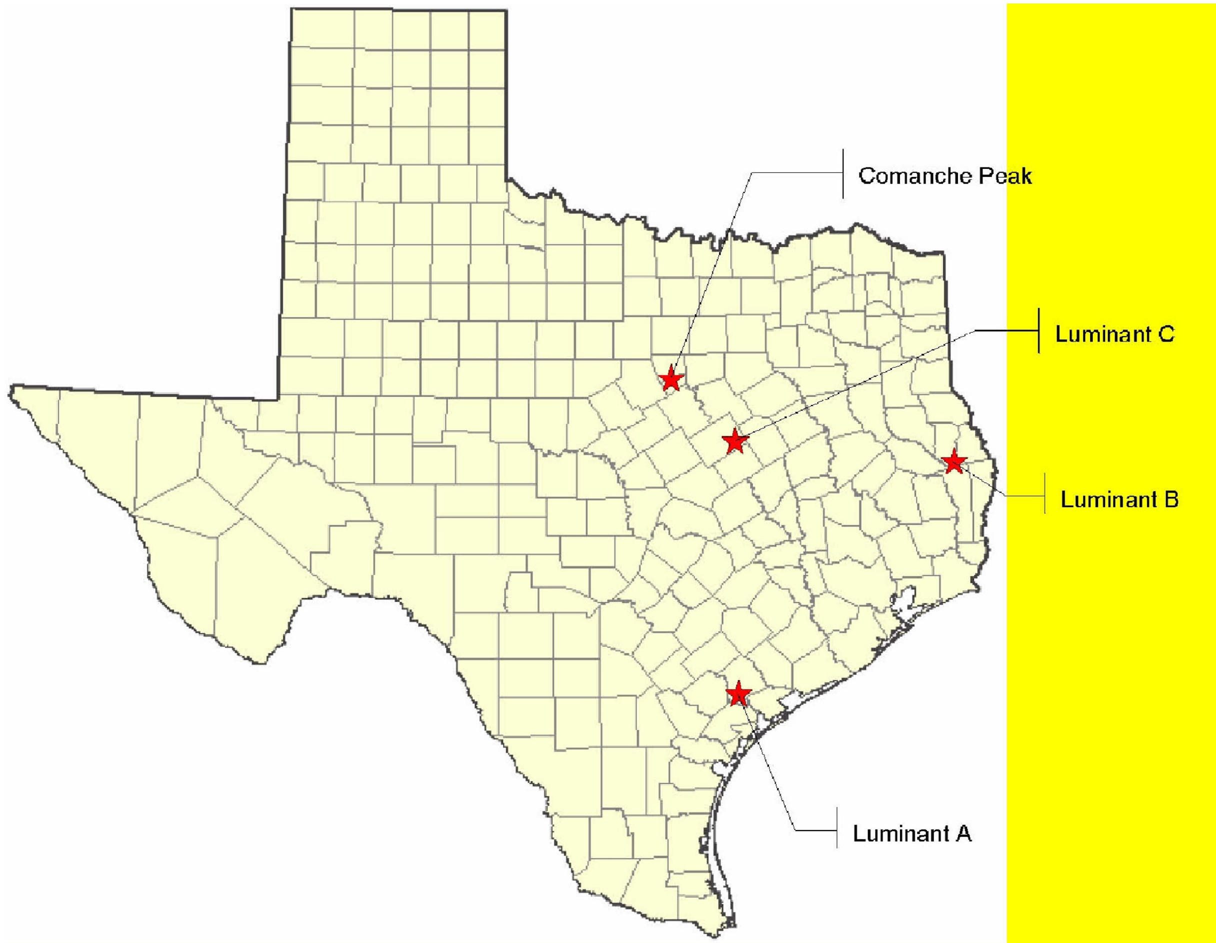
	Luminant A - Coastal	CPNPP Site	Luminant B - Pineland	Luminant C-Trading House
Local labor rates	Mean average construction: $14.51; Mean average Pipefitter/ Steamfitter worker: $17.91.	Mean average construction: $14.85; Mean average Pipefitter/ Steamfitter worker: $18.97.	Mean average construction: $15.27; Mean average Pipefitter/ Steamfitter worker: $18.57.	Mean average construction: $13.18; Mean average Pipefitter/ Steamfitter worker: $16.09.
Transmission access in terms of distance to the nearest existing transmission line	A 345 kV transmission line is located ~ 1.8 mi southeast of the candidate site.	The candidate site is an existing power plant location, and transmission access is currently available at the site.	A 345 kV transmission line is located ~ 45 mi northwest of the candidate site. A 500 kV transmission line is located ~ 25 mi southeast of candidate site. Construction of a additional transmission line (345 kV) is planned for the area.	The candidate site is an existing power plant location, and transmission access is currently available at the site.
Relative costs to provide rail access	Rail is located ~ 2.3 mi northwest of site. This rail line does not support passenger service. Line length = 2.3 mi.	Rail is immediately accessible at the site due to co-location with existing power plants. Costs associated with construction of a rail spur would be minimal.	Rail is located ~ 10.2 mi north of site. This rail line does not support passenger service. Rail construction could be complicated by rough area terrain. Line length = 10.2 mi.	Rail is located ~ 8.4 mi west of site. This rail line does not support passenger service. Line length = 13.0 mi.

TABLE 9.3-27 (SHEET 2 OF 3)
PRINCIPAL NON-ENVIRONMENTAL ATTRIBUTES BETWEEN THE CANDIDATE SITES

	Luminant A - Coastal	CPNPP Site	Luminant B - Pineland	Luminant C- Trading House
Relative cost of developing water supply facilities	Highest cost. The other 3 sites are assigned an equivalent and lower cost rating.	See Luminant A - Coastal.	See Luminant A - Coastal.	See Luminant A - Coastal.
Relative pumping costs (distance)	Luminant A - Coastal and Comanche Peak are assigned equivalent but higher relative costs than the Luminant B - Pineland and **Luminant C- Trading House** sites.	See Luminant A - Coastal.	Luminant B - Pineland and **Luminant C- Trading House** are assigned equivalent but lower relative costs than Luminant A - Coastal or Comanche Peak.	See Luminant B - Pineland.
Relative cost of flood protection structures cost	The candidate site is not located in the 100-yr flood zone. No other neighboring flooding concerns exist. Construction of flood protection features is not anticipated. All candidate sites are assumed to have approximately equivalent costs.	Construction of flood protection features is not anticipated provided construction of structures is limited to the higher elevations of the site (See Luminant A - Coastal).	See Luminant A - Coastal.	See Luminant A - Coastal.

TABLE 9.3-27 (SHEET 3 OF 3)
PRINCIPAL NON-ENVIRONMENTAL ATTRIBUTES BETWEEN THE CANDIDATE SITES

	Luminant A - Coastal	CPNPP Site	Luminant B - Pineland	Luminant C-Trading House
Relative cost of civil works (e.g., non-flood related berms, stabilizing of graded slopes and banks)	Candidate site is in an area having low landslide incidence (<1.5% of area involved in landslides). Compounded with minimal area sloping, costs associated with civil works (slope stability) are estimated to be low.	Candidate site is in an area having low landslide incidence (<1.5% of area involved in landslides). Compounded with moderate area sloping, costs associated with civil works (slope stability) are estimated to be low to moderate.	Candidate site is in an area having low landslide incidence (<1.5% of area involved in landslides). Compounded with moderate area sloping, costs associated with civil works (slope stability) are estimated to be low to moderate.	Candidate site is in an area having low landslide incidence (<1.5% of area involved in landslides). Compounded with moderate area sloping, costs associated with civil works (slope stability) are estimated to be low to moderate.
Relative costs associated with providing highway access	Estimated construction cost = $16.2M.	Costs associated with construction of additional/ improved roads would be minimal.	Estimated construction cost = $22.5M.	Costs associated with construction of additional/ improved roads would be minimal.
Relative costs associated with providing barge access	The candidate site is located ~ 9.4 mi from a barge pier. Luminant A - Coastal has a substantially lower cost than Comanche Peak or Luminant B - Pineland and C **Luminant C-Trading House** sites.	Barge access is not available in the vicinity of the candidate site (See Luminant A - Coastal).	Barge access is not available in the vicinity of the candidate site (See Luminant A - Coastal).	Barge access is not available in the vicinity of the candidate site (See Luminant A - Coastal).



~~Proprietary Information - Withheld Under 10 CFR 2.390 (a)(4)~~

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Figure 9.3-2 Locations of the Candidate Sites

Chapter 10

Chapter 10 Tracking Report Revision List

Change ID No.	Section	Page	Reason for change	Change Summary	Rev. of T/R
CTS-00615	Acronyms and Abbreviations	10-xvi	Editorial correction	Change “MPT Main Power Transformer” to “MT Main Transformer”.	0
CTS-00459	10.1.1.1	10.1-1	Erratum	Change “200 ac” to “400 ac”.	0
CTS-00461	10.1.3.2.1	10.1-11	Editorial Correction	Remove “diesel generators”, and mention the auxiliary boiler as an air emission source.	0
CTS-00459	Table 10.1-1	10.1-14	Erratum	Change “200 ac” to “400 ac”.	0
CTS-00650	Table 10.1-1	10.1-14	Erratum	Change “659 ac” to “675 ac”.	0
CTS-00633	Table 10.1-1	10.1-14	Erratum	Change 4152 to indicate this is the fourth item in the table and the number cited is 152	0
CTS-00460	10.1	10.1-5	Erratum	Add text to show an additional 250 gpm will be provided for de-mineralized water, and change “fifty gpm” to “three hundred gpm”.	0
CTS-00505	10.1.3.2.2	10.1-12	Editorial correction	Remove “adds on impact”.	0
CTS-00505	10.1.3.2.2	10.1-12	Editorial correction	Remove “not”.	0
CTS-00634	10.4.1.2.1	10.4-3	Erratum	Change “4461” to “4466”.	0
CTS-00459	10.4.2.2.1	10.4-8	Erratum	Change “approximately 200 ac” to “400 ac”.	0
CTS-00506	Table 10.4-2	10.4-15	Erratum	Change alignment of “3180”.	0

CTS-00459	Table 10.4-4	10.4-20	Erratum	Change “384 ac” to “400 ac”.	0