Nuclear Operating Company

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October 27, 2009
U7-C-STP-NRC-090184

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Request for Additional Information

Reference: Letter, Jessie Muir to Scott Head, "Request for Additional Information, Letter Number Five Related to the Environmental Report for the South Texas Combined License Application", dated October 1, 2009 (ML092750384).

The above referenced letter contained 26 Requests for Additional Information (RAI) pertaining COLA Part 3 Environmental Report. This transmittal letter contains responses to all RAIs from the reference letter.

The following 26 responses are submitted:

09.03-10	09.03-17	09.03.02-07	09.03.03-07
09.03-11	09.03-18	09.03.02-08	09.03.03-08
09.03-12	09.03-19	09.03.02-09	09.03.03-09
09.03-13	09.03-20	09.03.02-10	09.03.03-10
09.03-14	09.03-21	09.03.03-04	09.03.03-11
09.03-15	09.03-22	09.03.03-05	
09.03-16	09.03.02-06	09.03.03-06	

There are no commitments in this letter.

D091

STI: 32562499 NRO

If you have any questions, please feel free to contact me at (361) 972-7136, or Russell W. Kiesling at (361)-972-4716

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 10/27/09

Scott Head
Manager, Regulatory Affairs
South Texas Project, Units 3 & 4

rwk

Attachments:

Attachment 1: RAI 09.03-10
Attachment 2: RAI 09.03-11
Attachment 3: RAI 09.03-12
Attachment 4: RAI 09.03-13
Attachment 5: RAI 09.03-14
Attachment 6: RAI 09.03-15
Attachment 7: RAI 09.03-16
Attachment 8: RAI 09.03-17
Attachment 9: RAI 09.03-18
Attachment 10: RAI 09.03-19
Attachment 11: RAI 09.03-20
Attachment 12: RAI 09.03-21
Attachment 13: RAI 09.03-22
Attachment 14: RAI 09.03.02-06
Attachment 15: RAI 09.03.02-07
Attachment 16: RAI 09.03.02-08
Attachment 17: RAI 09.03.02-09
Attachment 18: RAI 09.03.02-10
Attachment 19: RAI 09.03.03-04
Attachment 20: RAI 09.03.03-05
Attachment 21: RAI 09.03.03-06
Attachment 22: RAI 09.03.03-07
Attachment 23: RAI 09.03.03-08
Attachment 24: RAI 09.03.03-09
Attachment 25: RAI 09.03.03-10
Attachment 26: RAI 09.03.03-11

Enclosure:

RAI 09.03-22: Nuclear Power Plant Siting Report. STP Nuclear Operating Company (STPNOC). June 2009.

cc: w/o attachment except*
(paper copy)

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Question Number: 09.03-10

QUESTION:

Clarify the assumptions behind the in-migration scenarios for each alternative.

FULL TEXT (Supporting Information):

For each alternative site a two-county Region of Interest (ROI) (host county plus an additional county) is used without explanation as to how the second county (non-host county) was chosen. Additionally, the same percentages of workers in-migrating used at STP (60.7% in one county, 22.4% in the other) are used at each alternative site without an explanation of why the same in-migration pattern is assumed. Given the proximity of Allens Creek to Houston and its suburbs, explain why the same number of workers is expected to in-migrate to the Allens Creek site as to the STP site.

RESPONSE:

All three alternative sites are located in rural host counties that contain no large towns or metropolitan areas. Therefore, the second county in the two-county ROI was selected because it was considered the most likely county where an in-migrating workforce and their families would choose to live (other than the host county) based on its close proximity to the alternative site (i.e., adjacent to the host county), overall county population (where a more populated county was considered to be advantageous over the less populated, rural host county), and access to other nearby and larger towns that could serve as another residence option for the in-migrating workforce and their families. Specifically, Grayson County was chosen for Red 2 because it is closest to the site and contains the Sherman-Denison metropolitan area which is within a reasonable commuting distance of the site (15 miles). Fort Bend County was chosen for Allens Creek because it is closest to the site and includes the western suburbs of Houston. Anderson County was chosen for Trinity 2 because it lies closest to the site, and contains a significantly larger population (55,109 population in 2000 compared to 17,867 in host Freestone County), including the City of Palestine with a population of 17,598 that lies approximately 20 miles away. Note that other nearby counties of Henderson and Navarro were also considered for Trinity 2 because of their slightly larger county populations; however, the closest city in Henderson County is Athens, which is smaller than Palestine and lies farther away (30 miles); and the closest town in Navarro County is Corsicana which has a population of just over 24,000 but is located over 45 miles away.

The introduction of ER 9.3.3.3.6 recognizes that fewer workers may in-migrate to the Allens Creek site because of its proximity to Houston:

> "Because of the large population projections and available workforce at the Allens Creek site (given its proximity to the Houston metro area), it is possible that up to 100% of the estimated peak construction workforce could be found within daily commuting distance

of the site and result in no (or minimal) in-migrating workforce. However, the same percentage influx was assumed for the Allens Creek site as for the other alternate sites in order to bound the potential impacts and address potential local impacts of an in-migrating workforce on the more rural Austin (host county)."

Note that in the ER, socioeconomic impacts are identified at the host county level, the two-county level, and within the region for each alternative site. Even based on the conservative assumption that 50% of the workforce would in-migrate into the area, the site's proximity to Houston is reflected in the impacts to the two-county area (SMALL) and to the region (SMALL). In the event that a significantly smaller percentage of workers did choose to in-migrate to Austin County, the host county impacts may be MODERATE or SMALL, depending on the final number of new residents. However, the host county population is sufficiently small such that an influx of only 3,000 persons (including direct and indirect workers and their families) would increase the county population by 10% (based on 2000 county population of 30,015) which could result in MODERATE to LARGE impacts to the existing community infrastructure and public services.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-11

QUESTION:

Provide additional information regarding the transportation network for each alternative site.

FULL TEXT (Supporting Information):

In regards to roads, please provide the number of lanes, current condition, current utilization, capacities, likely commuter routes and where any pinch points would occur during construction for each alternative site.

RESPONSE:

Annual Average Daily Traffic (AADT) data were readably available from the Texas Department of Transportation (TxDOT) for all DOT-maintained roads in the state, including Farm-to-Market (FM) roads. Data relating to road capacity, number of lanes, and current condition were not publicly available from TxDOT; however, first hand observations from site visits to alternative sites have been used to supplement this missing information. As a detailed transportation study was not performed for each of the alternative sites, locations of potential pinch points are predicted based on road size and major intersection locations in close proximity to the site.

Red 2

Primary commuter access to the Red 2 site would likely be via U.S. Route 82 from the south, which runs between Sherman and Bonham; some commuters may use U.S. Route 69 from Denison, which intersects U.S. 82 near Bells. Both U.S. routes are paved roads and in good condition. U.S. 82 is four-lanes east of Sherman, but eventually becomes a two-lane road before reaching Fannin County. AADT data for 2008 for these major roads are provided below. In most cases, traffic counts are given for several key segments along each highway or road.

- U.S. 82 (east of Sherman): 10,200 (in Sherman, east of I-75); 4,000 (west of Bells, before intersection with U.S. 69), 2,700 (east of intersection with U.S. 69 near Bells), 3,500 (between Bells and Savoy), 6,400 (west of Bonham).
- U.S. 69 (southeast of Denison): 6,300 (near Denison); 4,200 (east of Denison), 3,200 (north of Bells), 4,700 (south of Bells).

State Highway (SH) 56, parallels U.S. 82 to the south. AADT data for SH 56 are: 2,200 (west of Bells), 3,200 (in Bells), 2,700 (between Bells and Savoy), 1,600 (east of Savoy), 3,000 (west of Bonham).

Existing secondary roads currently providing access to the Red 2 site on either side of Valley Lake include: FM 1897 (heading north of U.S. 82 at Bells in Grayson County) and FM 1752 (heading north of U.S. 82 at Savoy in Fannin County). FM 1753 connects these two roads north

of Valley Lake (and the Red 2 site) and appears to be used as a travel route from Ravenna (to the east) and possibly from the Denison area to the west. Note that FM 1753 runs roughly parallel to U.S. 69 west of FM 1897. These FM routes are two-lane paved roads in fairly good condition (FM 1752 provides access to the Valley Plant). AADT counts for these three secondary FM roads are as follows:

- FM 1897: 1,100 (north of FM 1753).
- FM 1752: 240 (north of Valley Lake).
- FM 1753: 1,700 (east of FM 1752), 1,200 (at intersection with FM 1897), 900 to 2,500 (west of FM 1897 towards Denison).

Direct access to the Red 2 site from either FM 1897 or FM 1752 is currently via a one-lane unimproved road that is not currently maintained by TxDOT and would require major upgrades to accommodate plant traffic to the site.

Potential pinch points near the Red 2 site appear to be at the intersection of U.S. 69 and U.S. 82 (near Bells), and FM 1897 and FM 1752 (which also supports traffic accessing the Valley Plant) north of U.S. 82. It is assumed that traffic at these potential pinch points would be greatest during operational shift changes at the Valley Plant and/or the potential nuclear power plant.

Allens Creek

Primary commuter access to the Allens Creek site would likely be via I-10 (west of Houston) and SH 36, which intersects I-10 at Sealy. SH 36 is a paved two-lane road in good condition. AADT counts for 2008 for these primary roads are provided below. In most cases, traffic counts are given for several key segments along each highway or road.

- I-10 (west of Houston): 50,000 (east of San Felipe in Austin County), 46,000 (east of Sealy), 38,000 (west of Sealy).
- SH 36: 22,000 (intersection with I-10), 13,800 (south of the I-10 intersection), and 5,900 (between Sealy and Wallis) – note that direct access to the Allens Creek site would likely be off this stretch of SH 36; 6,500 (north of Sealy); 7,400 (in Wallis at intersection with SH 60 and FM 1093, south of Allens Creek site), 5,200 (south of Wallis).

Existing secondary roads also found in the area include FM 1458, which runs along the eastern side of the proposed reservoir location, between I-10 (to the north) and FM 1093 (to the south), and FM 1093, which runs to the south of the proposed site in an east-west direction, extending east into Houston. These FM routes are assumed to be in similar condition to many other FM routes in the state (i.e., two-lane paved roads). AADT counts for these two secondary FM roads are as follows:

- FM 1458: 1,200 (at I-10 intersection), 670 (near proposed site), 480 (near intersection with FM 1093).
- FM 1093: 2,400 (in Wallis, near intersection with SH 36), 2,700 (heading east towards Houston, at Austin and Fort Bend County line), 7,800 (east of Simonton, heading east

towards Houston), 12,000 (near Fulshear). Note that in Fulshear, FM 1093 is shown as a toll road on the TxDOT map, heading east into Houston.

Direct access to the Allens Creek site would likely be via SH 36. As such, potential pinch points near the site appear to be SH 36 (between Sealy and Wallis), the intersection of SH 36 and I-10 (in Sealy) and the intersection of SH 36, SH 60, and FM 1093 (near Wallis). It is assumed that traffic at these potential pinch points would be greatest during operational shift changes at the potential nuclear power plant. Traffic along FM 1458 (between FM 1093 and I-10) could also be impacted during reservoir construction.

Trinity 2

Primary commuter access to the Trinity 2 site would likely be via U.S. 84 from the south, I-45 or SH 75 from the west, and FM 27 from the west. With the exception of FM 27, whose condition is not known but is likely to be a two-lane paved road, these roads are all four-lane paved roads in generally good condition. AADT data for 2008, all in the vicinity of Fairfield, are provided below. In most cases, traffic counts are given for several key segments along each highway or road.

- I-45: 32,000 (north of U.S. 84); 37,000 (between FM 27 and U.S. 84); and 29,000 (south of U.S. 84).
- SH 75: 1,900 (north of U.S. 84); 2,900 (south of U.S. 84), and an average of 4,300 (at the intersection with U.S. 84).
- U.S. 84: 8,500 (west of I-45); 2,700 (southeast of FM 27); average of 14,750 (at the intersection with FM 27 and SR 75); 7,600 (east of FM 1580); 8,900 (west of FM 1580); and 10,400 (intersection with FM 488).
- FM 27: 4,300 (west of I-45); 5,900 (east of I-45).

Commuters from the Palestine and Corsicana areas may also have the option of accessing the site from the north along U.S. 287, and then south along FM 488. The AADT count for U.S. 287 at the intersection with FM 488 is 2,900.

Existing secondary roads currently providing access to the Trinity 2 site (off of the primary routes above) include: FM 488 and FM 2570 off of U.S. 84; and FM 833 off of I-45 and SH 75. These are all two-lane paved roads in fairly good condition, and lead to the Big Brown power plant, located west of the proposed site. TxDOT-maintained roads end near the Big Brown plant. East of the Big Brown power plant, all roads providing access to the Trinity 2 site are currently one-lane unimproved roads. AADT data for the secondary roads are as follows:

- FM 488: 5,800 (at the intersection with U.S. 84); 4,100 (west of intersection with FM 2570); 1,850 (east of intersection with FM 2570); 1,700 (between FM 833 and U.S. 287 to the north).
- FM 2570: 1,850 (at intersection with FM 488); 1,400 (north of FM 833). Also note that FM 3285 (AADT of 570) cuts east off of FM 2570 south of the Big Brown plant to access Fairfield Lake State Park, but ends at the park.

- FM 833: 480 (west of FM 488); 440 (between FM 488 and FM 2570).

Additional access to the site to the east of Fairfield from U.S. 84, which would avoid the Big Brown plant, is currently via one-lane, unimproved roads, and would require major upgrades to accommodate plant traffic to the Trinity 2 site.

Potential pinch points near the Trinity 2 site appear to be at any road intersections near the site, including the secondary FM roads near the site that would carry workers to the Big Brown plant nearby, and the major intersection of U.S. 84, SH 75, and I-45 (in Fairfield). It is assumed that traffic at these potential pinch points would be greatest during operational shift changes at the Big Brown Power Plant and/or the potential nuclear power plant.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-12

QUESTION:

Clarify the use of census blocks, census block groups, and census block points as applied to the Environmental Justice analysis, as well as the 5-mile radius for minorities and 10-mile radius for low-income populations.

FULL TEXT (Supporting Information):

The bullet on page 48 of revised ER Section 9.3 indicates there are 172 census blocks within 5 miles of the Red 2 site. But page 49 indicates that there are only 12 census block groups within a 10-mile radius. In addition, the analysis for the Freestone alternative site uses census block points. Please clarify whether census block points are the same as census block groups. Please clarify why a 5-mile radius is used to ascertain minority populations in the area, but a 10-mile radius is used for ascertaining the low-income population. It's not clear why different approaches would be used for minority versus low-income populations.

RESPONSE:

For purposes of mapping minority populations in a given area, census block points are synonymous with census blocks, where a single block point represents a geographic point location for demographic data for a given census block. Minority populations (demographics) within a 5-mile radius (as well as a 50-mile radius) were identified using census block points for each alternative site in ER 9.3.3.

Census blocks, which are a subdivision of a census tract, are the smallest geographic unit for which the Census Bureau tabulates 100-percent data. Many blocks correspond to individual city blocks bounded by streets, but blocks – especially in rural areas – may include many square miles and may have some boundaries that are not streets. A block group is the next larger area above blocks. Also a subdivision of a census tract, a block group is the smallest geographic unit for which the Census Bureau tabulates sample data. A block group consists of all the blocks within a census tract with the same beginning number. For example, block group 3 consists of all blocks within a 2000 census tract numbering from 3000 to 3999.

Because a census block group encompasses a larger geographic area than a census block and may contain up to hundreds of census blocks, it is possible to have more census blocks within a 5-mile radius than census block groups within a 10-mile radius, as was the case for the Red 2 and Allens Creek sites.

For the evaluation of alternative sites, the potential for environmental justice related impacts was assumed to be greatest for those populations living within close proximity to the site (i.e., within a 5-mile radius), where the impacts from construction and operation would be greatest; such impacts would result primarily from construction and could include noise, dust, traffic,

congestion, temporary road closures, etc. Because of the small impact area, the evaluation relied on the more detailed census block data, the smallest geographic area for which demographic data are available. However, because income data are only available at the census block group level, and because census block groups cover a larger geographic area than census blocks (e.g., in the case of Trinity 2, only one block group was identified within a 10-mile radius), the area for identifying low-income populations was expanded to encompass a 10-mile radius around each site.

Finally, potential impacts on the local housing market, as a result of increased demand from a large in-migrating workforce (and their families), could target low-income populations specifically by pricing them out of their housing because of increased housing prices and rental rates, at least in the short term. Such economic impacts would likely extend beyond a 5-mile radius to the closest towns where workers might live. For example, the towns of Sealy and San Felipe are located between 5 and 10 miles of the Allens Creek site; and the town of Fairfield is located 10 miles from the Trinity 2 site. Therefore, the area within a 10-mile radius of each site was believed to better capture potential impacts on low-income populations relative to a tight housing market.

In the final analysis, however, no low income populations were identified near any of the alternative sites, based on the "more than 20 percent" criterion.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-13

QUESTION:

Provide information as to how construction of the Allens Creek Reservoir would impact the Texas Independence trail.

FULL TEXT (Supporting Information):

The ER states that construction of the Allens Creek Reservoir could directly impact the Texas Independence Trail. What part of the Texas Independence Trail is located near the Allens Creek site, how many visitors does it receive, and how would construction impact it?

RESPONSE:

The Texas Independence Trail, as identified in the Texas Independence Trail website (http://www.texasindependencetrail.com/), denotes a driving route within the Texas Independence Trail Region of Texas. The Independence highway trail and region are one of ten drives and heritage regions in Texas created by the Texas Historical Commission in 1997 as part of a regional tourism initiative and statewide heritage tourism program. Overall, the Texas Independence Region incorporates 28 counties along the southeastern area of Texas. Travelers may obtain trail brochures and information on suggested itineraries and attractions through the Texas Heritage Trail Independence Region website.

A small portion of the Independence drive coincides with a short seven-mile stretch of FM 1458, running north-south between FM 1093 and Interstate 10, directly east of the proposed Allens Creek reservoir site. According to the Brazos River Authority's website (Frequently Asked Questions on the Allens Creek Reservoir), the maps included with the Allens Creek Reservoir preliminary designs indicated that FM 1458 will be located approximately 700 feet from the center of the dam alignment. While this is subject to change with the final design/engineering of the dam structure, it does appear that FM 1458 would remain intact following construction of the project (http://www.brazos.org/acrHome.asp).

This seven-mile portion of the drive along FM 1458 would be the area impacted during construction of the proposed Allens Creek reservoir (based on the 9,500-acre size currently proposed by the City of Houston and the Brazos River Authority); construction of the plant itself is assumed to occur to the west of the reservoir, off of SR 36, and would not be expected to impact the Texas Independence Trail. During construction of the reservoir, however, visitors along FM 1458/Texas Independence Trail would be affected by direct physical impacts associated with close proximity to a construction site (e.g., dust, noise, visual impacts, traffic delays during construction), thereby potentially diminishing their overall experience while driving along this portion of the drive. It is also possible that portions of FM 1458 could be closed for short periods of time during reservoir construction. These effects would be temporary, however.

During plant operation, increased traffic along FM 1458 could also impact Trail visitors as a result of operational workforce commuters and congestion during shift changes. However, more traffic is expected along SR 36 than FM 1458, and the magnitude of impact is expected to be SMALL through the help of mitigation measures such as vanpooling and travel reduction incentives. In addition, increased revenues generated by the proposed plant could be used to improve or expand the existing transportation infrastructure, including FM 1458 if necessary, to accommodate the increase in use.

Note that the driving route of the Texas Independence Trail has no historical significance, but rather serves as a link between areas of historical interest using existing highways. This particular stretch of the Independence Trail would still remain part of the "trail" even if FM 1458 were altered or re-routed. While no information pertaining to tourist use of the Independence Trail system was found on the website (and monitoring of tourists would appear to be a challenge given the nature of the program), the Texas Department of Transportation statistics indicate that between 480 and 670 cars traveled along this stretch of FM-1458 on average each day in 2008.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-14

QUESTION:

Explain whether the consumptive use of water at the Red 2 and Trinity 2 sites would cause significant adverse effects on other water users.

FULL TEXT (Supporting Information):

ESRP Section 9.3 (2007) states that consumptive use of water at a candidate site should not cause significant adverse effects on other users. The ER states that for both Red 2 and Trinity 2, the necessary water rights for cooling water consumption for the proposed two-unit plant are not presently owned by STPNOC and would need to be acquired, however, the ER does not discuss potential impacts of consumptive water use on surrounding water users.

RESPONSE:

Both Red 2 and Trinity 2 are located in rural areas of Texas. As such, there are no municipal or domestic water users in the vicinity of either site that would be impacted from cooling water consumption for the proposed two-unit plant. Impacts from cooling water consumption would be limited to the activities from which water rights would be purchased; those activities (presumably agricultural or industrial activities) would likely be retired from future use. Water rights would be voluntarily sold or relinquished, and water rights not acquired by STPNOC for the potential plant could not legally be impacted.

For each alternative site, ER 9.3.3 discusses the amount/percentage of existing water rights that would need to be acquired for plant cooling purposes as a measure of the level of impact on existing water users. Further, as stated in ER 9.3.3, only active industrial, irrigation, and mining uses were considered as potentially available for water rights sale/transfer – municipal/domestic, hydroelectric, navigation, recreation, recharge, and storage uses were not considered viable water rights for sale/transfer in the evaluation.

Finally, the potential impacts of consumptive water use at alternative sites are discussed in ER 9.3.3 in terms of socioeconomic (public services) impacts on public water supplies. The evaluation concludes that impacts from plant operation would not be expected to have a significant effect on public water supplies.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-15

QUESTION:

Clarify the population screening criteria in ER Table 9.3-1.

FULL TEXT (Supporting Information):

ER Table 9.3-1 indicates that urban areas were excluded but does not indicate what criteria were used in designating urban areas. Explain the criteria used in designating urban areas.

RESPONSE:

The data used to screen urban areas from the Region of Interest (ROI) was developed by the Texas General Land Office (TGLO) and is distributed in the form of a Geographic Information System (GIS) layer. The metadata for the GIS layer developed by TGLO is available at http://www.glo.state.tx.us/gisdata/metadata/urbanareas.htm.

The TGLO-designated urban areas were used as an initial screen of the ROI , but if an existing power plant or otherwise attractive location was located within a designated urban area, the area was further evaluated (during potential site identification) using satellite imagery to qualitatively confirm the presence of an urban area.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-16

QUESTION:

Clarify why major highways were avoided in the identification of potential sites.

FULL TEXT (Supporting Information):

The first full bullet on page 9.3-6 of the ER states that areas around major highways were avoided. Explain why these areas were avoided.

RESPONSE:

Areas in the immediate vicinity of major highways were avoided as these transportation routes are often the primary routes for hazardous cargo shipments, creating a potential safety concern for a potential plant site. Additionally, locating a potential nuclear power plant in the immediate vicinity of a major highway may require relocation or re-routing of the highway (exclusion area requirements). Finally, locating a power plant in the immediate vicinity of a major highway may result in undesirable visual impacts.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-17

QUESTION:

Clarify the process used to eliminate some of the potential sites from further consideration.

FULL TEXT (Supporting Information):

The explanation for eliminating some of the potential sites isn't clear. For example, the Red 1 site looks suitable except in the "composite" ranking (ER, p. 9.3-164). Here the site is scored negatively with regard to access to water, transmission, barge, and rail. Using environmental-only criteria, the Red 1 site ranks second (ER, p. 9.3-164). In explaining the expanded environmental ranking, the ER (p. 9.3-8) says that rail and transmission access was used as a surrogate for related environmental impacts. Are the "Engineering and Cost Related Criteria" a mix of business and environmental factors? Do the "Environmental Criteria" already include the environmental impacts of needed improvements such as rail and transmission access? If yes, then including the scores for access as an environmental proxy would appear to be double-counting those impacts. That said, the explanation of Criteria D.2.1.1 and D.2.2.1 (Siting Report, pages D-76 and D-83) indicates that the evaluation was only done for the site area. These apparently conflicting statements need to be resolved.

RESPONSE:

The objective of the alternative site analysis (ER, p. 9.3-2) was to identify suitable nuclear power plant sites that can be demonstrated to be the best sites that could reasonably be found within the ROI from an environmental perspective. In evaluating primary sites and identifying candidate sites (ER, p. 9.3-7 through 9.3-9), additional composite ratings were developed to gain further insights into the environmental suitability of the primary sites. Because these additional composites focus on environmental considerations, they were used, in conjunction with the all-criteria composite rating, to identify the more environmentally favorable sites.

Two sets of environmental composite ratings were developed:

> Environmental Site Rating – This rating consists of the Health and Safety Criteria (minus the Geology/Seismology criterion), the Environmental Criteria, and the Socioeconomic Criteria. These criteria reflect site ratings based on suitability of the site itself, without consideration of off-site impacts (e.g., environmental impacts from new rail or transmission corridors).
>
> Expanded Environmental Site Rating – This rating consists of the Environmental Site Rating plus the Railroad Access and Transmission Access criteria. These criteria were included to evaluate primary sites with respect to the difficulty of connecting them to the required infrastructure. Distance is used as a metric for these criteria, and application of these criteria results in lower composite ratings for sites with greater distances for

infrastructure connections. Because lower distances generally result in lower environmental impacts, these criteria were included in the expanded composite to reflect the environmental suitability of primary sites, taking into account the potential for both on-site and off-site impacts.

In the example of the Red 1 site, the site ranked second in the environmental site rating, but dropped to fifth when off-site impacts were taken in to account in the expanded environmental site rating (essentially tied with Allens Creek and Colorado 3). Allens Creek was brought forward from this group of three because it utilizes a different cooling water source than the other candidate sites, thereby allowing for the evaluation of environmental impacts for a site using the Brazos River as the cooling water source.

There is no conflict in the statements referenced. Evaluations for Criteria D.2.1.1 and D.2.2.1 (Siting Report, pages D-76 and D-83) were conducted for the site area, whereas the distance surrogate for off-site impacts is addressed in Criteria D.4.2.1 (Railroad) and D.4.2.4 (Transmission) (Siting Report, pages D-146 and D-152).

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-18

QUESTION:

Explain the use of distance as a potential site screening criterion.

FULL TEXT (Supporting Information):

In Siting Report Table 5-1, Criteria P7 and P8 are stated as based on cost, and distance is used as a surrogate for cost. If cost was used to screen potential sites, please justify this. Cost is generally considered in a cost-benefit analysis after an environmentally preferable alternative site has been identified, and it is usually not appropriate to use cost for screening potential sites. However, distance can also potentially be a surrogate for environmental impacts; so the outcome may be acceptable. Explain how and why distance was used as screening criteria.

RESPONSE:

Criteria P7 and P8 (heavy haul access and transmission access, respectively) are included as screening criteria to evaluate potential sites with respect to the difficulty of connecting them to the required infrastructure. Distance is used as a metric for these criteria, and application of these criteria results in higher composite ratings for sites with shorter distances for infrastructure connections. Because shorter distances generally result in both lower cost and lower environmental impacts, these criteria reflect both environmental and cost considerations.

Details on the methodology used to evaluate potential sites with respect to these criteria are presented in Table 5-1; site-specific data used in the evaluations are provided in Appendix C, Section C.2 of the Siting Report.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-19

QUESTION:

Explain the use of land acquisition cost as a potential site screening criterion.

FULL TEXT (Supporting Information):

In Siting Report Table 5-1, Criterion P9 is land acquisition cost. Please explain why land acquisition cost was chosen as a potential site screening criterion.

RESPONSE:

Land acquisition costs are one consideration identified in the EPRI Siting Guide and were included in the screening criteria to measure the relative suitability of potential sites at which land could be secured at lower relative cost, as well as the inherent advantages of sites already owned by NRG. In the sense that higher land prices reflect higher value of sites for other uses, this criterion can also be considered to be a surrogate for the effects of long term removal of land from other potential activities (e.g., farming, residential development). This criterion also reflects the additional land requirement at potential sites that would require reservoirs, versus those that would not. For example, neither of the coastal sites would require a reservoir; both of them were assigned a higher rating for this criterion than was assigned to riverine sites (e.g., Red and Trinity sites).

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-20

QUESTION:

Explain the use of barge access in site screening.

FULL TEXT (Supporting Information):

The proposed STP site appears to be the only site for which barge access was considered (Siting Report, p. C-71). Was barge access considered for any of the alternative sites? Further explanation is needed.

RESPONSE:

Barge access as an alternative to rail was considered but was not found to be environmentally favorable at sites other than STP. The Heavy Haul Access criterion used in the screening evaluation of potential sites allows consideration of both modes of transportation, such that access to an existing barge slip was deemed an acceptable alternative to construction of rail access. However, the evaluation focuses primarily on construction of rail access. The STP site is the only site that has access to an existing barge slip. Other sites (San Antonio 1 for example) could utilize existing barge access in the general area, but would still require new construction of rail between the barge access point and the potential site due to distance from the existing barge access point. For some potential sites (Coastal sites and potential sites near the Gulf of Mexico), construction of a new barge slip at the site could occur. However, construction of new barge access (where viable) was deemed to be of generally greater environmental impact (due to dredging and filling requirements) than construction of new rail access, and thus rail access was the basis for evaluation in these instances. Finally, barge access is not a viable option for a majority of the potential sites due to their inland locations.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-21

QUESTION:

Why was half of the Valley Lake acreage included in the wetlands estimate for the Red 2 site?

FULL TEXT (Supporting Information):

Page C-69 of the Siting Report indicates that half the acreage of Valley Lake is included in the wetlands estimate for the Red 2 site. Why was the lake acreage included given that no plant structures would be constructed there? If this approach is taken for the Red 2 site, would it be appropriate, for purposes of consistency, to include half of the MCR acreage at the STP site in the wetlands estimate?

RESPONSE:

Lakes/ponds (including man-made reservoirs and ponds) as well as rivers/streams are included in the NWI wetlands mapper results, which were the source for the wetlands acreages. While the evaluation of potential and primary sites excludes riverine habitat from the wetlands estimate, the evaluation does include acreages associated with lakes and ponds and identifies them as such in the site summary table, as was the case for the potential sites evaluated in Appendix C of the Siting Report. A 6,000-acre area (around a selected site center point) was evaluated for all potential sites, and in the case of the Red 2 site, this 6,000-acre area included the northern half of Valley Lake. Valley Lake is a man-made reservoir constructed to support an existing two-unit power plant located along the southern end of the lake. At this stage of the siting process, no assumption had been made regarding the potential for Valley Lake to serve as a potential cooling water supply source for a new nuclear power plant at the Red 2 location, either through expansion of the existing lake to accommodate two plants (existing and new), or through retirement of the existing plant and use by only the new plant. Because Valley Lake had the potential to be impacted by development of the Red 2 site, its acreage was included in the evaluation of potential and primary sites during the site selection process. However, in the final analysis, the evaluation of the alternative sites (ER 9.3.3) included a conservative assumption that a new reservoir would be constructed for the Red 2 plant.

In the case of the STP site, it was understood from the beginning of the site selection process that the MCR was sufficiently sized to accommodate two new units and that no additional modifications would be required. Because the MCR is an existing feature, originally constructed to support four units and it would not be disturbed from new development at the site, its acreage was not included in the total wetlands acreage evaluated for the STP site. Additionally, the MCR has been determined by the U.S. Corps of Engineers to not be "waters of the U.S., including wetlands."

Two additional points of note relating to this RAI include:

1. The inclusion of the Valley Lake acreage in the evaluation of the Red 2 site did not materially penalize Red 2, since it was one of the highest ranked sites, even with the acreage included.
2. Deducting the Valley Lake wetlands acreage in the evaluation would result in a wetlands rating of 4 (based on a revised total wetlands acreage of 50 to 75 acres) for the Red 2 site, and there would have been no change in the final site selection decisions.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03-22

QUESTION:

Provide a copy of the STP Nuclear Operating Company Nuclear Power Plant Siting Report (June 2009) on the docket.

FULL TEXT (Supporting Information):

The Siting Report contains details regarding the site selection process and approach that are not included in the revision to ER Section 9.3 (attachment to STPNOC Letter U7-C-STP-NRC-090066), and are needed for our analyses of alternative sites in the EIS. If the Siting Report contains proprietary information, provide a redacted version that can be made publicly available.

RESPONSE:

The Siting Report (June 2009) is attached as an enclosure to this RAI response. The Siting Report contains no proprietary information.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.02-06

QUESTION:

Provide clarification on the selection process for alternative sites regarding consideration of "important species."

FULL TEXT (Supporting Information):

The proposed text for revision to ER Section 9.3.2 (the Attachment to STPNOC Letter U7-C-STP-NRC-090066) states that "important species" were considered in the criteria for primary site selection, and "important species" includes the evaluation of threatened and endangered species. During discussions with the applicant and in the staff's review of STPNOC Nuclear Power Plant Siting Report (June 2009), the evaluation of important species was considered with information available at the county level. However, in the proposed text for revision to ER Section 9.3.3.1 (the Attachment to STPNOC Letter U7-C-STP-NRC-090066) the discussion for the STP site includes only those species known to be on-site, not within the county. Clarify why the evaluation of important aquatic and terrestrial species for STP is discussed only at the site-level, rather than at the county-level, as is done for the other potential sites.

RESPONSE:

The STP site has been evaluated in detail in the ER, and information on existing terrestrial and aquatic species found at the site are identified in ER Section 2.4. This information was used in the evaluation of alternative sites in ER 9.3.3 to ensure consistency with other sections of the COLA ER. In contrast, site-specific information (which is preferred) was not readily available in the public domain for the alternative greenfield site locations. Therefore, county-level data were used to support the evaluation of alternative sites.

Note that a more consistent approach was followed for all primary sites (including STP) during the site selection process – where county-level data were used in the evaluation of threatened and endangered species – consistent with statements made in ER 9.3.2. This is explained in the introduction to General Siting Criteria evaluations in Appendix D of the Siting Report:

> "With the exception of the South Texas Project site, the primary sites evaluated in this appendix are all considered to be greenfield sites, and the level of site specific information available is significantly less than for the South Texas Project site. In order to ensure a balanced site evaluation and comparison in the site selection process, the general site criteria evaluations rely on a consistent set of "higher level" data available on the general site area (e.g., typically county level) rather than known site specific conditions. Note that consideration of site specific information at the South Texas Project, if included in this evaluation, would result in higher ratings for several of the criteria evaluations; these are noted in the appropriate sections of this appendix."

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.02-07

QUESTION:

Provide clarification as to why once-through cooling system was chosen for the coastal sites.

FULL TEXT (Supporting Information):

The proposed text for revision to ER Section 9.3.2 (the Attachment to STPNOC Letter U7-C-STP-NRC-090066) states that "For purposes of the siting study, ... once-through cooling was assumed for the coastal locations." Given the restrictions placed on once-through cooling technology by Clean Water Act Section 316(b) and EPA's implementing regulations in 40 CFR 125 Subpart I, it is not clear why this cooling system is considered viable. Explain why once-through cooling system is a viable option.

RESPONSE:

The cited regulations do not prevent the use of once-through cooling systems for power plant cooling. Per Federal Register Volume 66, Number 243, December 18, 2001, "under Track II, an intake with the capacity needed to support a high-volume, once-through cooling system that is shown through studies to reduce impingement mortality and entrainment for all life stages of fish and shellfish to achieve a level of reduction comparable to the level that would be achieved by applying Track I technology-based performance requirements at a site would meet the requirements of the rule."

Additionally, cooling technology did not have a material effect on the evaluation of coastal sites in the siting study. Both coastal sites evaluated were deferred from further consideration in the evaluation of potential sites and identification of primary sites (ER, Section 9.3.2.4). The evaluation of environmental criteria at this stage in the siting process used information attributable to the general site area only and was independent of cooling technology.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.02-08

QUESTION:

----- A -----

Provide clarification regarding the selection of Candidate Areas within the Region of Interest with respect to guidance described in Regulatory Guide 4.7, ESRP Section 9.3 and the EPRI Siting Guide as it relates to water availability.

FULL TEXT (Supporting Information):

----- B -----

The NRC staff's meeting with Texas Commission on Environmental Quality (TCEQ) staff on August 27, 2009, regarding water availability and permitting at STPNOC's alternative sites revealed that although it is possible to obtain a permit for a reliable supply of water in the quantities required by proposed STP Units 3 and 4, obtaining such a permit would be difficult for the Red 2 and Trinity 2 alternative sites. TCEQ staff stated that it would be significantly easier to obtain a water use permit for sites that used waters from the Gulf of Mexico because such use would not compete with fresh surface water supplies.

Regulatory Guide 4.7, Section 7.2, p. 4.7-13, states: "To evaluate the suitability of sites, there should be reasonable assurance that permits for consumptive use of water in the quantities needed for a nuclear power plant of the stated approximate capacity and type of cooling system can be obtained by the applicant from the appropriate State, local, or regional agency."

Explain how it was determined that there is a reasonable assurance that water use permits at the alternative sites (Red 2, Trinity 2, and Allens Creek) can be obtained.

ESRP 9.3 lists Federal, State, local, and Native American Tribal laws and regulations affecting the siting of new energy facilities as an acceptance criterion. Further, ESRP 9.3 states "[t]he reviewer should determine if the applicant has employed a practicable site-selection process with the principal objective of identifying candidate sites that would be among the best that could reasonably be found for the proposed plant. This standard implies that all such candidate sites should be licensable (which includes consideration of whether other necessary Federal, State, and local permits could be obtained)." Please explain how TCEQ's requirements related to water availability and permitting were considered in the alternative site selection by STPNOC, or justify an alternative approach.

The EPRI Siting Guide (used by STPNOC according to section 9.3.1 of the ER), states in Chapter 3, Detailed Discussion of Siting Criteria, Section 3.1.1.2.1, Cooling Water Supply: (a) "Sites that are incapable of providing these levels of water supply within applicable physical *and regulatory constraints* should be excluded from further consideration. The evaluation of water supply capability should include both the effects on water quantity left in the source water body and the effects on water quality as a result of reduced waste assimilation capacity." (emphasis

added), (b) "The allocation *policies and laws operable at the state level* govern the use and consumption of cooling water. ... Evaluations of the ability to supply the facility water requirements *must take such allocations for other uses into account.*" (emphasis added), and (c) "Criteria that apply to the unique physical and *regulatory characteristics* of the ROI under study should be defined..." (emphasis added).

----- C -----

Explain how the guidance related to state regulatory characteristics and constraints listed in the EPRI Siting Guide were used by STPNOC in the alternative site selection study. Specifically, explain how the surface water availability and permitting issues from rivers in the state of Texas were taken into account in the exclusionary and avoidance criteria used to select Candidate Areas and further, in the process and criteria used to select Primary and Potential Sites.

----- D -----

Explain how the approach used in the Siting Report, with regards to access to water, provides a reasonable expectation that the sites identified would be among the best available in the ROI.

RESPONSE:

----- A -----

As noted in the application (ER, Table 9.3-1, p.9.3-160), water availability was taken into account in Candidate Area identification by identifying those river reaches within the Region of Interest (ROI) for which the historic average flow is at least 10 times the assumed maximum plant cooling design requirement of 50,000 acre-ft/yr (69.1 cfs); the Gulf of Mexico was also considered a viable water supply in Candidate Area identification. Candidate Areas were then defined along annular regions within specified distances from the water sources (ER, Table 9.3-1, p.9.3-160).

----- B -----

Guidance provided in Regulatory Guide 4.7, ESRP Section 9.3 and the EPRI Siting Guide reflects an assumption that alternative site analysis must be conducted using reconnaissance-level information. Regulatory Guide 4.7 goes on to define this information as:

> "...limited to information that is obtainable from published reports, public records, public and private agencies, and individuals knowledgeable about the locality of a potential site. Although in some cases the applicants may have conducted on-the-spot investigations, it is assumed here that these investigations would be limited to reconnaissance-type surveys at this stage in the site selection process."

Water availability was evaluated throughout the screening and evaluation of alternative sites using reconnaissance-level information as described in this guidance (see response C, below). Formal contact with agencies (e.g., TCEQ) to negotiate permit application requirements, review standards, and conditions at each of the alternate sites was considered well beyond the reconnaissance data standard reflected in this guidance.

Postulating that obtaining water permits would be difficult at Red 2 and Trinity 1 is not equivalent to saying that permits cannot be obtained. Rather, it is an indication that additional information, analysis, and negotiation – beyond the level of reconnaissance information – would be required to more fully evaluate conditions under which permits could be obtained and to evaluate the regulatory, technical, cost and feasibility considerations associated with resulting permit conditions. As noted above, this level of detail is not required by the guidance of Regulatory Guide 4.7, ESRP Section 9.3, and the EPRI Siting Guide.

----- C -----

Upon commencing the STPNOC Siting Study, it was understood that cooling water availability would be a complex consideration in the site selection process. Surface water is a valued commodity in Texas, and unappropriated surface waters are scarce as illustrated by the General Water Availability Maps by River Basin available on the TCEQ website (http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wam.html). Unappropriated flows under the full authorization condition (which must be considered for perpetual water rights) for 75-100% of months exist in the following river basins:

- Colorado-Lavaca Coastal Basin – note that a coastal site was evaluated in this region in the STPNOC Siting Study;
- Cypress River Basin – only a short river segment near the eastern Texas border; area is outside of the STPNOC Siting Study Region of Interest (ERCOT service territory);
- Guadalupe River Basin – river segment near confluence of Guadalupe and San Antonio rivers; note that a potential site was evaluated in this region in the STPNOC Siting Study;
- Neches River Basin – only a short river segment near the southeastern Texas border; area is outside of the STPNOC Siting Study Region of Interest;
- Neches-Trinity Coastal Basin – portions of area are outside of the STPNOC Siting Study Region of Interest; other portions of area encounter higher population densities (Houston and Galveston areas);
- Sabine River Basin – below Toledo Bend Reservoir; area is outside of the STPNOC Siting Study Region of Interest;
- San Antonio River Basin – river segment near confluence of Guadalupe and San Antonio rivers; note that a potential site was evaluated in this region in the STPNOC Siting Study;
- San Antonio-Nueces Coastal Basin – note that a coastal site was evaluated in this region in the STPNOC Siting Study;
- San Jacinto River Basin – only a short river segment in area of higher population density (Houston area);
- San Jacinto-Brazos Coastal Basin – area encounters higher population densities (Houston and Galveston areas);
- Sulphur River Basin – only a short river segment near the eastern Texas border; area is outside of the STPNOC Siting Study Region of Interest;
- Trinity River Basin – only a short river segment near the southeastern Texas border at Galveston Bay; area encounters higher population densities (Houston area); and
- Trinity-San Jacinto Coastal Basin – area encounters higher population densities (Houston area);

Depending on the amount of unappropriated flow available, the above areas would likely be further constricted given the significant quantity of water required for nuclear power plant cooling. Thus, the areas where unappropriated surface water could supply the cooling needs of a nuclear power plant are extremely limited within the STPNOC Region of Interest.

In order to consider the complete spectrum of sites potentially available for evaluating environmental preferability as compared to the STP site, the siting study considered both coastal sites along the Gulf of Mexico (offering an unlimited water supply) and the purchase of existing water rights in river basins as viable cooling water sources; groundwater as a source of plant cooling water was not considered a viable option. Furthermore, existing water rights designated to municipal/domestic, hydroelectric, navigation, recharge, and storage uses were not considered viable water rights for sale/transfer; industrial, irrigation, and mining uses were considered to be viable candidates for water rights sale/transfer.

As described in ER Section 9.3.2.2, the siting process screened the Region of Interest down to candidate areas utilizing a number of regional criteria, of which cooling water availability was one. It was assumed that rivers for which more than 10% of the average flow will be required for makeup water may present permitting or operational water supply problems (regardless of water rights availability). Therefore, river segments with average flows less than 691 cubic feet per second (as reported by USGS gaging stations) were deferred from further consideration. Additionally, a maximum pumping distance of 5 miles from rivers and 10 miles from the coast was assumed, as greater pumping distances may impose significant construction and operational costs. Environmental impacts from construction and maintenance activities within pipeline rights-of-way will also increase as pumping distances increase.

As described in ER Section 9.3.2.3 and 9.3.2.4, potential sites were identified within the resulting candidate areas, and the potential sites were evaluated based on a set of nine regional screening criteria, which included cooling water availability. Potential sites were evaluated with respect to the ability to meet plant cooling water requirements (river flow volume and/or Gulf of Mexico accessibility) and the ownership of existing water rights (by STPNOC) or the availability of unappropriated water rights.

As described in ER Section 9.3.2.5, primary sites were selected from the potential sites and were evaluated based on a set of more detailed criteria, which included cooling system requirements. The previous evaluation of potential sites for cooling water availability was expanded in this phase of the site selection process to include an evaluation of the current ownership of water rights at the primary sites and any river-specific allocation requirements (e.g., Red River Compact). The Water Rights Database available on the TCEQ website (http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wr_databases.html) was consulted to identify the allocation of water rights by use category and to determine the percentage of existing water rights (from the use categories considered as viable) that would need to be procured to fulfill plant cooling requirements (assuming no unappropriated flows exist). As water rights ownership is treated as a commodity in Texas, it was assumed that the

necessary water rights could be obtained, and that the matter of procuring the water rights is primarily an economic consideration.

Finally, the potential environmental impacts of the proposed and alternative sites were evaluated in the Environmental Report, Section 9.3.3. Impacts from the purchase of existing water rights were considered. Additionally, impacts to hydrology, water use, and water quality were included in this evaluation, and both impacts from construction activities and impacts from operational activities were considered. Additionally, potential challenges in obtaining water permits were identified and characterized in this evaluation. Evaluations were primarily based on reconnaissance-level data obtained during completion of the STPNOC Siting Study.

In summary, the availability of unappropriated surface water in the STPNOC Region of Interest is limited, and cooling water availability was identified as an important consideration in the early stages of the site selection process. Cooling water availability was evaluated and considered at every stage in the site selection process, with a greater level of detail being examined at successive steps in this process. The site selection process identified the availability of viable water rights within the relevant river basins, and the impacts to existing water users was evaluated to make the required environmental comparisons. The matter of procuring the water rights is primarily an economic consideration and was beyond the scope of this analysis.

----- D -----

The objective of the alternative site analysis (ER, p. 9.3-2) was to identify suitable nuclear power plant sites that can be demonstrated to be the best sites that could reasonably be found within the ROI from an environmental perspective.

Referring to the response in B, above, there is no basis – based on reconnaissance level information – to conclude that Red 2 and Trinity 1 could not be feasibly permitted. There is an indication from TCEQ (see first paragraph under FULL TEXT, above) that obtaining water permits at these sites would be difficult, but possible. Thus, based on reconnaissance-level information and the alternative site analysis (ER, Sections 9.3.1 and 9.3.2), there is a firm basis for including Red 2 and Trinity 1 in the evaluation.

Further, eliminating these sites would result in the elevation of other, less environmentally favorable sites, to the status of alternative sites. Eliminating Red 2 and Trinity 1 from consideration of alternative sites would, in turn, weaken the site screening process by failing to consider the most environmentally favorable alternative sites that could reasonably be found within the ROI. Using less environmentally favorable sites in the comparison of proposed and alternative sites would not change the determination that there is no environmentally preferable site to STP.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.02-09

QUESTION:

Provide clarification on screening criteria used for identification of Candidate Areas with regard to proximity to rivers or the gulf.

FULL TEXT (Supporting Information):

Table 3-1 of the Siting Report sets the screening distance as 5 miles for rivers and 10 miles for the Gulf of Mexico. Explain the basis for the difference in these distances with respect to impacts from a pipeline that may need to be constructed from the site to the respective water body for conveyance of cooling or makeup water.

RESPONSE:

In examining the ROI, it was apparent that sufficient lands within 5 miles of rivers existed to site a potential plant, and greater distances from rivers would only incur greater environmental impacts from pipeline construction and maintenance. For coastal locations, 5 miles was not a great enough distance to allow identification of potential sites (due to flooding concerns, ecological sensitivity, and population along the coast), and thus the distance was increased to 10 miles to enable identification of potential sites at coastal locations.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.02-10

QUESTION:

Provide clarification on screening criteria ratings for Potential Sites with regard to water supply.

FULL TEXT (Supporting Information):

1. Table 9.3-2 in the proposed text for revision to ER Section 9.3 shows the composite ratings of the Potential Sites. The Siting Report mentions that the rating for a Potential Site based on the screening criterion for Cooling Water Supply is the average of two components: (a) ability to meet cooling water quantity requirement and (b) availability of water rights. The site should be rated 5 for the first component if the water source has unlimited capacity. For the second component, a site should be rated 5 if water rights are currently owned by the applicant.

   Table 9.3-2 in the proposed text for revision to ER Section 9.3 shows that the water supply criterion score for the proposed site, the STP site, was 5. The applicant currently holds water rights at the STP site. However, the water supply source at the STP site, the Colorado River, does not have an unlimited capacity. Explain why the STP site was rated 5 for water supply.

   Table 9.3-2 in the proposed text for revision to ER Section 9.3 shows that the water supply criterion scores for the two coastal sites were each 4. The coastal sites, however, have access to a water source with an unlimited capacity. Also, the staff's discussions with TCEQ have revealed that there is little regulatory restriction on obtaining water rights from the Gulf of Mexico. Given this information, explain the basis for rating the coastal sites as 4 for water supply.

2. In Appendix C of the Siting Report, Section C.2, Screening Criterion Ratings, details of ratings for each criterion for all Potential Sites are provided. For the coastal sites, a note is included for the Cooling Water Supply criterion that states: "Pipeline construction to Gulf of Mexico could encounter permitability challenges from crossing critical habitat." This statement describes an ecology consideration and not a hydrology consideration. Explain what effect this consideration had on the coastal sites scoring a 4 for the Cooling Water Supply criterion.

RESPONSE:

The Colorado River near the STP site has an average flow of approximately 37 times the operating requirement of the new nuclear power plant, and a rating of 3 was given for the first component of the cooling water criterion evaluation per the evaluation metric established in the siting study. Water rights are currently owned for the additional cooling water requirement at the STP site, and a rating of 5 was given for the second component of the cooling water criterion evaluation, for an overall average rating of 4 for the STP site. However, a cooling water scenario

where water rights are presently owned and intake and discharge locations are established and permitted was preferred over the Gulf of Mexico cooling water scenario where unlimited supplies exist but access agreements and intake and discharge locations have not been established. Therefore, the STP site was assigned the highest overall rating of 5 for the cooling water criterion evaluation. However, if an overall rating of 4 had been assigned to the STP site for the cooling water criterion evaluation, the change in overall scoring for the site would not have had a material effect on the outcome of the decisions made in the siting process.

For the coastal locations, since an unlimited capacity exists for the Gulf of Mexico source water, each was given a rating of 5 for the first component of the cooling water criterion evaluation. The coastal locations do not currently have access to water rights from the Gulf of Mexico. General Water Availability Maps produced by TCEQ (http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wam.html) show the areas of potential water withdrawal for each coastal site as having unappropriated flows available for a new application in 75%-100% of months. Therefore, each site was given a rating of 3 for the second component of the cooling water criterion evaluation per the evaluation metric established in the siting study, resulting in an overall average rating of 4 for each site.

The potential for coastal locations to encounter permitability challenges, primarily from pipeline rights-of-way impacting sensitive environmental areas, was also recognized. While not strictly a hydrological consideration, such permitability challenges could present difficulty in acquiring the cooling water necessary to operate a nuclear power plant at the coastal locations. This information was qualitatively considered in supporting the overall cooling water criterion rating of 4 for each coastal site (described above) in lieu of assigning an overall rating of 5 based solely on the unlimited cooling water supply from the Gulf of Mexico.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.03-04

QUESTION:

Provide clarification on the evaluation of essential fish habitat at the STP site.

FULL TEXT (Supporting Information):

Section 2.4.2.4 of the Environmental Report (ER), Rev. 2, states that the lower Colorado River is designated essential fish habitat (EFH) by the Gulf of Mexico Fishery Management Council. The ER is also consistent with information available to the public on NOAA's Office of Habitat Conservation, Habitat Protection Division's website (http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/GIS_mapper.htm). However, the proposed text for revision to ER Section 9.3.3.1.5 (the Attachment to STPNOC Letter U7-C-STP-NRC-090066) implies that the Colorado River is not essential fish habitat, and that EFH is seven miles away in the Gulf of Mexico or Matagorda Bay. Explain why there is a discrepancy regarding the designated EFH for the lower Colorado River.

RESPONSE:

The lower Colorado River is designated essential fish habitat by the Gulf of Mexico Fishery Management Council. The text in ER Section 9.3.3.1.5 will be amended to be consistent with this fact and information presented in ER Subsection 2.4.2.4. This amendment does not change the previous findings relating to the potential impacts from construction and operation of STP Units 3 and 4 on aquatic ecology (as discussed in ER 9.3.3.1.5).

The Siting Report also has been revisited to determine how ratings would be affected if the presence of EFH in the lower Colorado River had been considered in the Siting Report evaluation of the STP site. This updated information would affect the evaluation of the following general siting criteria related to aquatic species/habitat: Disruption of important Aquatic Species/Habitat, Thermal Discharge Effects, Entrainment/Impingement Effects, and Drift Effects on Surrounding Areas). Specifically:

- Disruption of Important Aquatic Species/Habitat: Habitat and flexibility sub-ratings would be reduced to 2, and the overall rating would be reduced by 1 point, from a 4 to a 3.
- Thermal Discharge Effects: Carrying forward the adjusted aquatic species rating would have no effect on this criterion and the STP site rating would remain a 3.
- Entrainment/Impingement Effects: The evaluation of entrainment/impingement effects was based primarily on the potential presence of a federally listed aquatic species that could be impacted, since all sites were assumed to include a closed cycle design. However, a more conservative analysis that accounts for the presence of valuable EFH and associated species at STP would result in the rating being lowered from a 4 to a 3.

- Drift Effects on Surrounding Areas: Carrying forward the adjusted aquatic species rating into the drift effects evaluation would result in the rating for drift effects being reduced one point from a 5 to a 4.

With the ratings revised as above, the composite rating for STP would drop from 735.40 to 720.46; even with these modifications, the scoring for STP would remain significantly higher than all other sites.

CANDIDATE COLA REVISION:

The third paragraph of ER Subsection 9.3.3.1.5 will be revised as follows:

Nearby coastal waters to the STP site and the lower Colorado River have been designated as essential fish habitat (EFH) for various species. EFH has been designated within the Gulf of Mexico and Matagorda Bay estuary along the Texas coastline for the following species: Reef fish, Red drum, Stone crab, Shrimp, and coastal migratory pelagic fish (References 9.3-15 and 9.3-16). Managed species in the lower Colorado River considered important to the development of STP Units 3 and 4 include brown shrimp, white shrimp, and red drum. EFH has been designated for all life stages of these species. However, because the area to be disturbed along the lower Colorado River is small and in a protected near shore area that is already dedicated to plant-related functions, the overall construction impacts on aquatic species, including their habitat (EFH), is expected to be SMALL. In addition~~However~~, since development of additional units at the STP site would not include construction within, or water withdrawal directly from, the Gulf of Mexico or Matagorda Bay, which is over seven miles away, no impacts are expected to protected habitat in the Gulf or to the coastal threatened and endangered species which include five species of sea turtles. No threatened or endangered species are expected to be affected by the proposed construction (ER Section 4.3.2.1).

Question Number: 09.03.03-05

QUESTION:

Provide clarification on the evaluation of water availability and aquatic resources for the Trinity 2 site.

FULL TEXT (Supporting Information):

The proposed text for revision to ER Section 9.3.3.4.5 (the Attachment to STPNOC Letter U7-C-STP-NRC-090066) does not consider the planned reservoirs within the vicinity of the Trinity 2 site. According to the Trinity River Authority Basin Master Plan, there are two significant reservoirs (Tennessee Colony Reservoir and Tehuacana Reservoir) that would be built in the vicinity of Trinity 2 and would be contiguous with Lake Fairfield. Evaluation of these reservoirs would be similar to the evaluation of Allens Creek Reservoir for the proposed Allens Creek site. The impact from construction of a reservoir for Trinity 2 was considered MODERATE, whereas the same evaluation for construction of a reservoir for Allens Creek was considered LARGE. The process of inundating land for the construction of a planned reservoir would appear to be similar. Clarify why Trinity 2 site was evaluated differently from Allens Creek with regard to planned reservoirs that are discussed in the public domain.

RESPONSE:

Planned reservoirs within the vicinity of the Trinity 2 site were not considered in the ER Section 9.3.3.4.5 because the status of their proposed development was uncertain and believed to be too far in the future to support nuclear power plant development in the time frame for the proposed STP nuclear project. In addition, the primary planned purpose of these reservoirs is to address water resource needs in the Trinity basin, and there is no assurance that they would be available to support nuclear power plant cooling water requirements. For these reasons, the comparison of alternative sites in ER Section 9.3.3 is based on the assumption that a dedicated-purpose reservoir would be required to develop a nuclear power plant at Trinity 2.

In contrast, a water right permit has already been issued for the proposed Allens Creek Reservoir to the Texas Water Development Board (TWDB), the Brazos River Authority (BRA), and the City of Houston for use of 99,650 acre feet per year for municipal, industrial and irrigation purposes. Detailed design and environmental studies are ongoing and according to the Brazos River Authority website, construction of the reservoir is scheduled to begin in 2018. (Additional information on plans for the Allens Creek reservoir is provided below.) Thus, the Allens Creek Reservoir would be available in a time frame for potential use at a nuclear power plant; for this reason, and because previous plans for a nuclear unit at Allens Creek included joint use of the reservoir, the environmental comparisons in Section 9.3.3 are based on the assumption that the total area of the proposed reservoir site (9,500 acres) would be developed, even if it was not all required for plant cooling. As stated in the introduction to ER Section 9.3.3.3:

"Should the larger reservoir be constructed, it would likely support the anticipated water supply needs of the City of Houston as well as the nuclear power plant; potential impacts of the larger reservoir are evaluated to address potential cumulative impacts of these two related actions."

Impacts from reservoir construction under this scenario were estimated in ER Section 9.3.3.3.4 as LARGE at the reservoir location, based on the potential area impacted and the potential presence of protected species in the area (e.g., a candidate Federal species and state threatened species). While much of the area has already been disturbed, construction would impact over 2,700 acres of forested land, including potential high quality bottomland hardwood habitat and over 1,700 acres of wetlands. If a smaller reservoir were to be developed – solely to support nuclear power plant water requirements – the size of the reservoir would be reduced to the same size as that assumed in evaluating the other alternative sites (nominally 1,700 acres). In this scenario, a much smaller land area would be affected, but some wetlands and bottomland forest habitat would still be expected to be impacted; there would be considerable additional flexibility to avoid ecologically sensitive areas, however. Although no studies have been conducted to site or design such a reduced-size reservoir at Allens Creek, it is estimated that the impacts of reservoir construction under this scenario would be reduced to SMALL or MODERATE, given the amount of habitat already degraded in the area and the absence of protected species in the area.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.03-06

QUESTION:

Provide clarification on groundwater use during operations and the groundwater availability at the alternative sites.

FULL TEXT (Supporting Information):

For all alternative sites, STPNOC stated that groundwater use during construction would be approximately 1200 gpm. There is no discussion of groundwater use during operations for the alternative sites. Provide a discussion of groundwater use during operations. Also provide a comparison of the quantity of groundwater that may be used during construction versus that used during operations for all alternative sites.

In the proposed text for revision to ER Section 9.3, STPNOC stated for each alternative site: "In summary, due to the relatively small quantity requirements and the availability of groundwater or imported water, the sites will have a SMALL impact on water use for construction activity." How was groundwater and imported water availability determined at each alternative site? How was it determined that the groundwater or imported water demand during construction would be "relatively small?"

RESPONSE:

As stated in ER Section 5.2.2.2, groundwater use for STP Units 3 & 4 under normal operating conditions is estimated at 1,242 gpm (2,003 acre-ft/yr) and under maximum use operating conditions is estimated at 4,108 gpm (6,626 acre-ft/yr). Groundwater needs above the currently permitted amount will be obtained from the Main Cooling Reservoir. The groundwater use during construction (estimated maximum rate of 1,200 gpm per ER Section 4.2.2) is similar to the groundwater use during normal operations (estimated at 1,242 gpm). These estimates are assumed to apply at the alternative sites as well.

Texas is divided into 16 groundwater management areas, and portions of these areas are subdivided into groundwater conservation districts. The following presents supplemental information regarding the availability of groundwater at each alternative site.

Red 2

The Red 2 site is located in Groundwater Management Area (GMA) 8 and the Red River Groundwater Conservation District (GCD). The site is located above the Trinity major aquifer and the Woodbine minor aquifer. For the Woodbine aquifer, the GMA has established a desired average drawdown not to exceed 186 feet from estimated year 2000 conditions after 50 years in Fannin County. Application of a groundwater availability model estimates 2,676 acre-ft/yr of managed available groundwater in the Woodbine aquifer for Fannin County in the Red River basin (where Red 2 is located). Thus, adequate groundwater is available for construction and

normal operating conditions for the potential power plant. Additional groundwater capacity is also available in the Trinity aquifer. For maximum use operating conditions, it is assumed that a temporary increase in surface water use could be negotiated. Additionally, access to existing groundwater wells in the vicinity could be obtained to utilize existing groundwater uses in lieu of accessing the future groundwater availability supplies. Finally, use of imported water (primarily for potable uses) could be employed to reduce the impact on groundwater supplies. Therefore, impacts on groundwater resources were predicted to be SMALL.

Trinity 2

The Trinity 2 site is located in GMA 12 and the Mid-East Texas GCD. The site is located above the Carrizo-Wilcox major aquifer. Desired future conditions have not yet been adopted for the site area. Wells located in the Carrizo-Wilcox aquifer commonly yield 500 gpm, and therefore, a minimal number of wells would be required to supply the groundwater use during construction and normal operations. For maximum use operating conditions, it is assumed that a temporary increase in surface water use could be negotiated. Additionally, access to existing groundwater wells in the vicinity could be obtained to utilize existing groundwater uses in lieu of accessing the future groundwater availability supplies. Finally, use of imported water (primarily for potable uses) could be employed to reduce the impact on groundwater supplies. Therefore, impacts on groundwater resources were predicted to be SMALL.

Allens Creek

The Allens Creek site is located in GMA 14 and the Bluebonnet GCD. The site is located above the Gulf Coast major aquifer and the Brazos River Alluvium minor aquifer. Desired future conditions have not yet been adopted for the site area. Wells located in the Gulf Coast aquifer are highly variable (100-3,000 gpm), and wells located in the Brazos River Alluvium aquifer typically yield 250-500 gpm. Projected 2060 production of the Gulf Coast aquifer is nearly 1.7M acre-ft/yr, and it is assumed that access to the relatively small groundwater requirement for the proposed power plant could be obtained. For maximum use operating conditions, it is assumed that a temporary increase in surface water use could be negotiated. Additionally, access to existing groundwater wells in the vicinity could be obtained to utilize existing groundwater uses in lieu of accessing the future groundwater availability supplies. Finally, use of imported water (primarily for potable uses) could be employed to reduce the impact on groundwater supplies. Therefore, impacts on groundwater resources were predicted to be SMALL.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.03-07

QUESTION:

Provide clarifications regarding cooling water requirements.

FULL TEXT (Supporting Information):

In the proposed text for revision to ER Section 9.3.3, STPNOC stated that the maximum plant cooling design consumption for a two-unit plant would be 31,000 gpm (50,000 ac-ft/yr) at the proposed site and at the alternative sites.

1. In the proposed text for revision to ER Section 9.3, Table 9.3-1, ROI Regional Screening Criteria, STPNOC stated that the assumed makeup water requirement would be 31,000 gpm (50,000 ac-ft/yr). Clarify if the consumptive use is the same as makeup water requirement. If the makeup water requirement is larger than 31,000 gpm, provide updated estimates of the percentage of existing water rights that would need to be acquired at the alternative sites to support the operations of the potential plant.

2. Clarify if the makeup water requirement stated for the alternative sites includes evaporation losses from a cooling reservoir like the MCR if such a configuration were to be used at the alternative sites.

RESPONSE:

Consumptive water use is the same as the makeup water requirement (31,000 gpm; 50,000 ac-ft/yr). Therefore, the estimate of the percentage of existing water rights that would need to be acquired would not change. The assumed makeup water requirement was derived from the existing makeup water requirement at the STP site (Units 1 and 2). This requirement includes evaporation losses from the Main Cooling Reservoir (MCR) at the STP site. Therefore, if an MCR configuration were to be used at the alternative sites, the makeup water requirement used in the evaluation would include evaporation losses from the MCR.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.03-08

QUESTION:

Provide supplemental information regarding wildlife and game species associated with the alternative sites and pipeline/transmission line corridors.

FULL TEXT (Supporting Information):

Provide additional information describing the common wildlife and game species that are likely to inhabit 1) forested habitat, 2) grassland habitat, or 3) agricultural habitats that are found at the Trinity 2, Allens Creek, and Red River 2 sites and in the proposed routes for pipelines and transmission corridors. Identify those species that may be considered ecologically, recreationally, or commercially important.

RESPONSE:

As described in ER Sections 9.3.3.2.1 and 9.3.3.2.4, the Red 2 site is found in the Northern Blackland prairie region (within the Post Oak Savannah, although most of the prairie has been converted to cropland and non-native pasture). Land use in the site area is a mixture of cleared land and forest, and the proposed transmission corridor would traverse along similar terrain for approximately 5 miles to the existing Valley plant (located near Valley Lake) to the south. Typical game species include mourning dove and northern bobwhite on the uplands and eastern fox squirrel along stream bottoms. Ecologically important species, including Federal and State protected species as well as species of concern but with no regulatory status, have been identified for host Fannin County in ER Section 9.3.3.2.4.

As described in ER Sections 9.3.3.4.1 and 9.3.3.4.4, the Trinity 2 site is located in the East Central Texas Plains, in the Southern Post Oak Savannah ecoregion. Current land cover is a mix of post oak woods, improved pasture, and rangeland. Land use in the immediate site area appears to be a mixture of forest and open fields/grassland with surface lignite mining operations to the west; the proposed transmission corridor would traverse along similar terrain for approximately 5 miles to the existing Big Brown plant to the west. The site area, particularly along Tehuacana Creek heading towards the Richland Chambers Reservoir, contains deer and wild turkey habitat, as well as gray squirrel habitat (because of the sizeable high quality bottomland hardwood habitat present). Ecologically important species, including Federal and State protected species, as well species of concern but with no regulatory status, have been identified for host Freestone County in ER Section 9.3.3.4.4.

As described in ER Sections 9.3.3.3.1, terrain at the Allens Creek site varies from rolling hills in the northern, western, and central sections to a nearly level coastal prairie in the south where site is located. In the south, the coastal prairie exhibits wide expanses of open grassland fringed by stands of oak and elm. The site is comprised of mostly flat, agricultural land used to farm row crops (primarily cotton, sorghum, corn and soybeans) and graze cattle. Although much of the

Although much of the site has been disturbed for agriculture, the coastal prairie around the site exhibits wide expanses of open grassland fringed by stands of oak and elm. Animal species that occur near the site are typically found in similar habitats in Post Oak Savannah region of Texas. Ecologically important species, including Federal and State protected species as well species of concern but with no regulatory status, have been identified for host Austin County in ER 9.3.3.3.4.

Because all three alternative sites are found in the Post Oak Savannah prairie and pinewoods ecoregion of the state, similar habitat types would be affected by project development, with some minor variations given that the sites span the range from the northern most to the southern most part of the ecoregion. Slight variations also arise where another adjacent ecoregion may start to overlap the Post Oak Savannah, such as the Allens Creek site which overlaps with the coastal prairie ecoregion. In general, however, many of the common wildlife species would be expected to be similar across habitats at all three sites. In addition, the species found along the potential transmission corridors at Red 2 and Trinity 2 would be expected to be similar to those found at each site given the relatively short distance (5 miles) and similar habitats between the two areas. Species found along the proposed transmission corridor at Allens Creek would likely include more species native to the Coastal Prairie habitat, and perhaps include more migratory waterfowl, shorebirds, and neotropical birds.

The general list of species has been compiled from two primary sources: (1) listing of species found in nearby wildlife protected areas (located within similar ecoregion); and (2) listing of species found in Great Texas Wildlife Trail Ecoregions and Texas Wildlife Species List (based on habitat and distribution), as identified on the Texas Parks and Wildlife Department (TPWD) website (Great Texas Wildlife Trails at http://www.tpwd.state.tx.us/huntwild/wild/wildlife_trails/ and Wildlife Fact Sheets at http://www.tpwd.state.tx.us/huntwild/wild/species/).

Common wildlife species are broken out by habitat although note that some species have overlapping habitats and may be found in more than one habitat type. Note that some species may be more common to one site than another; relevant differences are noted if known and where appropriate.

Farmland/Pasture

Mammals: Cottontail rabbit, skunk, coyote, fox, opossum, gopher, mice
Reptiles: Black rat snake
Birds: Meadowlark, field sparrows, wrens, bluebird, dove, quail

Grasslands

Mammals: Cottontail rabbit, armadillo, coyote (prefers open brush), opossum, red fox, skunk, white tailed bobcat, silver-haired bat, big brown bat, raccoon, skunk, bobcat, white-tailed deer, feral hogs
Reptiles: Snakes (black rat snake, garter, copperhead, cottonmouth)
Birds: White-tailed Hawk, Coopers hawk, red tailed hawk, Ferruginous Hawk, Sprague's Pipit, Sedge Wren, Grasshopper Sparrow, LeConte's Sparrow, and Harris's Sparrow;

quail, turkey, bobwhite, painted buntings (field edge), Carolina chickadee, hummingbird (coastal prairie/Red 2), eastern kingbirds and purple martins (Red 2)

Woodlands

Mammals: White tailed deer (mostly wooded/edge species), gray squirrel and Eastern fox squirrel, skunk, raccoon, beaver (near water)
Reptiles: Turtle, frogs
Birds: Woodpecker (pileated, red-headed), red shouldered hawk, common nighthawk, northern flicker, vireos, tanagers, warblers (songbirds), brown thrasher, big brown bat (old growth forest), wild turkey (prefer older timber stands), summer tanager, neotropical birds, osprey (Trinity 2)

Finally, recreationally important (game) species as identified on the TPWD website are essentially identical for the alternative site host counties. Typical game species for all three alternative sites include (from northernmost to southernmost site within ecoregion) white tailed deer, squirrel, turkey, quail and dove. Eastern turkey are identified specifically at Red 2; mourning dove and northern bobwhite prefer the uplands and eastern fox squirrel are found along stream bottoms. The Tehuacana Creek area heading north of the Trinity 2 site has been identified as containing deer and wild turkey habitat, as well as gray squirrel habitat (bottomland hardwood). Public hunting is permitted in the Richland Creek Wildlife Management Area for white-tailed deer, feral hog, squirrel, mourning dove, waterfowl, woodcock, gallinule, snipe, rabbits, and hares.

Conditions in Austin County do not appear to be as favorable, largely due to changing land use practices over the years that have reduced upland game species habitat in the Oak-Prairie Regulatory District. The departure of the small farmer, whose farms in the northern district provided excellent habitat for doves and quail, and the conversion of native pastures to improved grasses to enhance cattle production have combined to greatly reduced the quail population, although higher numbers are found in the southwestern part of the district. Dove hunting is still popular in many parts of the Oak-Prairie region, although numbers are tied to food supply. Finally, the Oak-Prairie wildlife district has two species of turkeys: the eastern turkey (eastern tier of counties) and the Rio Grand turkey which is found in many western counties. The birds are usually found along the major creek and river drainages. Most counties do not support a large number of birds.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.03-09

QUESTION:

Provide information regarding the presence of bird or bat migration corridors for each of the alternative sites.

FULL TEXT (Supporting Information):

Provide information to describe whether the three proposed alternative sites lie within a major migratory corridor for birds or bats. If these sites are located within the migratory corridor, describe whether important bird areas or songbird fallout areas are located within the proposed alternative sites or the vicinity.

RESPONSE:

Bird Migration

All three alternative sites lie within the Central Flyway of Texas. Fallout of migratory songbirds is typically associated with the coastal areas/woodlands that stretch from Texas to Florida and provide sheltered habitat for rest and forage opportunities after a long journey north from South America across the Gulf of Mexico. The presence of important bird areas or songbird fallout areas along the migratory flyway through the Texas interior has not been identified or confirmed within the alternative site areas. However, significant fallout is not expected at any alternative site given the combination of development (e.g., agriculture, industry) currently occurring in each site area, the availability of protected wildlife migratory bird habitat in nearby areas, and the distance of the alternative sites from the coast.

Site-specific conditions which identify important bird areas (including potential resting places for migratory songbirds) that occur generally near each site are discussed further below. In every instance, the alternative site is located at sufficient distance from an important bird area such that the bird area would not be expected to be adversely impacted from site development.

Red 2

As indicated in the ER Section 9.3.3.2.4, the Red 2 site is located in a mostly cleared, agricultural area north of the Valley Power Plant; no important area for migratory birds is known to occur on the site.

Two areas of potential importance to migratory birds occur in the general site vicinity:

- The Caddo National Grasslands/Wildlife Management Area (closest segment located in eastern Fannin County) provides valuable habitat for migrant birds – including migratory neotropical birds from Central and South America in the spring. At its nearest point, it is located more than 20 miles from the site.

- The Hagerman National Wildlife Refuge, located just west of Sherman-Denison in Grayson County, is home to thousands of geese and waterfowl during the winter; this refuge is located more than 15 miles from the site.

Because of their distance from the Red 2 site, migratory birds at either area would not be affected by construction and operation of a nuclear power plant at the site.

Allens Creek

As noted in ER 9.3.3.4, much of the Allens Creek site has been disturbed for agriculture (e.g., planted in cropland or used as pasture); no important area for migratory birds is known to occur on the site.

The Great Texas Wildlife Trails identified by the Texas Parks and Wildlife Department (TPWD) includes two birding areas in the vicinity of the Allens Creek site that support migratory birds:

- The Washington-on-the-Brazos State Historic Park (within the southern portion of the Prairies and Pineywoods Wildlife Trail West; more than 20 miles north of Allens Creek in Washington), where migratory birds have been observed along the Brazos River (vireos, warblers, tanagers, orioles and neotropical migrants including warblers); and
- Chapel Hill/Brazos River Valley Trail (east of SH 36 near Hempstead, between 10 and 15 miles north of the Allens Creek site), where "[s]pring and fall migrations release a river of neotropical birds through this area."

The areas identified above are at a sufficient distance to not be affected by development of the Allens Creek site.

Trinity 2

As noted in ER 9.3.3.4.4, current land use in the immediate area of the Trinity 2 site appears to be a mixture of forest and fields/grasslands); no important area for migratory birds is known to occur on the site.

The Big Woods Loop of the Great Texas Prairies and Pineywoods Wildlife Trail West fully encompasses the site area. There are numerous wildlife areas located along this loop, including Fairfield Lake State Park, immediately west of the site, the Richland Creek Wildlife Management Area (WMA) (approximately 7 miles to the north of the site) and Gus Engeling WMA (more than 10 miles to the east of the site). In particular, the Richland Creek WMA is noted as supporting a wide variety of bottomland and wetland dependent wildlife and vegetation communities which serve as nesting and brood rearing habitat for many species of neotropical birds; in addition, the area has numerous marshes and sloughs, which provide habitat for migrating and wintering waterfowl, wading birds and shore birds. The presence of the Richland Creek WMA directly north of the Trinity 2 would indicate that migratory birds pass near the Trinity 2 site during fall and spring migrations. However, the areas identified above are at a sufficient distance to not be affected by development of the Trinity 2 site.

Bat Migration

None of the alternative sites are located in counties with protected bat species except for the southeastern myotis bat in Freestone County (Trinity 2); this species is a terrestrial species of concern that is considered rare but with no regulatory status. The southeastern myotis bat occurs westward from the southeastern U.S. to the Pineywoods region of East Texas. It roosts in a variety of shelters including caves, mines, bridges, buildings, culverts, and tree hollows. It is not a migratory species.

TPWD information indicates that those bats that live in eastern Texas and could be present near the alternative sites are mostly found to be year-round residents (i.e., non-migratory), such as the Big Brown bat; and those bats that are migratory (over various long distances) are mostly found to live in central, south or west Texas, and not near the alternative site locations. Possible exceptions are the hoary bat, a migratory species found state-wide and the silver-haired bat, a migratory species found in six physiographic regions in Texas including the pineywoods in Eastern Texas (potentially near Red 2 or Trinity 2). The Mexican Free-tailed bat also occurs in Texas, and most populations are migratory, except for the bats found in East Texas which are non-migratory and are year-round residents. It is not known, however, whether the populations that live near the alternative sites are included within the Eastern population that is non-migratory.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 09.03.03-10

QUESTION:

Reconcile land use impact acreage inconsistencies provided in the revised ER section 9.3.

FULL TEXT (Supporting Information):

The total acreages cited in 9.3.3.2.1 (land use) for impacts resulting from rail, cooling water supply pipeline, and road corridors are not equal to the sum of the individual acres attributed to each construction activity (page 9.3-29). This is also the case in section 9.3.3.4.1 (p. 9.3-80). Clarify the total acreage attributed to these activities for each of the proposed alternative sites, and describe whether this changes other summary information regarding the total estimated acreages reported in both the land use and terrestrial ecology sections.

RESPONSE:

The total acreages cited in 9.3.3.2.1 and 9.3.3.4.1 for individual impacts resulting from rail, cooling water supply pipeline, and road corridors are correct. However, the sum of the individual acres attributed to each of these offsite construction activities is in error in each instance and will be revised in the respective ER land use sections (9.3.3.2.1 and 9.3.3.4.1) and ER terrestrial ecology sections (9.3.3.2.4 and 9.3.3.4.4), to correct the passages where these totals are reflected.

The corrected acreages do not change other summary information regarding the total estimated acreages and associated impacts on land use and terrestrial ecology, as currently reported in ER 9.3.3.

CANDIDATE COLA REVISION:

Section 9.3.3.2.1, paragraph twelve, second sentence will be revised as follows:

> The following are acreage estimates for new cooling water supply pipeline, rail, and road rights-of-way to be constructed at each site (total of ~~63~~81 acres):

Section 9.3.3.2.1, paragraph fifteen, first sentence will be revised as follows:

> In summary, offsite impacts from transmission line construction and transportation infrastructure, which would affect an estimated ~~183~~201 acres of land, are predicted to be SMALL at the Red 2 site.

Section 9.3.3.2.4, first paragraph, second sentence will be revised as follows:

This is exclusive of the land required for development of transmission lines, water pipelines, rail or road access, which are estimated to impact an additional ~~183~~201 acres.

Section 9.3.3.4.1, paragraph 15, first sentence will be revised as follows:

In summary, offsite impacts from transmission line construction and transportation infrastructure, which would affect an estimated ~~285~~303 acres of land, are predicted to be SMALL at the Trinity 2 site.

Section 9.3.3.4.4, first paragraph, second sentence will be revised as follows:

This is exclusive of the land required for development of transmission lines, water pipelines, rail or road access, which are estimated to impact an additional ~~285~~303 acres.

Question Number: 09.03.03-11

QUESTION:

Describe the potential construction impacts to the Attwater's Prairie Chicken National Wildlife Refuge.

FULL TEXT (Supporting Information):

The proposed Allen's Creek site lies to the south of Sealy, Texas, and is located relatively close to the Attwater's Prairie Chicken National Wildlife Refuge, which harbors a population of Attwater's prairie-chicken, a Federally endangered species. Describe the approximate distance between the Attwater's Prairie Chicken National Wildlife Refuge and the proposed site, proposed reservoir, and approximate routes for associated construction activities. Describe whether proposed construction activities present the potential to affect available habitat or individuals of this species.

RESPONSE:

The Attwater Prairie Chicken National Wildlife Refuge (NWR) is located directly south of Interstate 10 and off of FM 3013. Access to the NWR is south of Sealy (and I-10) on Highway 36 to FM 3013, and then traveling west on FM 3013 for 10 miles. According to the Texas Atlas and Gazetteer for Texas, the Refuge includes two separate parcels, both of which are located directly west of the proposed Allens Creek site. The closest and smallest parcel, located just north of Rexville along East Bernard Creek in Austin County, is approximately 5 miles west of the proposed plant site. The second and larger parcel, with direct access to the public, is located off of FM 3013, along the western bank of the San Bernard River in Colorado County; it is located approximately 10 miles west of the proposed plant site. The NWR is located at sufficient distance from the proposed plant site and primary access road (more than four miles from Highway 36), such that it would not be directly impacted by plant construction or operation; nor would Attwater Prairie Chickens, presently confined within the boundaries of the refuge, be expected to migrate off the refuge and into the Allens Creek site area. Therefore, no adverse impacts would be expected from development of the Allens Creek site. In addition, other offsite project features, such as the proposed new reservoir, water pipelines to the Brazos River, and the proposed transmission corridors, would mostly be located (or extend) in the opposite direction from the refuge (i.e., east of the proposed plant site), and therefore farther away from the refuge than the proposed plant site. In particular, the potential new transmission corridors (up to three) would extend out from the plant site to the east, southeast, and southwest. The southwest corridor would run closest to the refuge but would be routed sufficiently to the south of FM 3013 and the Refuge to avoid potential conflicts.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Enclosure supporting RAI response 09.03-22:

Nuclear Power Plant Siting Report. STP Nuclear Operating Company (STPNOC). June 2009.

STP Nuclear Operating Company (STPNOC)
Nuclear Power Plant
Siting Report

June 2009

Table of Contents

1.0 Background and Introduction

1.1 Background

STP Nuclear Operating Company (STPNOC) is applying for a Combined Operating License (COL) for a new nuclear power plant in Texas (STP Units 3 & 4). One step in this process is the selection of a site that provides the geographic setting for the COL application (COLA).

STPNOC currently operates a two-unit nuclear power plant at its South Texas Project (STP) site near Bay City, Texas. The STP site was selected as the proposed site based on its numerous advantages as an existing nuclear power plant site, including its:

- Proven site suitability (previously licensed for nuclear power construction and operation),
- Capacity for expansion (availability of land and water to support additional units),
- Existing site infrastructure,
- Established positive working relationships with local communities, and
- Ability to serve the Electric Reliability Council of Texas (ERCOT) markets

Guidance provided in NUREG-1555, Section 9.3 specifies an environmental comparison of the proposed site with alternative sites to determine whether an environmentally preferable site exists. The alternative sites should be identified using a practicable site-selection process with the "principal objective of identifying candidate sites that would be among the best that could reasonably be found for the proposed plant."

The overall objective of this site selection study was to apply such a process to identify alternative nuclear power plant sites that:

1) Satisfy applicable Nuclear Regulatory Commission (NRC) site suitability requirements,
2) Are the best sites that could reasonably be found from an environmental perspective, and
3) Would allow NRC to conclude that all reasonable alternatives have been identified in compliance with the National Environmental Policy Act (NEPA).

This Siting Report provides a description of the bases, assumptions, and processes applied in selecting the STPNOC alternative sites.

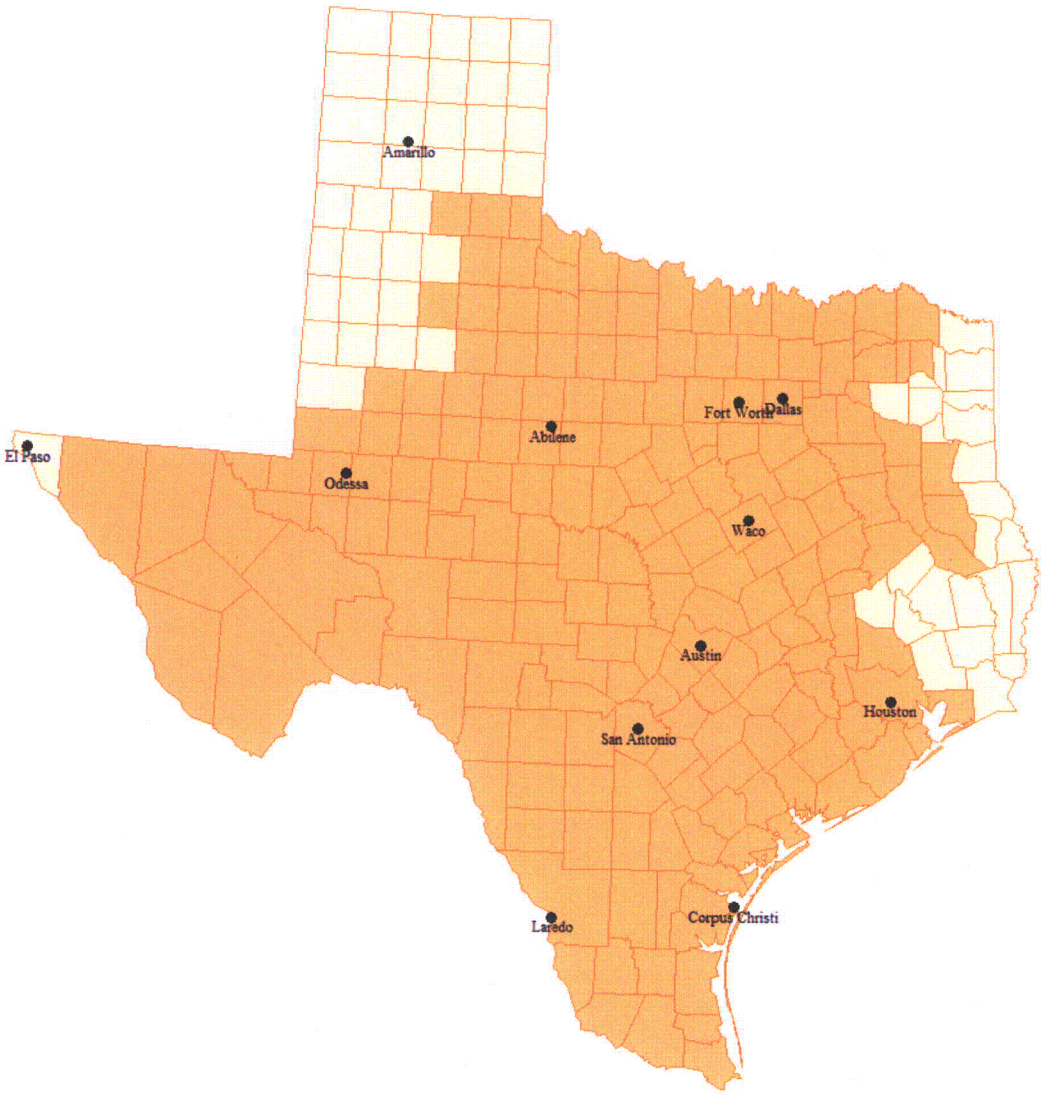
1.2 Region of Interest

As stated in the *South Texas Project Units 3 & 4 COLA Environmental Report*, the purpose of STP Units 3 & 4 is to provide baseload generation for use by the owners and/or for eventual sale on the wholesale market. Because the STPNOC owners are chartered to provide power in the ERCOT region, and because energy generated in the region is also consumed within the region, the Region of Interest (ROI) was defined as the ERCOT service territory. STP Units 3 & 4 are located within the ERCOT region.

ERCOT is the regional transmission operator for almost all of Texas. Its transmission grid is unique from other regional grids in that ERCOT has limited interties that connect the grid with other systems. Because of this lack of interconnects, the vast majority of the power generated in the region must be used within ERCOT. In addition to ensuring reliability of the transmission grid, ERCOT also manages the power market. The size and environmental diversity of ERCOT also provides a large, manageable area from which to draw candidate areas and potential sites. ERCOT was also selected as the ROI because the power generated by the new nuclear power plant will be sold to customers within the region. ERCOT manages grids from Houston in the east to the Mexican Border. To facilitate this process, ERCOT is divided into three regional planning areas: (1) North Region, with Dallas, Waco and Austin as the main load centers; (2) South Region, with Houston, San Antonio, Corpus Christi and Laredo as main load centers; and (3) West Region, where the major load centers are Odessa and Abilene.

The ROI encompasses the shaded counties depicted in Figure 1-1.

Figure 1-1 STPNOC Site Selection Study Region of Interest



1.3 Plant Characteristics

For the purposes of evaluating site suitability, it was assumed that a two-unit nuclear power plant using the Advanced Boiling Water Reactor (ABWR) design would be developed, as referenced in the STP Units 3 & 4 application. Additionally, a closed-cycle cooling system utilizing either a cooling water reservoir or cooling towers was assumed for the remaining inland locations, and once-through cooling was assumed for the coastal locations.

A summary of the key plant parameters used in the site evaluations is provided in Table 1-1. It is noted that the parameters listed in Table 1-1 do not cover the entire spectrum of site-related plant parameters; however, they do address the key site characteristics that are necessary to evaluate

site suitability for a nuclear power plant and to evaluate important trade-offs among site alternatives.

Table 1-1 Key Siting Parameters Used in Siting Evaluations

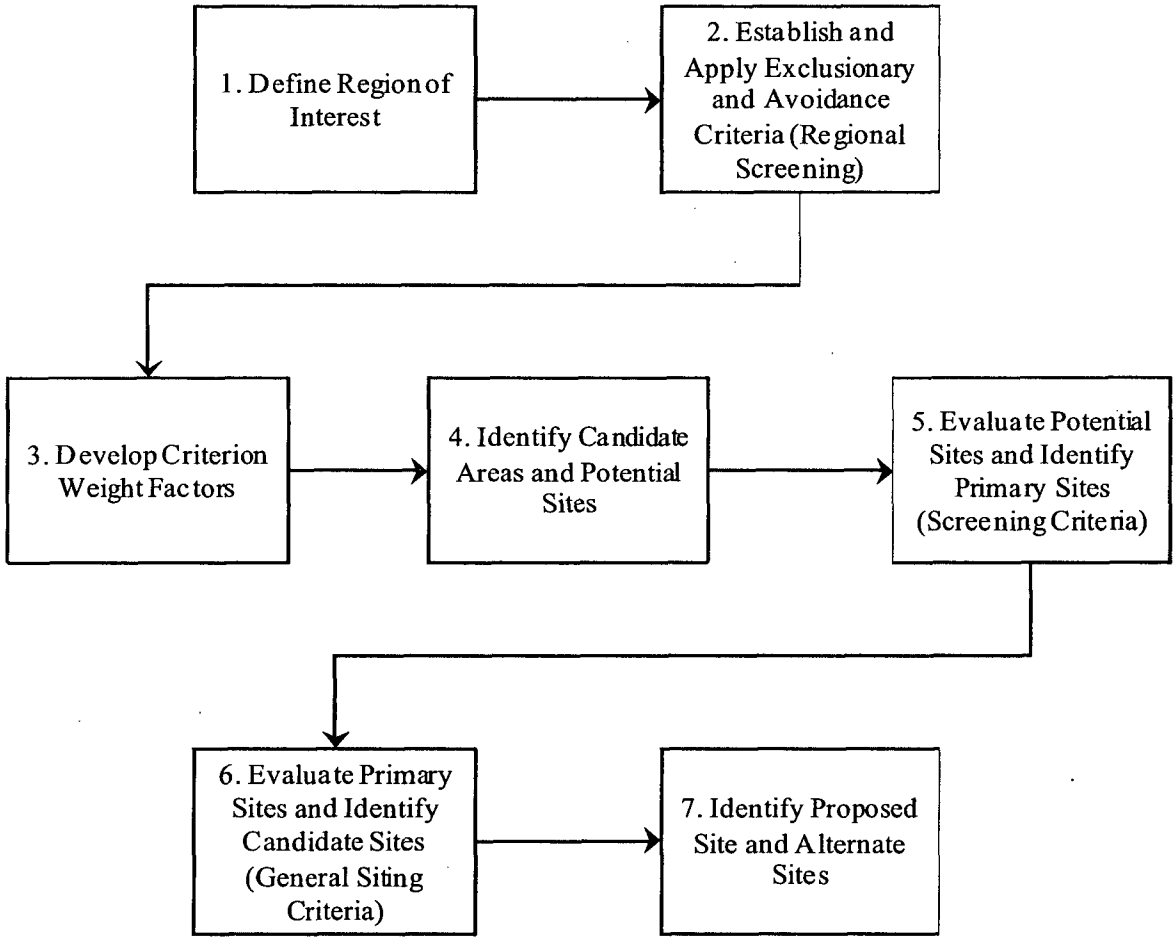
Siting Parameter	Value
Consumptive water use (net water requirement for plant operation [i.e., water that must be supplied from sources that can be made available at the site])	Closed Cycle: 50,000 acre-ft/yr (69.1 cfs, 31,000 gpm, 44.6 Mgal/day). Once-through: 1.3M acre-ft/yr (1,796 cfs, 805,950 gpm, 1,160 Mgal/day)
Safe Shutdown Earthquake (SSE) peak acceleration based on 2% in 50 year probability	< 0.3 g Peak Ground Acceleration
Minimum total site area	2,000 acres (6,000 acres preferred)

An overall description of the siting process and the project approach appears in Section 2.0; additional detail on component steps in the site selection process and results of executing these steps is provided in succeeding sections. Additional technical detail on the site selection analyses appear in the appendices.

2.0 Siting Process and Approach

Site selection was conducted in accordance with the overall process outlined in the EPRI *Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application* (Siting Guide), March 2002. This process, as adapted for the STPNOC site selection study, is depicted in Figure 2-1.

Figure 2-1 Site Selection Process Overview



Definition of the ROI is described in Section 1.2. The process then began with screening the ROI and reducing the area under consideration in successive steps to candidate areas (defined as sub-areas of the ROI that appear to contain suitable potential sites), potential sites, primary sites, and candidate sites. The candidate sites comprise the set of the proposed site and the alternate sites.

Site suitability criteria listed in the Siting Guide were used as the overall framework for these evaluations. The candidate sites were selected based on the results of the application of this process and consideration of how well they satisfy NRC's site suitability requirements.

To provide a consistent initial perspective on STP site suitability in relation to other identified sites, it was included as a potential site in these evaluations. Thus, as used in this Siting Report, the term "candidate sites" refers to STP (as the proposed site) and alternative sites identified (see Section 6.0) by execution of the process described above.

3.0 Regional Screening and Identification of Candidate Areas

Section 3.1 outlines the regional screening process. Section 3.2 describes the results of applying the process to the ROI and the identification of candidate areas for identification of potential sites (Section 4.0).

3.1 Regional Screening Process

The first step in the site selection process was to screen the ROI to eliminate those areas that are either unsuitable or are significantly less suitable than other potential siting areas. Exclusionary and avoidance criteria identified in the Siting Guide were reviewed to identify those regional screening criteria and related physical features that provide insights into site suitability on an areal basis within the STPNOC ROI.

Regional screening criteria applied to the ROI are listed in Table 3-1. Additional information provided in Table 3-1 includes:

- Identification of data to be mapped.
- Mapping criteria that define how suitability was determined based on mapped data (e.g., buffer zones).
- Suitability impact (i.e., identification of areas excluded from further study).
- Sources for identification and location of data to be mapped.
- Comments and rationale for the application of mapped data in determining site suitability.

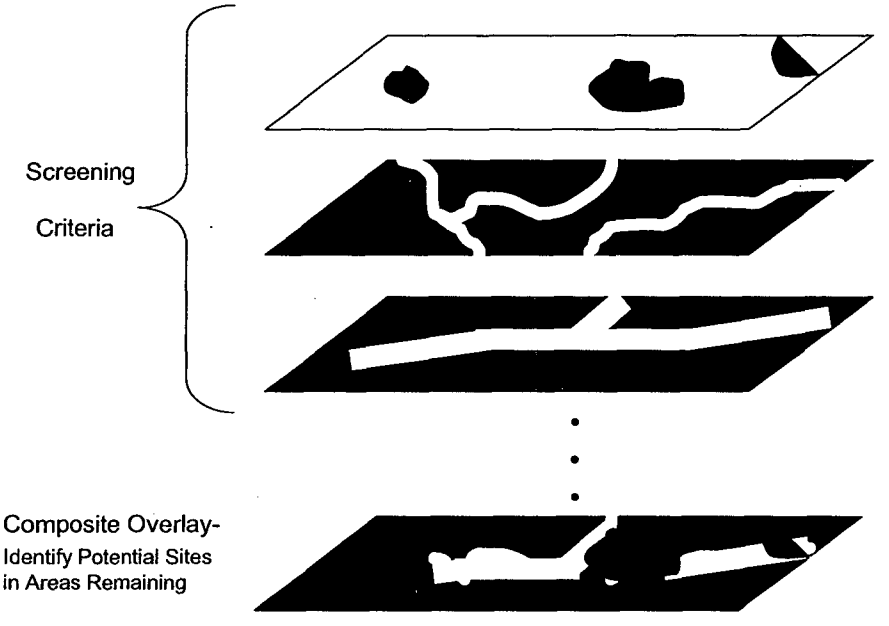
Table 3-1 Regional Screening Criteria

Criterion	Mapped Data	Screening Criteria	Suitability Impact	Data Source(s)	Comments/Rationale
Geology/ Seismology	Ground Motion	Areas with predicted peak ground acceleration < 0.3g with a 2% probability of exceedance in 50 years	> 0.3g Excluded	Rukstales, Kenneth S. (compiler), 2002	The ROI was screened using the seismic hazard map for the United States. No regions with predicted peak ground accelerations > 0.3g were identified within the state of Texas. Thus, this criterion had no practical effect on regional screening. http://nationalatlas.gov/mld/seihazp.html
Water Availability	Water sources (major rivers, existing reservoirs, coastal areas)	River reaches for which the average flow ≥ 10 times the plant makeup water requirement, and the Gulf of Mexico	Excluded areas greater than 5 miles from rivers and 10 miles from the Gulf of Mexico that meet the mapping criteria	USGS records	Rivers for which more than 10% of the average flow will be required for makeup water may present permitting or operational water supply problems. The Gulf of Mexico was assumed to be a viable source for cooling water makeup. Pumping makeup water more than 5 miles from rivers and more than 10 miles from the Gulf of Mexico may impose significant construction and operational costs and can result in operational risks. Assumed makeup water requirements (closed cycle) = 50,000 acre-ft/yr (69.1 cfs, 31,000 gpm, 44.6 Mgal/day). Assumed that groundwater would not supply a significant portion of the required cooling water makeup.
Population	Urban and metropolitan areas	Urbanized areas in Texas, mapped by Texas General Land Office (TGLO) personnel	Excluded	TGLO, 1999	Urban and metropolitan areas likely would place the plant within an unacceptable distance of high population density areas. http://www.glo.state.tx.us/gisdata/gisdata.html

Criterion	Mapped Data	Screening Criteria	Suitability Impact	Data Source(s)	Comments/Rationale
Dedicated Lands	Lands designated as National Park Service parks, U.S. Fish and Wildlife Service national wildlife refuges, Department of Defense lands, and Texas Parks and Wildlife Department parks and wildlife management areas	Boundaries of dedicated lands identified	Excluded	NPS, 2001 USFWS TPWD, 1995	NPS, USFWS, DOD, and TPWD lands were classified as dedicated lands that should be excluded from consideration in the siting study. http://www.glo.state.tx.us/gisdata/gisdata.html http://nationalatlas.gov/mld/fedlanp.html
Ecology	Critical Habitat	Boundaries of critical habitat identified for Federally listed threatened and endangered species	Excluded	USFWS	Development of a plant at the location of significant known areas of ecological importance could result in unacceptable environmental impacts and/or challenge as to whether environmentally preferable alternatives are available. http://criticalhabitat.fws.gov/

Information defined for each of the ROI screening criteria listed in Table 3-1 can be mapped and displayed on separate maps of the ROI. These maps can then be combined using a simple overlaying technique to produce a composite screening map; Figure 3-1 provides a conceptual depiction of this process.

Figure 3-1 Conceptual Depiction of ROI Screening Process



Areas that were identified as eligible based on the screening process described above were reviewed to verify that they provided adequate land area for a reasonable number of potential sites.

3.2 Regional Screening Results

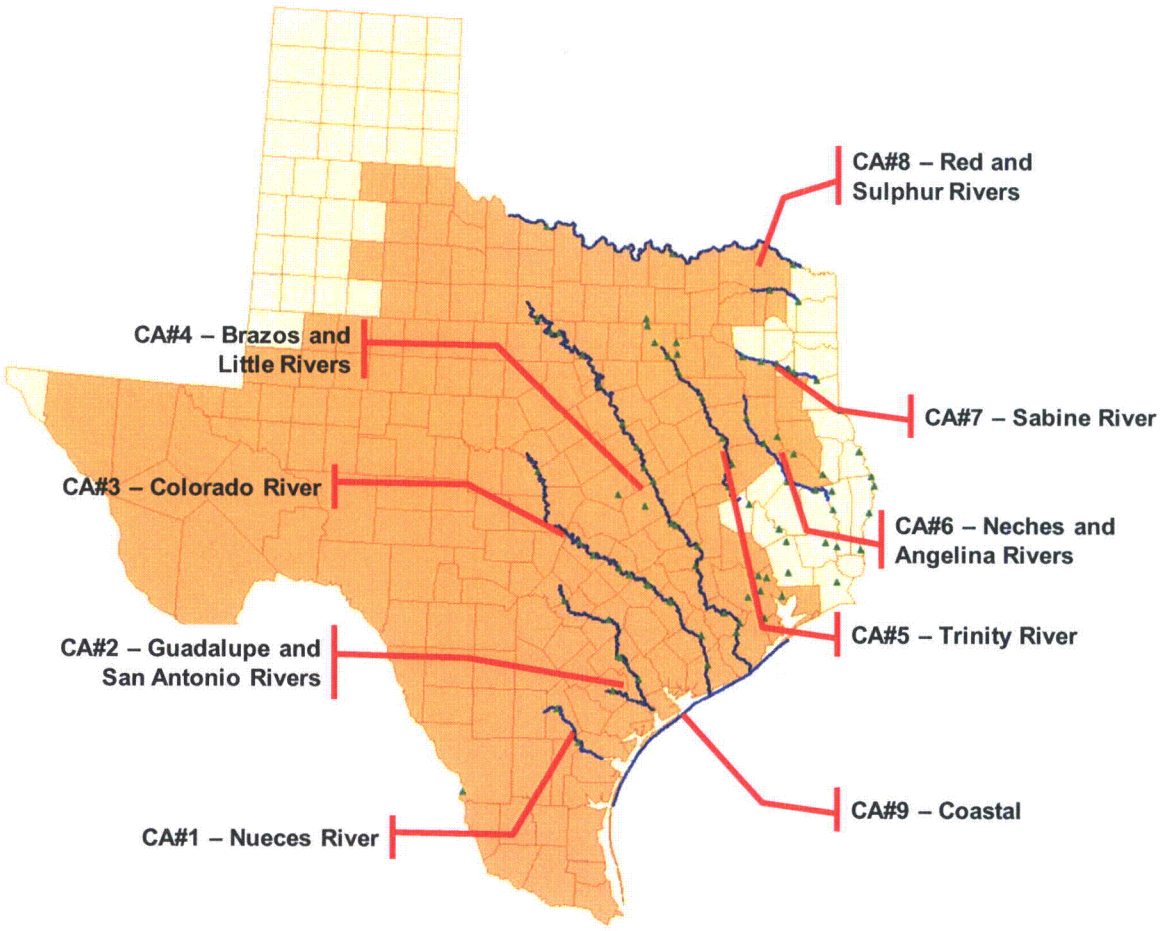
The water availability criterion was the most influential criterion in screening the region of interest down to candidate areas. For the most part, rivers in the ERCOT-West region cannot support the water availability requirements defined for the STPNOC plant. Additionally, the pumping distance condition restricted candidate areas to areas very near the rivers/coast that are potential water sources. After applying all regional screening criteria, nine candidate areas were identified as follows:

- Candidate Area 1 – The Nueces River below Choke Canyon Reservoir – approximately 85 river miles.
- Candidate Area 2 – The Guadalupe River below New Braunfels, TX and the San Antonio River below Goliad, TX – approximately 320 river miles.
- Candidate Area 3 – The Colorado River below San Saba, TX (just above Lake Buchanan) – approximately 450 river miles.

- Candidate Area 4 – The Brazos River below South Bend, TX (just above Possum Kingdom Lake) and the Little River below Little River, TX – approximately 685 river miles.
- Candidate Area 5 – The Trinity River below Dallas, TX – approximately 200 river miles.
- Candidate Area 6 – The Neches River below Lake Palestine and the Angelina River below Alto, TX – approximately 185 river miles.
- Candidate Area 7 – The Sabine River below Mineola, TX – approximately 60 river miles.
- Candidate Area 8 – The Sulphur River below Talco, TX and the Red River below Burkburnett, TX – approximately 435 river miles.
- Candidate Area 9 – The Gulf Coast – approximately 230 coastal miles.

These candidate areas are shown in Figure 3-2. The individual and composite regional screening maps are included in Appendix A.

Figure 3-2 ROI Regional Screening Results



4.0 Identification of Potential Sites

Section 4.1 outlines the process used in identifying potential sites; Section 4.2 describes the results of applying the process and the potential sites identified.

4.1 Potential Site Identification Process

Within the candidate areas identified in ROI screening, potential sites were identified that allow for the evaluation of siting trade-offs across the candidate areas. Specific considerations applied in selecting the potential sites were:

- Avoidance of high-population areas.
- Avoidance of ecologically sensitive and special designation areas.
- Avoidance of special dedicated land uses (e.g., national parks).
- Proximity to transmission/load centers.
- Proximity to transportation infrastructure (e.g., rail lines).

For each of the potential sites identified, aerial photographs and other available geographic information were compiled and nominal site locations were identified. Potential sites were defined to be approximately 6,000 acres in size, although favorable sites as small as 2,000 acres were considered. In addition to reflecting major siting trade-offs, the objective of this phase was to optimize potential sites within each area with respect to cost and environmental considerations.

Additional factors taken into account in this process, as feasible, included:

- Flexibility to optimize site layout and design for cost minimization.
- Flexibility to optimize site layout and design for avoidance or mitigation of environmental impacts.
- Minimization of the number of land parcels contained within the site.
- Optimization of site engineering factors (e.g., topography, foundation conditions, grading requirements).

4.2 Potential Site Identification Results

Potential site identification was conducted, by McCallum-Turner, Inc. and STPNOC personnel, who collaboratively identified potential sites within each of the nine candidate areas.

Candidate areas were examined to identify sites that would be feasible for a new nuclear power plant, taking into account the considerations identified in Section 4.1. The following process was used:

1. 1:100,000- and 1:24,000-scale topographic maps (USGS) were examined to identify areas for potential sites within the previously identified candidate areas. Information on identified sites was supplemented using American Automobile Association (AAA) state maps and county highway maps showing roads, towns, wetlands and dedicated lands.
2. Satellite imagery of the areas was viewed using Google Earth® (http://earth.google.com/). Potential sites were identified by visually applying the criteria described below.

3. The latitude and longitude of the approximate center point of each potential site was noted.

Using these data sources, the following considerations were applied, as feasible, in implementing the process described in Section 4.1 for locating potential sites:

- Distances from towns, villages, and developed areas were maximized. Developed areas were identified from regional screening data maps, satellite imagery, and county and topographic maps.
- Distances from industrial areas identifiable from the satellite imagery and topographic maps (e.g., airports, industrial complexes, military installations) were maximized.
- The optimal topography was assumed to be a relatively flat area and above the 100-year floodplain for construction of the plant. Topographic maps and aerial photographs were qualitatively examined to find areas as close to this ideal as possible.
- Heavy haul (primarily rail) access to the potential sites was qualitatively evaluated. Land areas around major highways were avoided; those within a reasonable distance of state highways were considered.
- Distance to existing 345-kV transmission lines was minimized to the extent possible (ERCOT Transmission System Map).

The result of this process was the identification of 33 potential sites, as shown on Figure 4-1. The potential sites and their nominal center point coordinates are provided in Table 4-1.

Two existing nuclear power plants are located in the STPNOC Region of Interest: South Texas Project and Comanche Peak. The South Texas Project site was included in the siting study. However, the Comanche Peak site was not included as a potential site, as the site is owned by another utility, already being proposed for a new nuclear power plant, and not available to STPNOC for development.

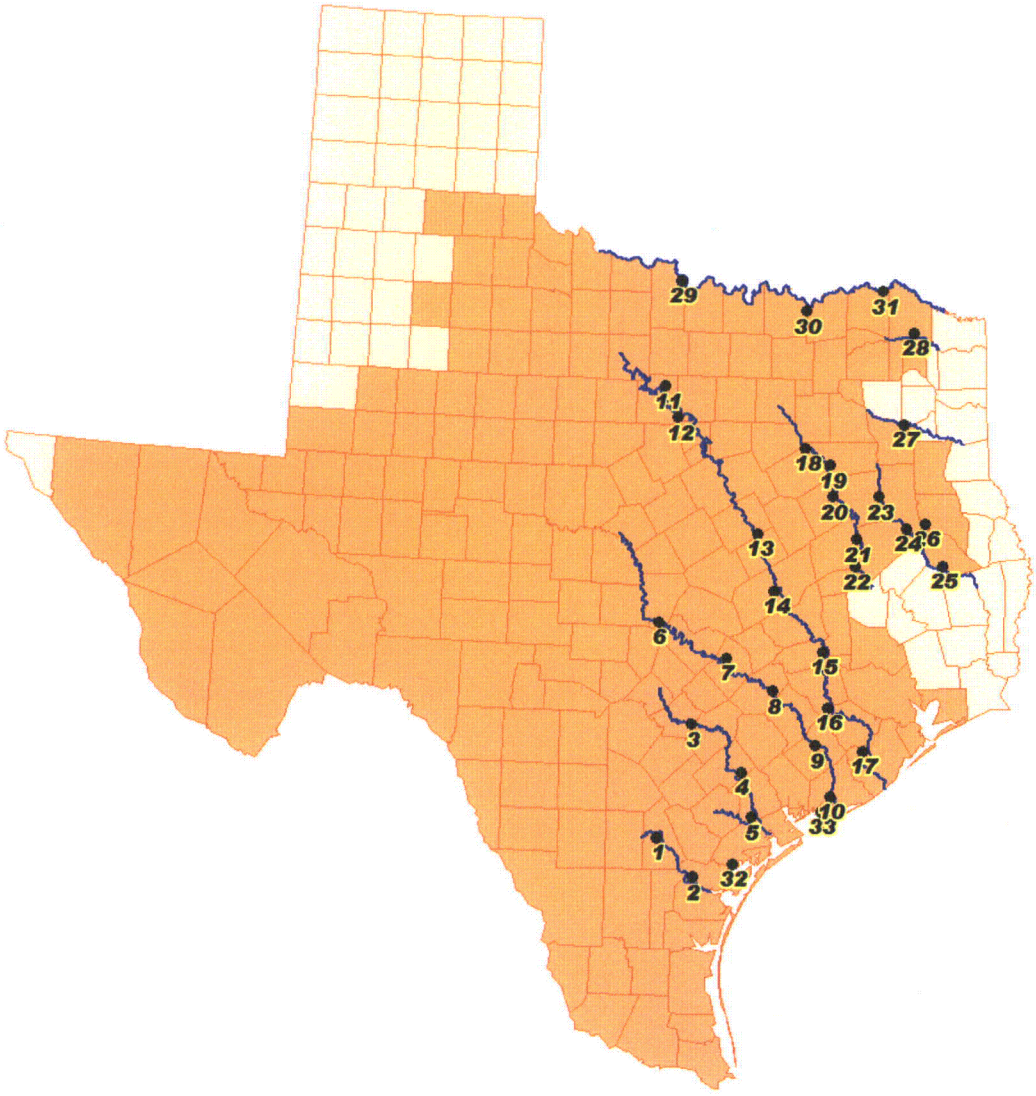
The identification of potential sites also included a second step – consideration of existing power plant locations and brownfield locations that were found within the candidate areas. The EIA-860 Annual Electric Generator Report (2007) identified 108 power plant sites in the counties surrounding the nine candidate areas. Each power plant site was mapped, and 31 of these sites were found to be within a candidate area.

While each of these 31 sites was considered, none of the sites were selected as potential sites, primarily because of insufficient land or size constraints or close proximity to (or within) a populated area. However, some potential sites were identified as greenfield locations in close proximity to the existing plant sites, including Colorado 3 near the Fayette Power Plant, Red 2 near the Valley plant site, and Trinity 2 near the Big Brown plant site. It was noted that many of the existing plant sites are small hydroelectric plants and were not found to be suitable sites for a new nuclear power plant.

Inclusion of brownfield locations was also considered in the siting study. A number of abandoned mine land (AML) reclamation sites are present in Texas, and two such sites are located within the candidate areas: Bastrop AML and Malakoff AML. While each of these brownfield locations was considered, neither was chosen as a potential site. The Bastrop AML

site is located adjacent to Highway 95 and neighboring residential developments. A greenfield potential site was identified near the Bastrop AML site providing a location nearer the cooling water source (Colorado River) and farther from residential developments (Colorado 2). The Malakoff AML site was not chosen as a greenfield location as land currently owned by NRG was identified near the Malakoff AML (Malakoff). This greenfield site is located closer to the cooling water source (Trinity River), has flatter topography, and appears from satellite imagery to be previously disturbed.

Figure 4-1 Potential Site Locations



Site numbers on figure correspond to site numbers in Table 4-1.

Table 4-1 Potential Sites – Nominal Center-Point Locations

Site	Candidate Area	North Coordinate	West Coordinate
1. Nueces 1	Nueces River	28° 21' 59.62" N	98° 10' 40.18" W
2. Nueces 2	Nueces River	27° 58' 24.10" N	97° 43' 23.40" W
3. Guadalupe 1	Guadalupe/San Antonio Rivers	29° 30' 43.85" N	97° 45' 47.68" W
4. Guadalupe 2	Guadalupe/San Antonio Rivers	29° 2' 3.58" N	97° 8' 12.86" W
5. San Antonio 1	Guadalupe/San Antonio Rivers	28° 35' 21.24" N	97° 0' 49.56" W
6. Colorado 1	Colorado Rivers	30° 32' 15.72" N	98° 12' 15.71" W
7. Colorado 2	Colorado River	30° 11' 19.31" N	97° 21' 9.65" W
8. Colorado 3	Colorado River	29° 51' 39.85" N	96° 45' 33.95" W
9. Colorado 4	Colorado River	29° 18' 30.96" N	96° 13' 43.31" W
10. South Texas Project	Colorado River	28° 47' 59.98" N	96° 3' 22.71" W
11. Brazos 1	Brazos/Little Rivers	32° 53' 12.65" N	98° 11' 38.33" W
12. Brazos 2	Brazos/Little Rivers	32° 34' 47.30" N	98° 1' 11.71" W
13. Brazos 3	Brazos/Little Rivers	31° 26' 24.45" N	96° 57' 59.91" W
14. Brazos 4	Brazos/Little Rivers	30° 52' 9.80" N	96° 45' 31.87" W
15. Brazos 5	Brazos/Little Rivers	30° 15' 28.99" N	96° 8' 50.88" W
16. Allens Creek	Brazos/Little Rivers	29° 41' 34.48" N	96° 5' 7.06" W
17. Brazos 6	Brazos/Little Rivers	29° 15' 4.22" N	95° 38' 24.86" W
18. Trinity 1	Trinity River	32° 17' 22.47" N	96° 22' 3.66" W
19. Malakoff	Trinity River	32° 7' 19.77" N	96° 2' 35.27" W
20. Trinity 2	Trinity River	31° 48' 39.32" N	96° 0' 46.56" W
21. Trinity 3	Trinity River	31° 23' 7.63" N	95° 43' 21.64" W
22. Trinity 4	Trinity River	31° 6' 40.67" N	95° 43' 41.55" W
23. Neches 1	Neches/Angelina Rivers	31° 48' 29.96" N	95° 25' 37.53" W
24. Neches 2	Neches/Angelina Rivers	31° 29' 23.70" N	95° 4' 22.88" W
25. Neches 3	Neches/Angelina Rivers	31° 6' 39.68" N	94° 37' 22.49" W
26. Angelina 1	Neches/Angelina Rivers	31° 32' 29.87" N	94° 50' 10.57" W
27. Sabine 1	Sabine River	32° 31' 25.52" N	95° 5' 52.27" W
28. Sulphur 1	Red/Sulphur Rivers	33° 25' 50.65" N	94° 57' 39.82" W
29. Red 1	Red/Sulphur Rivers	33° 56' 28.62" N	98° 0' 42.53" W
30. Red 2	Red/Sulphur Rivers	33° 39' 17.43" N	96° 21' 43.40" W
31. Red 3	Red/Sulphur Rivers	33° 50' 57.48" N	95° 21' 28.60" W
32. Coastal 1	Coastal	28° 6' 59.22" N	97° 14' 1.41" W
33. Coastal 2	Coastal	28° 38' 56.07" N	96° 9' 22.80" W

Coordinates in WGS84 datum.

5.0 Evaluation of Potential Sites and Identification of Primary Sites

5.1 Potential Site Evaluation

The potential sites were evaluated to identify a smaller set of primary sites for more detailed evaluation. Criteria used in this evaluation are listed in Table 5-1, along with the methodology applied to develop site ratings for each criterion. Criteria presented in Table 5-1 are derived from the larger set of more detailed criteria listed in Chapter 3 of the Siting Guide. These criteria provide insights into the overall site suitability trade-offs inherent in the available sites within the STPNOC ROI and were designed to take advantage of data available at this stage of the site selection process.

The overall process for potential site evaluation was composed of the following elements, each of which is described in the succeeding paragraphs; results from applying the process are described in Section 5.2:

- Develop criterion ratings for each site.
- Apply weight factors reflecting the relative importance of each criterion.
- Develop composite site suitability ratings.

Criterion Ratings – Each potential site was assigned a rating of 1 to 5 (1 = least suitable, 5 = most suitable) for each of the potential site evaluation criteria using the rationale listed in Table 5-1. Information sources for these evaluations include publicly available data, information available from STPNOC files and personnel, and satellite imagery.

Weight Factors – Weight factors reflecting the relative importance of these criteria were derived using methodology consistent with the modified Delphi process specified in the Siting Guide. The process used in weight factor development is described in Appendix B; weight factor results (1 = least important, 10 = most important) are listed in the table below:

Criterion Number	Criterion	Weight Factor
P1	Cooling Water Supply	9.2
P2	Flooding	4.8
P3	Population	7.8
P4	Hazardous Land Uses	5.9
P5	Ecology	6.2
P6	Wetlands	6.3
P7	Heavy Haul Access	6.3
P8	Transmission Access	7.2
P9	Land Acquisition	6.2

Composite Suitability Ratings – Ratings reflecting the overall suitability of each potential site were developed by multiplying criterion ratings by the criterion weight factors and summing over all criteria for each site.

Table 5-1 Screening Criteria for Evaluation of Potential Sites

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P1	Water Supply	Average of two ratings concerning cooling water supply: • Ability to meet cooling water quantity requirements based on current allocation for STP Units 1 & 2 (max. consumption 50,000 acre-ft/yr [69.1 cfs, 31,000 gpm, 44.6 Mgal/day]) • Availability of water rights based on reported percent of months with unappropriated flows	Ability to meet cooling water quantity requirements: 5 = Unlimited capacity exists 4 = Flow > 50 times requirement 3 = Flow 30-50 times requirement 2 = Flow 20-30 times requirement 1 = Flow 10-20 times requirement Availability of water rights: 5 = Currently own water rights 3 = 50-100% of months with unappropriated flow 2 = 25-50% of months with unappropriated flow 1 = 0-25% of months with unappropriated flow
P2	Flooding	Site location with respect to 100/500-year flood zone. Difference between mean site elevation and mean water elevation from USGS topographic maps and USGS gaging station measurements also was considered.	5 = Site located outside 100/500-year flood zone 3 = Site located inside 500-year flood zone or near or on border of 100-year flood zone 1 = Site located inside 100-year flood zone

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P3	Population	Composite ratings are based on an average of the following two sub-ratings: • Distance to nearest incorporated town (with U.S. Census Bureau population data) • Population density of the host county In addition, a rating point will be deducted or added, respectively, if the site is in a particularly densely populated area or not.	Distance to Closest incorporated town or city: 5 = None within 20 miles 4 = Between 15 miles and 20 miles 3 = Between 10 miles and 15 miles 2 = Between 5 miles and 10 miles 1= Within 5 miles Ratings are based on distances from towns using 2000 population data available from the U.S. Census Bureau (USCB). Ratings are based on distances from the closest incorporated town. Note that the listing of towns is representative (and fairly comprehensive) of the mileage categories within which incorporated towns are found, and are sufficient to provide the basis for the ratings. However, the listings do not necessarily include every incorporated town within a 20 mile radius of the site. Unincorporated towns with no official U.S. Census Bureau population are noted but not included in the evaluations. County Population Density Ratings: 5 = Less than 50 persons per square mile (psm) 4 = Between 50 psm and 100 psm 3 = Between 100 psm and 250 psm 2 = Between 250 psm and 500 psm 1 = More than 500 psm A point was added if no densely populated area is found within 40 miles of the site; a point was deducted if a densely populated area is found within 15 miles of the site or if a large grouping of densely populated areas is located within 15-40 miles of the site.

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P4	Hazardous Land Uses	Average of four site sub-ratings for proximity to airports, pipelines, railroads, and other known hazardous industrial facilities.	Airports: 5 = No airports within 10 miles 4 = 1 minor airstrip within 10 miles 3 = Multiple small airstrips within 10 miles 2 = Minor airport (municipal, county, etc.) within 10 miles 1 = Major airport within 10 miles Railroads: 5 = No railroad within 10 miles of site 4 = Railroad 6-10 miles from site 3 = Railroad 4-6 miles from site 2 = Railroad 2-4 miles from site 1 = Railroad within 2 miles of site Pipelines: 5 = No pipelines within 5 miles of site 4 = 1 pipeline within 5 miles of site 3 = 2-3 pipelines within 5 miles of site 2 = 4 pipelines within 5 miles of site 1 = 5 or more pipelines within 5 miles of site Other: 5 = No other hazardous facilities within 10 miles of site 4 = Gravel/mining operation at or near 10 miles from site 3 = 1 minor hazardous facility within 10 miles of site 2 = Multiple hazardous facilities within 10 miles of site 1 = Multiple hazardous facilities in close proximity to site

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P5	Ecology	Number of Federal Threatened, Endangered and Rare Species in county where site is located (aquatic and terrestrial).	5 = 0 species 4 = 1-5 species 3 = 6-10 species 2 = 11-15 species 1 = More than 15 species Critical habitat and essential fish habitat also factored in where appropriate.
P6	Wetlands	Number of acres or percentage of wetlands within site area (acreages based on nominal 6,000 acres).	5 = Less than 60 acres (<1%) 4 = Between 60 acres and 300 acres (1%-5%) 3 = Between 300 acres and 600 acres (5%-10%) 2 = Between 600 acres and 1,200 acres (10%-15) 1 = More than 1,200 acres (>15%) Riverine acreage is not included in the total acreage.
P7	Heavy Haul Access	Estimated cost of constructing a rail spur to the site, based on distance in miles to the nearest in-service rail line.	Ratings computed by scaling costs from lowest (rating = 5) to highest (rating = 1) using distance from existing rail as a surrogate for rail spur construction costs. 1 = More than 12 miles 2 = Between 6 miles and 12 miles 3 = Between 3 miles and 6 miles 4 = Between 1 mile and 3 miles 5 = Less than 1 mile Local availability of barge access was also considered in the site evaluations.
P8	Transmission Access	Surrogate of costs to construct transmission access, based on sum of distances to the three nearest 345kV transmission lines.	Ratings computed by scaling costs from lowest (rating = 5) to highest (rating = 1) using total combined distance to the three nearest 345kV transmission lines as a surrogate for transmission access construction costs. 5 = Less than 10 miles 4 = Between 10 miles and 25 miles 3 = Between 25 miles and 50 miles 2 = Between 50 miles and 100 miles 1 = More than 100 miles

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P9	Land Acquisition	Estimated cost of acquiring land at the site, based on cost/acre provided by U.S. Census of Agriculture.	5 = Sufficient land at site owned by NRG 4 = Land owned by NRG, but additional acquisition required to develop site (e.g., reservoir) 3 = Land privately owned, estimated land cost < $2,000 per acre 2 = Land privately owned, estimated land cost < $3,000 per acre 1 = Land privately owned, estimated land cost > $3,000 per acre Close proximity to a large city, as an indicator of higher land cost, was also considered by examining the average land price in the adjacent county where the large metropolitan area was located. Note that the ratings were not affected for the majority of sites – i.e., where the average cost per acre of the adjacent county (host to large city) was not significantly different than the cost per acre in the site host county, or the city was at sufficient distance that the land price was assumed not to be affected based on best professional judgment. Land use restrictions, where identified, and additional land requirements for reservoir construction were also considered where appropriate.

5.2 Identification of Primary Sites

Results of applying the screening criteria described in Section 5.1 to the potential sites are summarized in Table 5-2 and Figure 5-1; the technical basis for the individual criterion ratings is detailed in Appendix C.

Examination of the screening results (Figure 5-1) indicates that the top nine sites rank higher than the next group of six sites whose composite ratings are similar. Additionally, an examination of the lower-ranked sites did not identify significant environmental advantages or the opportunity to further evaluate major siting tradeoffs. Based on these results, the nine highest rated sites were selected as the primary sites for further evaluation, and lower-ranked sites were deferred from further consideration. The resulting set of primary sites (listed below and shown in Figure 5-2) allows evaluation of the major siting trade-offs within the ROI:

- STP
- Trinity 2
- Guadalupe 2
- Sulphur 1
- Red 2
- Red 1
- Malakoff
- Colorado 3
- Allens Creek

Table 5-2 Screening Criteria Ratings

	Cooling Water Supply	Flooding	Popula-tion	Hazard-ous Land Uses	Ecology	Wetlands	Railroad Access	Transmis-sion Access	Land Acquisi-tion	
	Weight Factors									Site Rating
Potential Site Name	**9.2**	**4.8**	**7.8**	**5.9**	**6.2**	**6.3**	**6.3**	**7.2**	**6.2**	
Nueces 1	1	5	4	2	4	4	4	2	3	**184.4**
Nueces 2	1	5	3	3	2	5	3	4	3	**184.5**
Guadalupe 1	1	1	3	3	4	3	2	3	2	**145.4**
Guadalupe 2	3	5	4	2	4	4	4	2	3	**202.8**
San Antonio 1	3	3	3	3	4	3	4	2	3	**185.0**
Colorado 1	2	3	3	4	3	4	2	1	2	**155.8**
Colorado 2	2	3	3	3	3	4	4	4	2	**184.1**
Colorado 3	2	3	4	2	4	4	4	4	2	**192.2**
Colorado 4	2	3	3	2	4	5	3	3	3	**183.4**
South Texas Project	5	5	5	4	3	5	5	5	5	**281.2**
Brazos 1	1	3	3	4	3	2	1	2	3	**141.1**
Brazos 2	2	5	3	4	4	4	2	3	1	**179.8**
Brazos 3	3	1	2	2	4	2	3	3	2	**150.1**
Brazos 4	3	1	3	4	4	3	3	2	3	**175.0**
Brazos 5	3	5	3	4	3	3	2	2	1	**169.3**
Allens Creek	3	5	3	3	3	2	5	2	3	**188.4**
Brazos 6	4	5	2	3	3	2	1	3	2	**165.6**
Trinity 1	3	3	2	4	4	3	2	3	2	**171.5**
Malakoff	3	1	3	3	4	3	4	3	5	**195.0**
Trinity 2	3	5	5	3	3	4	1	5	3	**213.0**
Trinity 3	3	1	5	4	3	3	1	4	2	**180.0**
Trinity 4	3	1	5	4	4	4	1	2	2	**178.1**
Neches 1	2	5	4	4	3	3	3	2	2	**180.4**
Neches 2	2	5	4	5	4	3	1	1	2	**172.7**
Neches 3	3	3	4	4	4	2	2	1	2	**166.4**
Angelina 1	2	5	4	3	4	4	2	2	2	**180.7**
Sabine 1	2	3	2	2	4	3	3	2	1	**143.4**
Sulphur 1	2	5	5	4	4	3	1	4	3	**202.4**
Red 1	3	5	4	5	4	4	2	1	3	**200.7**
Red 2	2	5	3	3	4	3	3	5	3	**200.7**
Red 3	2	1	4	4	3	3	2	2	3	**161.1**
Coastal 1	4	3	3	4	1	4	2	2	4	**181.4**
Coastal 2	4	3	4	4	1	1	2	4	4	**184.7**

Figure 5-1 Summary of Potential Site Screening Criteria Composite Ratings

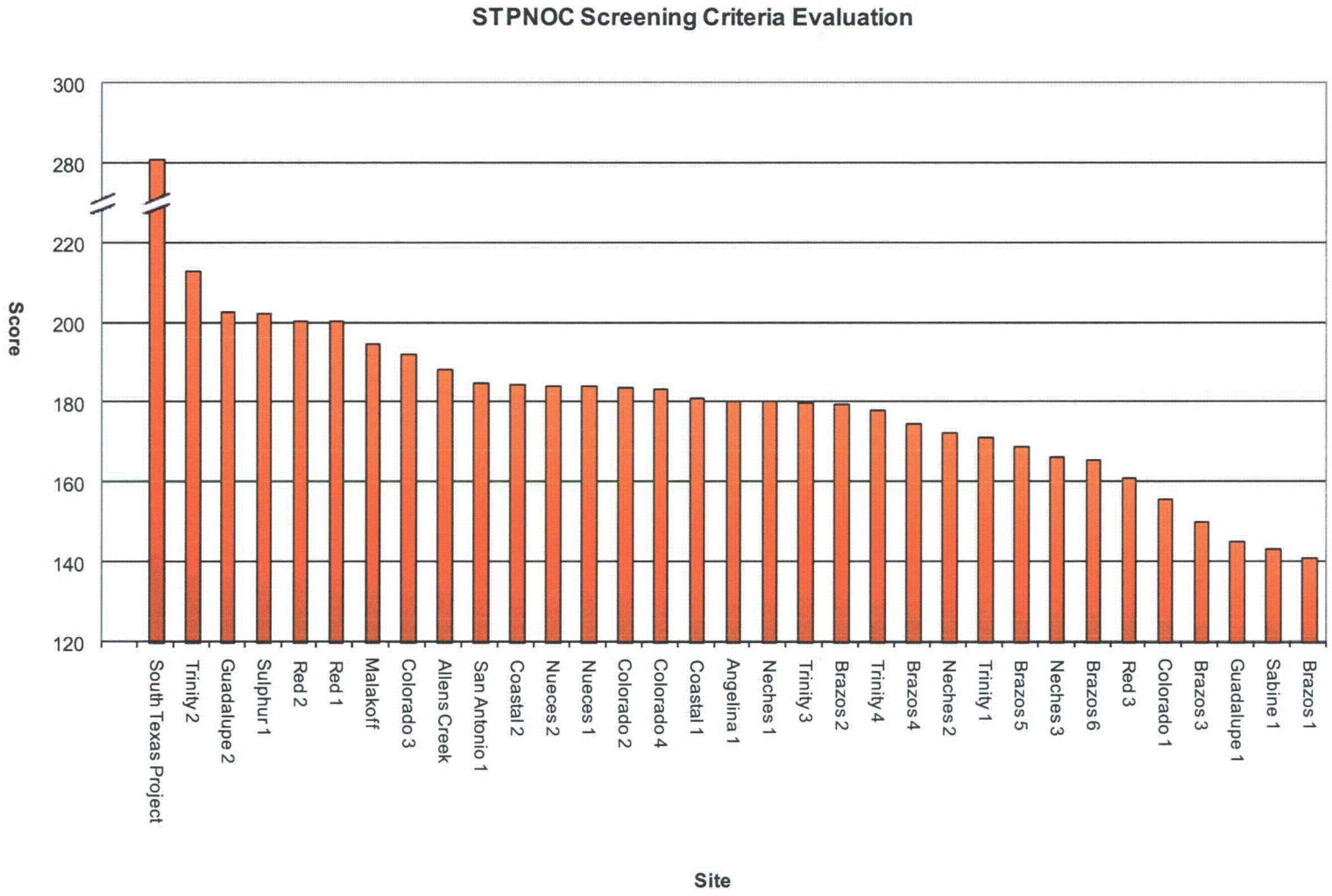
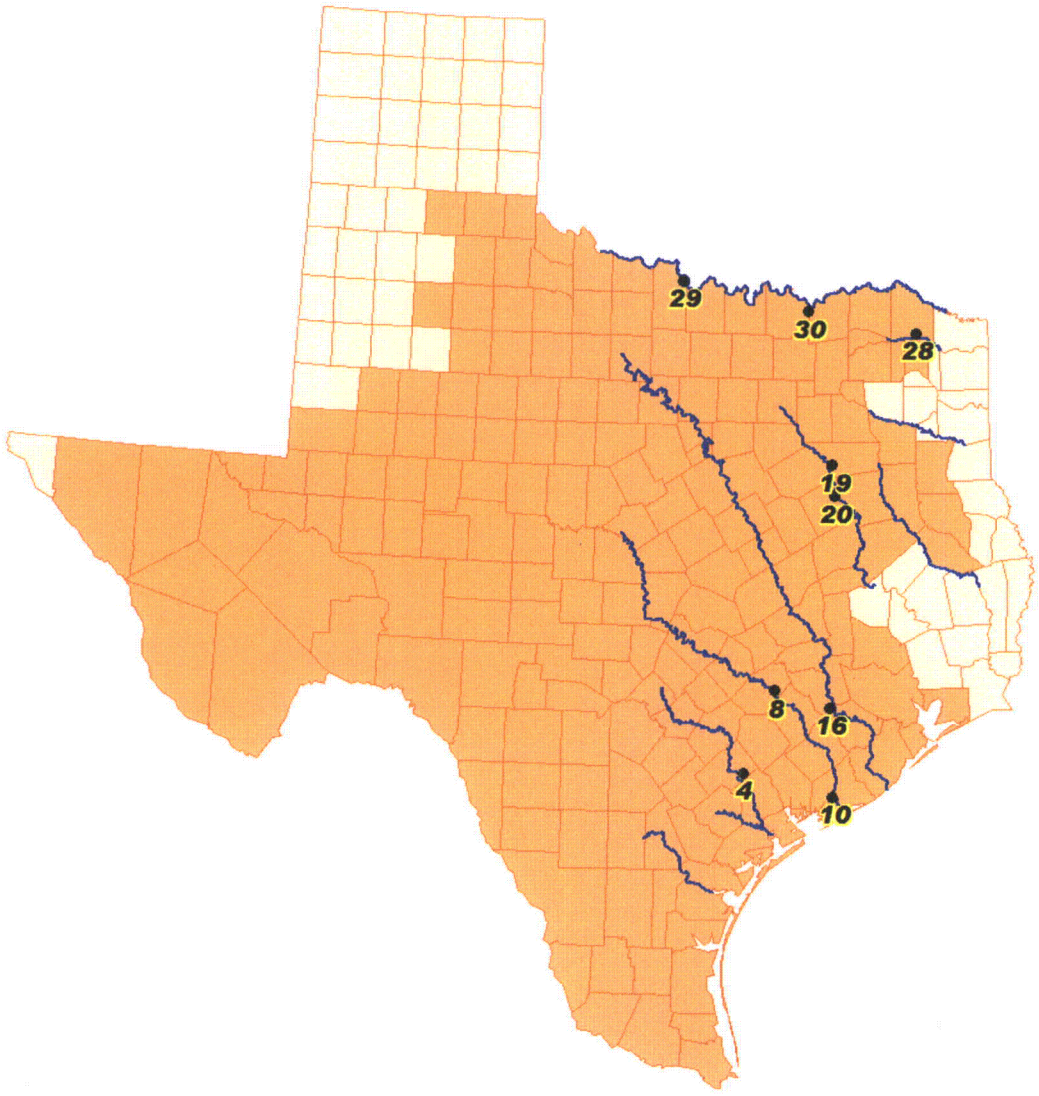


Figure 5-2 Primary Site Locations



Site Number 4 = Guadalupe 2
Site Number 8 = Colorado 3
Site Number 10 = STP
Site Number 16 = Allens Creek
Site Number 19 = Malakoff
Site Number 20 = Trinity 2
Site Number 28 = Sulphur 1
Site Number 29 = Red 1
Site Number 30 = Red 2

6.0 Evaluation of Primary Sites and Identification of Candidate Sites

The objective of this component of the site selection process was to further evaluate the primary sites and select a smaller set of candidate sites, which would then lead to the ultimate selection of the proposed and alternate sites. Section 6.1 outlines the process for evaluating primary sites, while Section 6.2 describes process results and the selection of candidate sites.

6.1 Process for Evaluating Primary Sites

General siting criteria used to evaluate the primary sites were derived from those presented in Chapter 3.0 of the Siting Guide; criteria from the siting guide were tailored to reflect issues applicable to, and data available for, the STPNOC primary sites. A list of the criteria appears in Table 6-1.

The overall process for applying the general siting criteria was analogous to that described in Section 5.1 and was composed of the elements listed below; results from applying the process are described in Section 6.2. Appendix D provides the detailed technical basis for the general siting criteria ratings.

- Criterion Ratings – Each site was assigned a rating of 1 to 5 (1 = least suitable, 5 = most suitable) for each of the general siting criteria, using the rationale described in Appendix D. Information sources for these evaluations included publicly available data, information available from STPNOC files and personnel, and USGS topographic maps.

- Weight Factors – Weight factors reflecting the relative importance of these criteria were derived using methodology consistent with the modified Delphi process specified in the Siting Guide. The process used in weight factor development is described in Appendix B; weight factors used (1 = least important, 10 = most important) are listed in Table 6-2.

- Composite Suitability Ratings – Ratings reflecting the overall suitability of each primary site were developed by multiplying criterion ratings by the criterion weight factors and summing over all criteria for each site, as summarized in Table 6-2.

6.2 Primary Site Evaluation and Results

Results of applying the evaluation process described in Section 6.1 to the candidate sites are summarized in Table 6-2 and Figure 6-1. Detailed discussions of the basis for site ratings for each of the criteria are provided in Appendix D.

Examination of the results (Figure 6-1) indicates that, after the South Texas Project site, the Red 2 site ranks high, followed by the third through sixth ranked sites (Allens Creek, Colorado 3, Trinity 2, and Guadalupe 2) which are rated similarly. To provide additional insights on environmental preferability of these sites, two additional indicators were developed:

- Environmental Site Rating – This rating consists of the Health and Safety Criteria (minus the Geology/Seismology criterion), the Environmental Criteria, and the Socioeconomic Criteria. The top sites based on this rating were STP, Red 1, Red 2, Trinity 2, and Allens

Creek/Guadalupe 2, with no significant difference between Allens Creek and Guadalupe 2.

- Expanded Environmental Site Rating – This rating consists of the Environmental Site Rating plus the Railroad Access and Transmission Access criteria, which reflect a rough proxy of environmental impact through measurement of the relative distances required for these support facilities. The top sites based on this rating were STP, Red 2, Trinity 2, and Allens Creek, with the observation that no significant difference was found between Allens Creek, Red 1, and Colorado 3.

The results of these two additional indicators are included in Table 6-2.

This evaluation showed that while the Colorado 3 site ranked fourth overall in composite rating, it did not rank as high in the environmentally-related criteria ratings and is not expected to be among the best alternatives environmentally. Additionally, the Guadalupe 2 site, ranked sixth overall, did not rank high in the environmentally-related criteria ratings and is not expected to be among the best alternatives environmentally. These two sites, along with the three lowest ranked sites, were deferred from further consideration. Additionally, the Allens Creek site utilizes a different cooling water sources than the other candidate sites, thereby allowing for the evaluation of environmental impacts for a site using the Brazos River as the cooling water source. Thus, the following sites (shown in Figure 6-2) were identified as the candidate sites for the STPNOC project:

- STP
- Red 2
- Allens Creek
- Trinity 2

Table 6-1 General Site Criteria

Siting Criteria
1.1 Health and Safety Criteria: Accident Cause-Related Criteria
1.1.1 Geology and Seismology
1.1.2.1 Cooling System Requirements: Cooling Water Supply
1.1.2.2 Cooling Water System: Ambient Temperature Requirements
1.1.3 Flooding
1.1.4 Nearby Hazardous Land Uses
1.1.5 Extreme Weather Conditions
1.2 Health and Safety Criteria: Accident Effects-Related
1.2.1 Population
1.2.2 Emergency Planning
1.2.3 Atmospheric Dispersion
1.3 Health and Safety Criteria: Operational Effects-Related
1.3.1 Surface Water – Radionuclide Pathway
1.3.2 Groundwater Radionuclide Pathway
1.3.3 Air Radionuclide Pathway
1.3.4 Air – Food Ingestion Pathway
1.3.5 Surface Water – Food Radionuclide Pathway
1.3.6 Transportation Safety
2.1 Environmental Criteria: Construction-Related Effects on Aquatic Ecology
2.1.1 Disruption of Important Species/Habitats
2.1.2 Bottom Sediment Disruption Effects
2.2 Environmental Criteria: Construction-Related Effects on Terrestrial
2.2.1 Disruption of Important Species/Habitats and Wetlands
2.2.2 Dewatering Effects on Adjacent Wetlands
2.3 Environmental Criteria: Operational-Related Effects on Aquatic Ecology
2.3.1 Thermal Discharge Effects

Siting Criteria
Environmental Criteria: Operational-Related Effects on Aquatic Ecology, cont'd.
2.3.2 Entrainment/Impingement Effects
2.3.3 Dredging/Disposal Effects
2.4 Environmental Criteria: Operational-Related Effects on Terrestrial Ecology
2.4.1 Drift Effects on Surrounding Areas
3 Socioeconomic Criteria
3.1 Socioeconomic – Construction Related Effects
3.2 Socioeconomics – Operation (deleted from evaluation, see Appendix D)
3.3 Environmental Justice
3.4 Land Use
4.1 Engineering and Cost-Related Criteria: Health and Safety Related Criteria
4.1.1 Water Supply
4.1.2 Pumping Distance
4.1.3 Flooding
4.1.4 Vibratory Ground Motion (deleted from evaluation, see Appendix D)
4.1.5 Civil Works
4.2 Engineering and Cost: Transportation or Transmission Related Criteria
4.2.1 Railroad Access
4.2.2 Highway Access
4.2.3 Barge Access
4.2.4 Transmission Access
4.3 Engineering and Cost-Related Criteria: Related to Socioeconomic & Land Use
4.3.1 Topography
4.3.2 Land Rights
4.3.3 Labor Rates

Table 6-2 General Site Criteria Ratings for Primary Sites

Health and Safety Criteria

Criteria		Weight Factor	Guadalupe 2		Colorado 3		South Texas Project		Allens Creek		Malakoff		Trinity 2		Sulphur 1		Red 1		Red 2	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
D.1.1.1	Geology/Seismology	5.9	4	23.6	4	23.6	4	23.6	4	23.6	4	23.6	4	23.6	3	17.7	3	17.7	3	17.7
D.1.1.2	Cooling System Requirements	8.5	2	17.0	2	17.0	5	42.5	3	25.5	3	25.5	3	25.5	2	17.0	1	8.5	1	8.5
D.1.1.3	Flooding	4.4	5	22.0	3	13.2	5	22.0	5	22.0	1	4.4	4	17.6	5	22.0	4	17.6	4	17.6
D.1.1.4	Nearby Hazardous Land Uses	4.9	2	9.8	2	9.8	4	19.6	3	14.7	3	14.7	3	14.7	4	19.6	5	24.5	3	14.7
D.1.1.5	Extreme Weather Conditions	3.2	3	9.6	3	9.6	2	6.4	3	9.6	3	9.6	3	9.6	4	12.8	3	9.6	3	9.6
D.1.2	Accident Effect Related	7.4	4	29.6	4	29.6	4	29.6	4	29.6	3	22.2	4	29.6	4	29.6	4	29.6	3	22.2
D.1.3.1	Surface Water – Radionuclide Pathway	4.4	4	17.6	5	22.0	5	22.0	5	22.0	4	17.6	4	17.6	4	17.6	4	17.6	4	17.6
D.1.3.2	Groundwater Radionuclide Pathway	4.5	2	9.0	3	13.5	2	9.0	2	9.0	3	13.5	3	13.5	2	9.0	3	13.5	3	13.5
D.1.3.3	Air Radionuclide Pathway	4.5	5	22.5	4	18.0	4	18.0	4	18.0	3	13.5	4	18.0	4	18.0	5	22.5	5	22.5
D.1.3.4	Air-Food Ingestion Pathway	4.2	2	8.4	2	8.4	2	8.4	2	8.4	3	12.6	3	12.6	3	12.6	1	4.2	1	4.2
D.1.3.5	Surface Water-Food Radionuclide Pathway	4.1	5	20.5	3	12.3	3	12.3	3	12.3	4	16.4	5	20.5	4	16.4	4	16.4	4	16.4
D.1.3.6	Transportation Safety	4.3	1	4.3	2	8.6	3	12.9	2	8.6	3	12.9	4	17.2	5	21.5	4	17.2	4	17.2

Environmental Criteria

Criteria		Weight Factor	Guadalupe 2		Colorado 3		South Texas Project		Allens Creek		Malakoff		Trinity 2		Sulphur 1		Red 1		Red 2	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
D.2.1.1	Disruption of Important Species/Habitats	5.5	4	22.0	4	22.0	4	22.0	4	22.0	4	22.0	3	16.5	3	16.5	5	27.5	3	16.5
D.2.1.2	Bottom Sediment Disruption Effects	3.9	3	11.7	2	7.8	2	7.8	3	11.7	2	7.8	2	7.8	3	11.7	3	11.7	3	11.7
D.2.2.1	Disruption of Important Species/Habitats and Wetlands	4.9	4	19.6	3	14.7	4	19.6	2	9.8	2	9.8	3	14.7	3	14.7	4	19.6	4	19.6
D.2.2.2	Dewatering Effects on Adjacent Wetlands	4.2	5	21.0	4	16.8	4	16.8	2	8.4	2	8.4	4	16.8	3	12.6	5	21.0	4	16.8
D.2.3.1	Thermal Discharge Effects	5.2	3	15.6	4	20.8	3	15.6	4	20.8	4	20.8	4	20.8	2	10.4	3	15.6	4	20.8
D.2.3.2	Entrainment/Impingement Effects	5.1	4	20.4	4	20.4	4	20.4	3	15.3	4	20.4	4	20.4	3	15.3	4	20.4	4	20.4
D.2.3.3	Dredging/Disposal Effects	3.6	3	10.8	2	7.2	3	10.8	3	10.8	2	7.2	2	7.2	3	10.8	3	10.8	3	10.8
D.2.4.1	Drift Effects on Surrounding Areas	4.2	4	16.8	4	16.8	5	21.0	3	12.6	3	12.6	3	12.6	3	12.6	4	16.8	4	16.8

Table 6-2 General Site Criteria Ratings for Primary Sites

Socioeconomic Criteria

Criteria		Weight Factor	Guadalupe 2		Colorado 3		South Texas Project		Allens Creek		Malakoff		Trinity 2		Sulphur 1		Red 1		Red 2	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
D.3.1	Socioeconomics – Construction – Related Effects	6.2	2	12.4	1	6.2	3	18.6	5	31.0	4	24.8	2	12.4	1	6.2	2	12.4	4	24.8
D.3.3	Environmental Justice	5.5	3	16.5	5	27.5	3	16.5	3	16.5	4	22.0	4	22.0	3	16.5	5	27.5	5	27.5
D.3.4	Land Use	6.2	2	12.4	3	18.6	5	31.0	2	12.4	3	18.6	3	18.6	2	12.4	2	12.4	3	18.6

Engineering and Cost Related Criteria

Criteria		Weight Factor	Guadalupe 2		Colorado 3		South Texas Project		Allens Creek		Malakoff		Trinity 2		Sulphur 1		Red 1		Red 2	
			Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
D.4.1.1	Water Supply	7.5	2	15.0	3	22.5	5	37.5	2	15.0	2	15.0	3	22.5	2	15.0	2	15.0	3	22.5
D.4.1.2	Pumping Distance	5.6	4	22.4	4	22.4	4	22.4	4	22.4	4	22.4	4	22.4	4	22.4	4	22.4	4	22.4
D.4.1.3	Flooding	4.2	5	21.0	3	12.6	5	21.0	5	21.0	2	8.4	5	21.0	5	21.0	5	21.0	5	21.0
D.4.1.5	Civil Works	4.2	5	21.0	5	21.0	5	21.0	5	21.0	5	21.0	5	21.0	4	16.8	5	21.0	5	21.0
D.4.2.1	Railroad Access	6.2	4	24.8	4	24.8	5	31.0	5	31.0	4	24.8	1	6.2	1	6.2	2	12.4	4	24.8
D.4.2.2	Highway Access	6.2	2	12.4	4	24.8	5	31.0	4	24.8	3	18.6	2	12.4	2	12.4	4	24.8	3	18.6
D.4.2.3	Barge Access	6.5	4	26.0	3	19.5	5	32.5	3	19.5	2	13.0	2	13.0	1	6.5	1	6.5	1	6.5
D.4.2.4	Transmission Access	7.8	2	15.6	4	31.2	5	39.0	2	15.6	3	23.4	5	39.0	4	31.2	1	7.8	5	39.0
D.4.3.1	Topography	4.9	4	19.6	5	24.5	5	24.5	5	24.5	5	24.5	3	14.7	5	24.5	4	19.6	4	19.6
D.4.3.2	Land Rights	7.0	3	21.0	2	14.0	5	35.0	2	14.0	4	28.0	2	14.0	2	14.0	2	14.0	2	14.0
D.4.3.3	Labor Rates	4.7	3	14.1	3	14.1	3	14.1	3	14.1	3	14.1	3	14.1	3.5	16.5	3	14.1	3.5	16.5

Composite Site Rating	Guadalupe 2	Colorado 3	STP	Allens Creek	Malakoff	Trinity 2	Sulphur 1	Red 1	Red 2
	586.00	595.80	735.40	597.50	574.10	590.10	539.95	573.20	611.85

Environmental Site Rating	Guadalupe 2	Colorado 3	STP	Allens Creek	Malakoff	Trinity 2	Sulphur 1	Red 1	Red 2
	349.50	340.80	402.80	351.00	337.30	366.20	335.80	376.90	368.30

Expanded Environmental Site Rating - Transmission & Rail	Guadalupe 2	Colorado 3	STP	Allens Creek	Malakoff	Trinity 2	Sulphur 1	Red 1	Red 2
	389.90	396.80	472.80	397.60	385.50	411.40	373.20	397.10	432.10

Figure 6-1 Composite General Site Suitability Ratings for Primary Sites

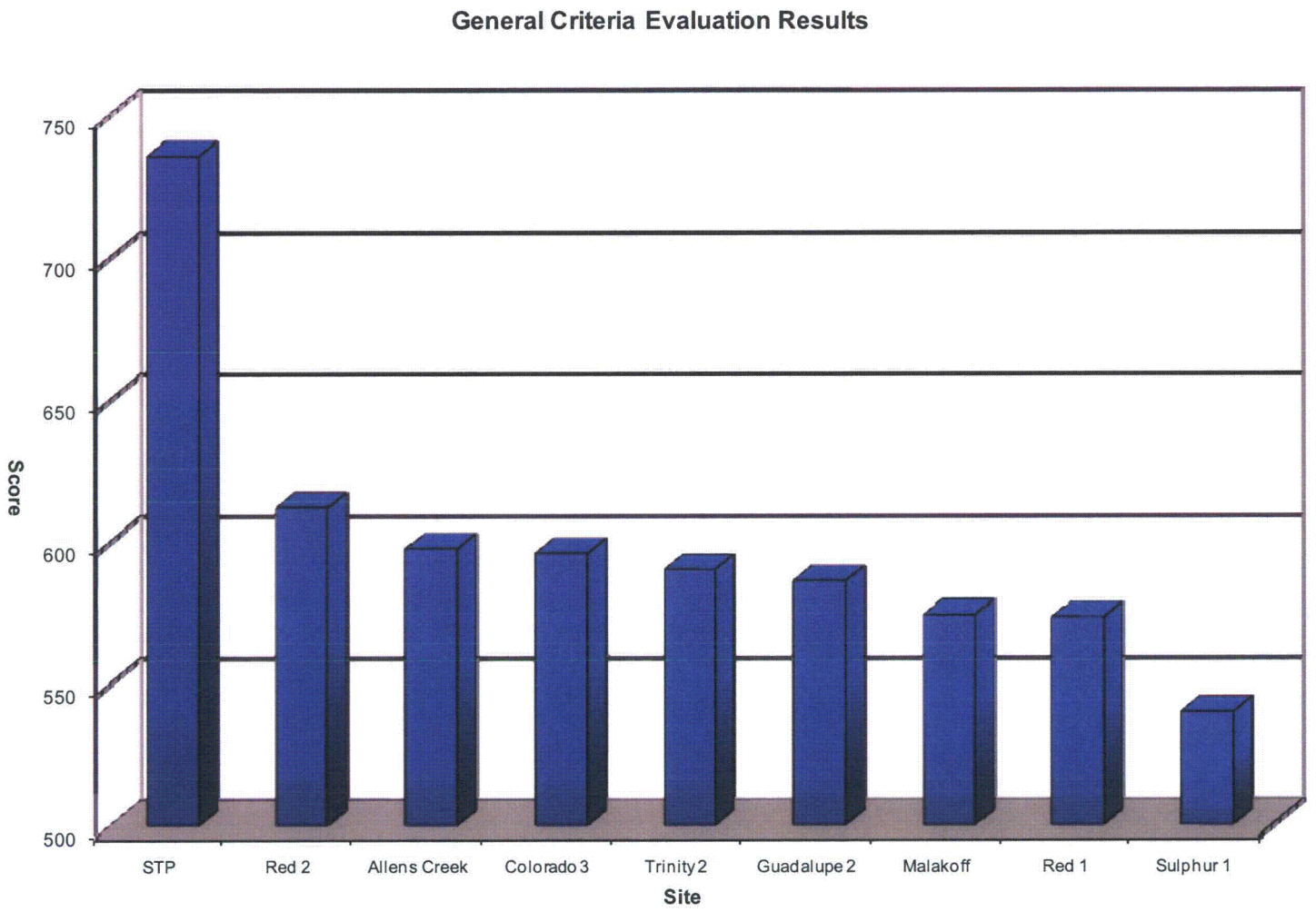
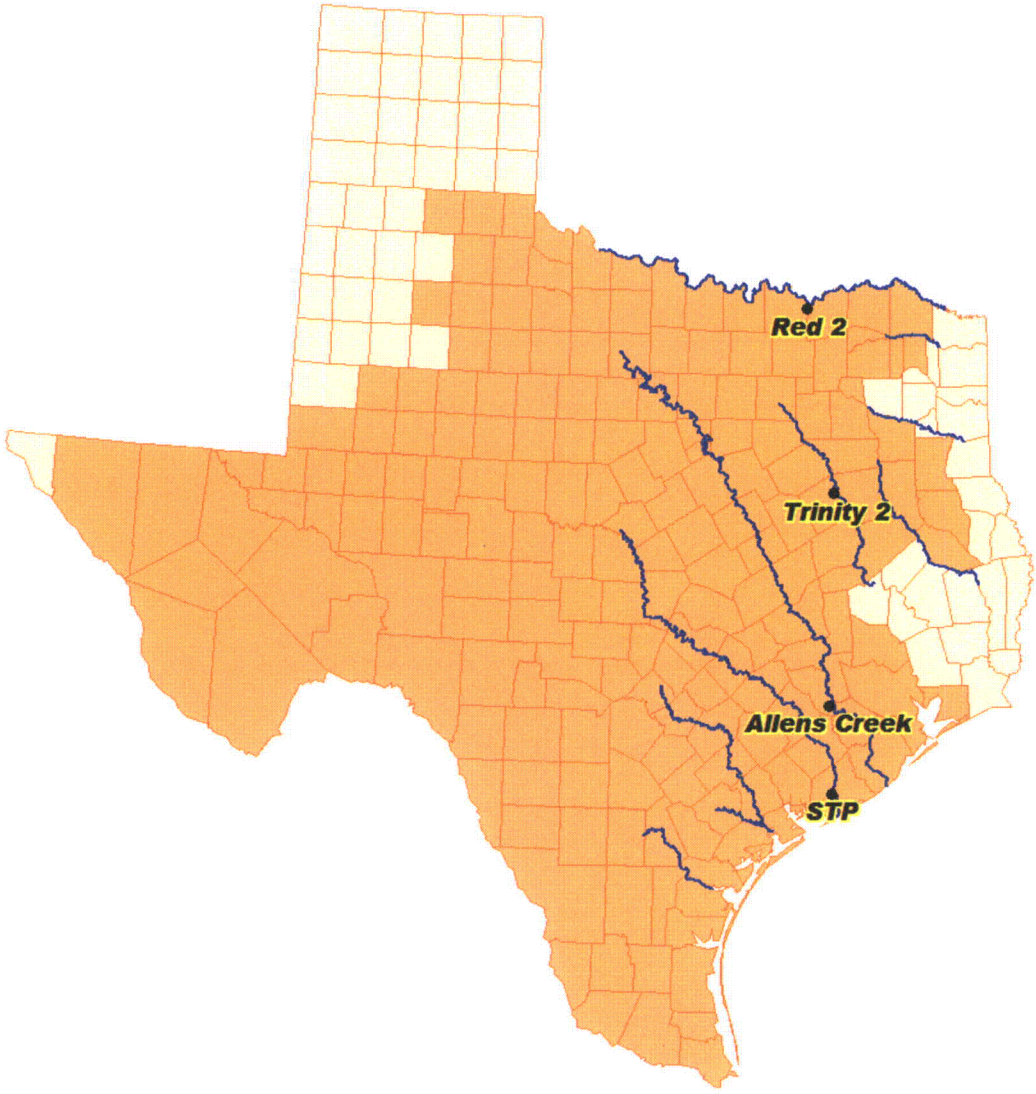


Figure 6-2 Candidate Site Locations



7.0 Selection of Proposed Site

As noted in Section 1.0, the STP site was identified as the proposed site for the STPNOC project. This conclusion was confirmed by the very favorable rankings at each stage of the siting analysis.

Beyond STP, the remaining candidate sites were identified through the process described above as being among the best sites that could reasonably be found within the ROI; these sites are designated as alternate sites and include:

- Red 2
- Allens Creek
- Trinity 2

8.0 References

Energy Information Administration, Form EIA-860 Database – Annual Electric Generator Report, 2007, http://www.eia.doe.gov/cneaf/electricity/page/eia860.html.

EPRI 2002, Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application, Electric Power Research Institute, March 2002.

Railroad Commission of Texas, Surface Mining and Reclamation Division, Texas Abandoned Mine Land Reclamation Projects, http://www.rrc.state.tx.us/programs/mining/texasamlprojects.pdf.

Appendix A – Results of Regional Screening

Figures provided in this Appendix provide results of the screening of the STPNOC Region of Interest in accordance with the screening criteria described in Section 3.0. The following information related to identification of candidate areas is contained in this Appendix:

- Figure A-1, Water Availability – Identifies areas within 5 miles of rivers with average flows greater than 10 times the required cooling water volume of 50,000 acre-ft/yr (69.1 cfs, 31,000 gpm, 44.6 Mgal/day).
- Figure A-2, Population – Identifies areas designated as Urbanized Areas as mapped by the Texas General Land Office (TGLO).
- Figure A-3, Dedicated Lands – Identifies the boundaries of the following dedicated lands: Federal Lands, Department of Defense Lands, National Wildlife Refuges, National Parks Service Parks, and Texas Parks and Wildlife Department (TPWD) Parks.
- Figure A-4, Critical Habitat – Identifies areas designated as threatened and endangered species critical habitat.
- Figure A-5, Composite Map – Depicts the areas resulting from application of the above described criteria.

Figure A-1, Water Availability

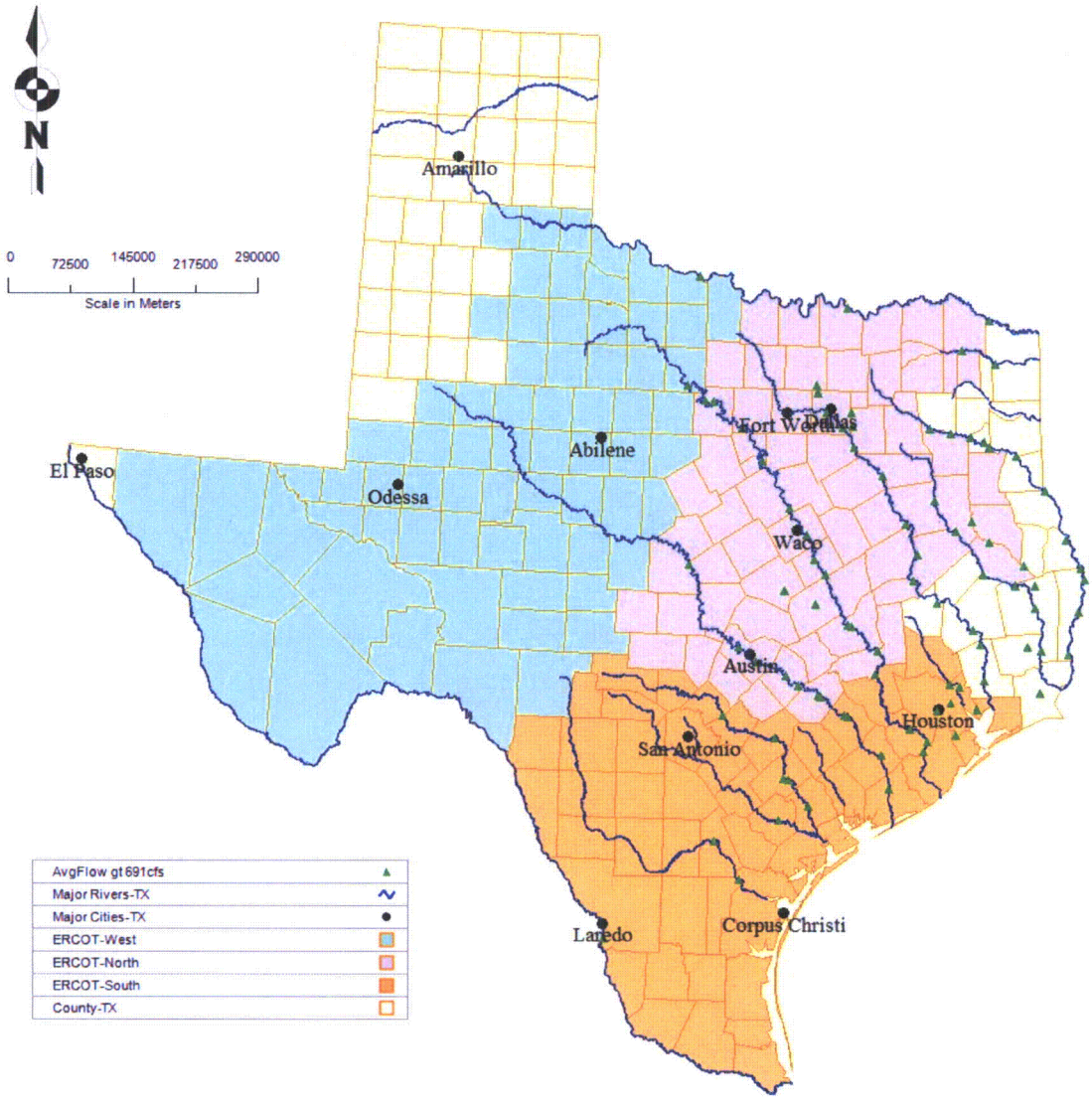


Figure A-2, Population

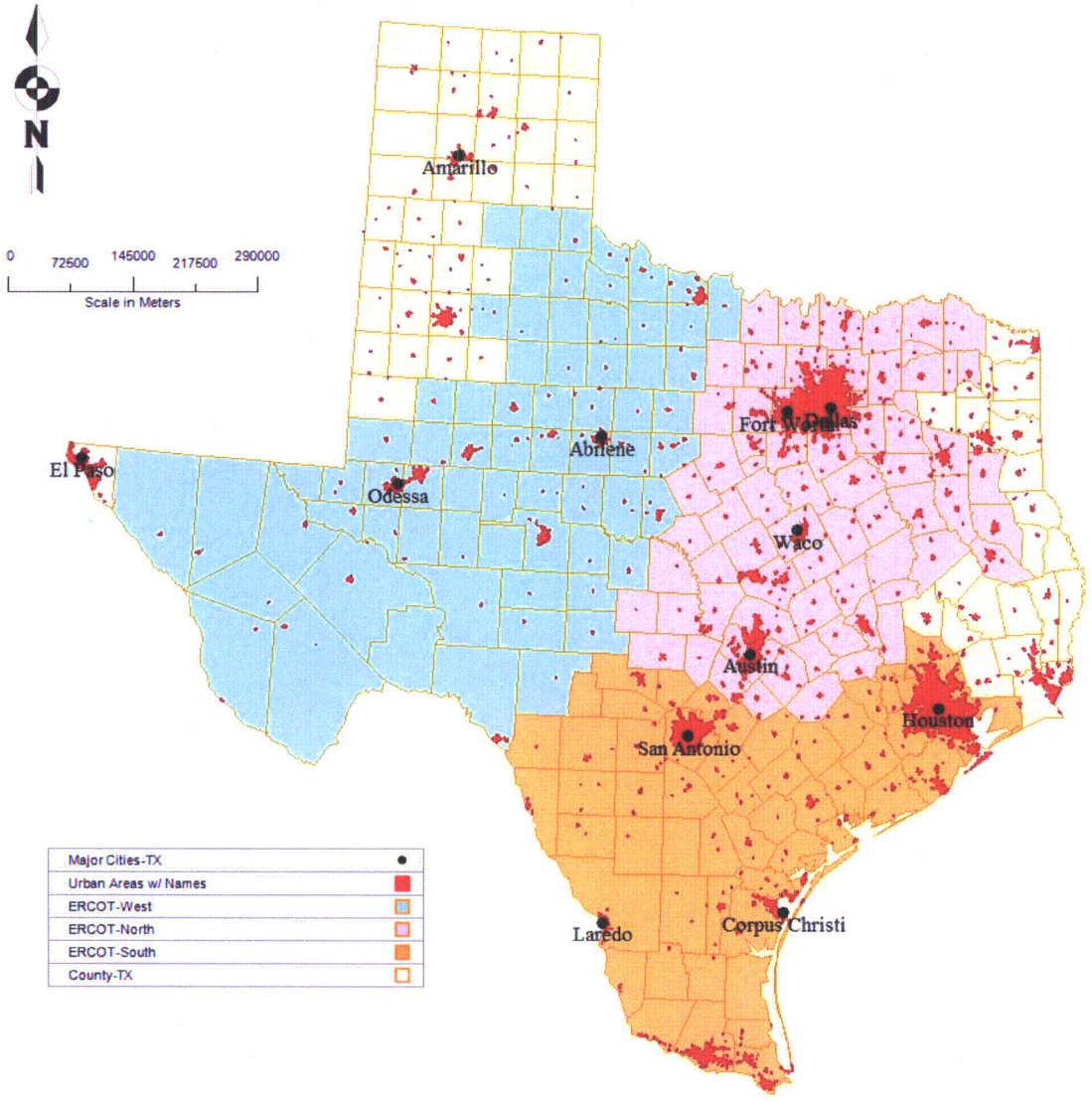


Figure A-3, Dedicated Lands

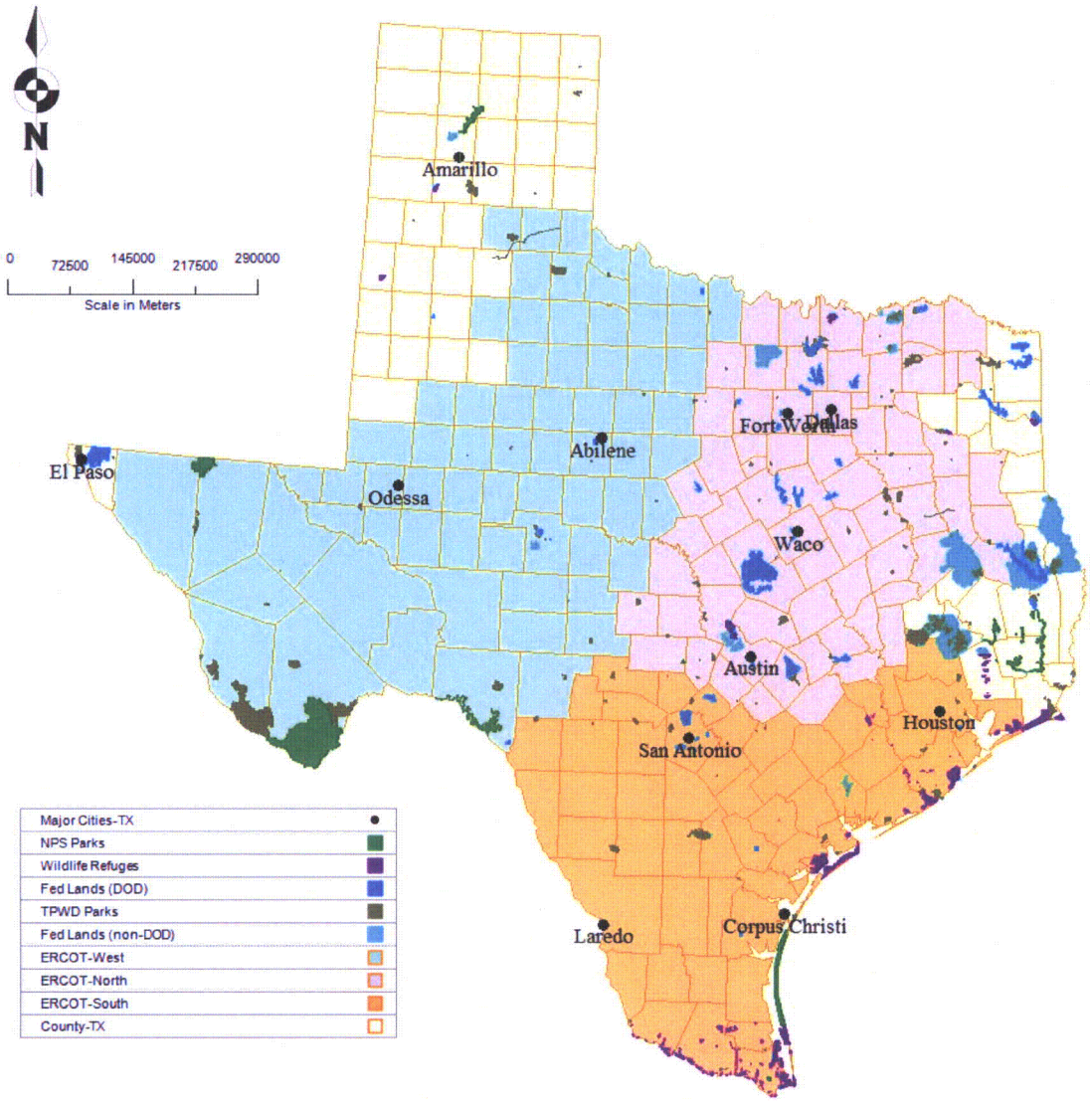


Figure A-4, Critical Habitat

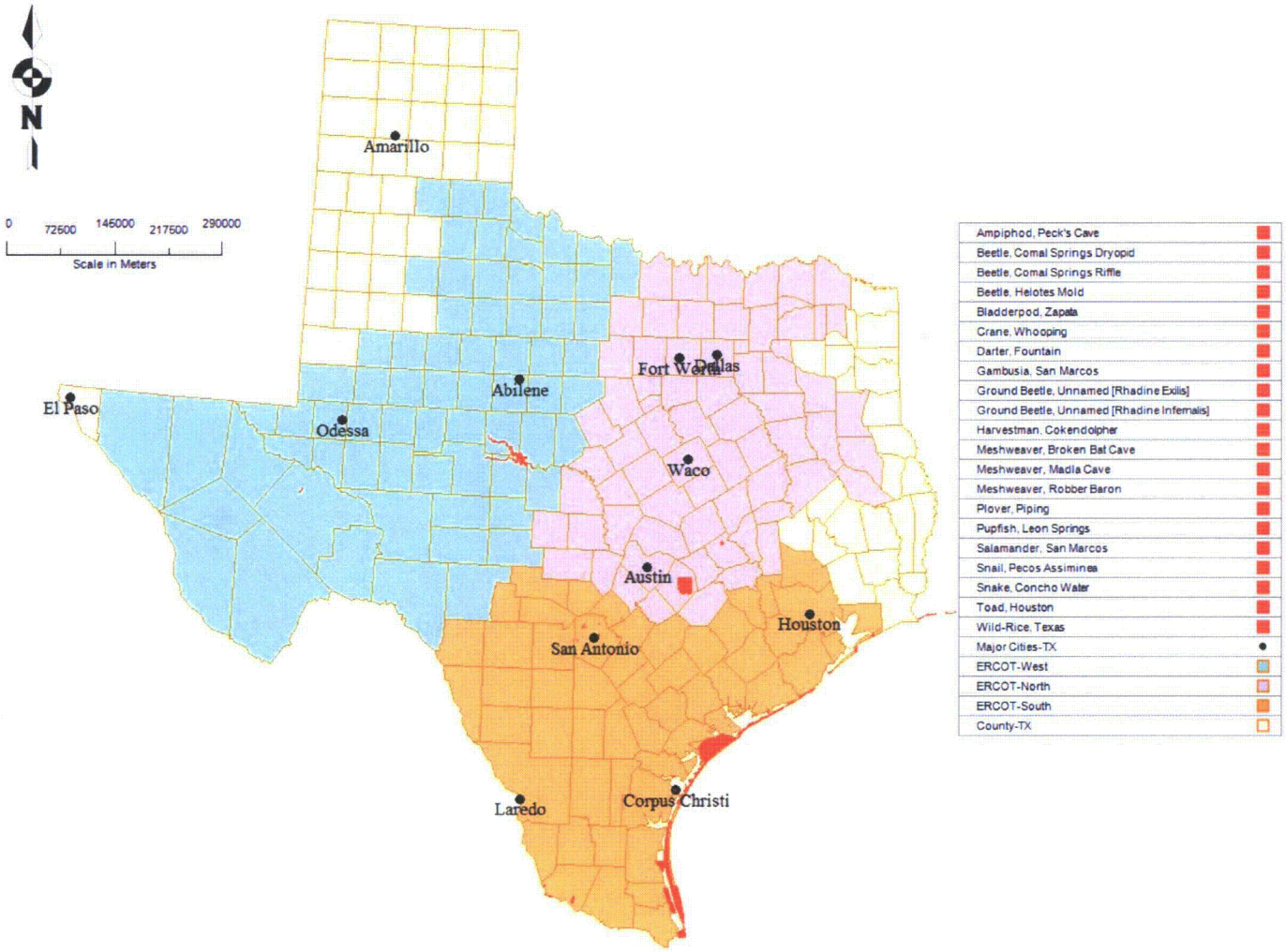
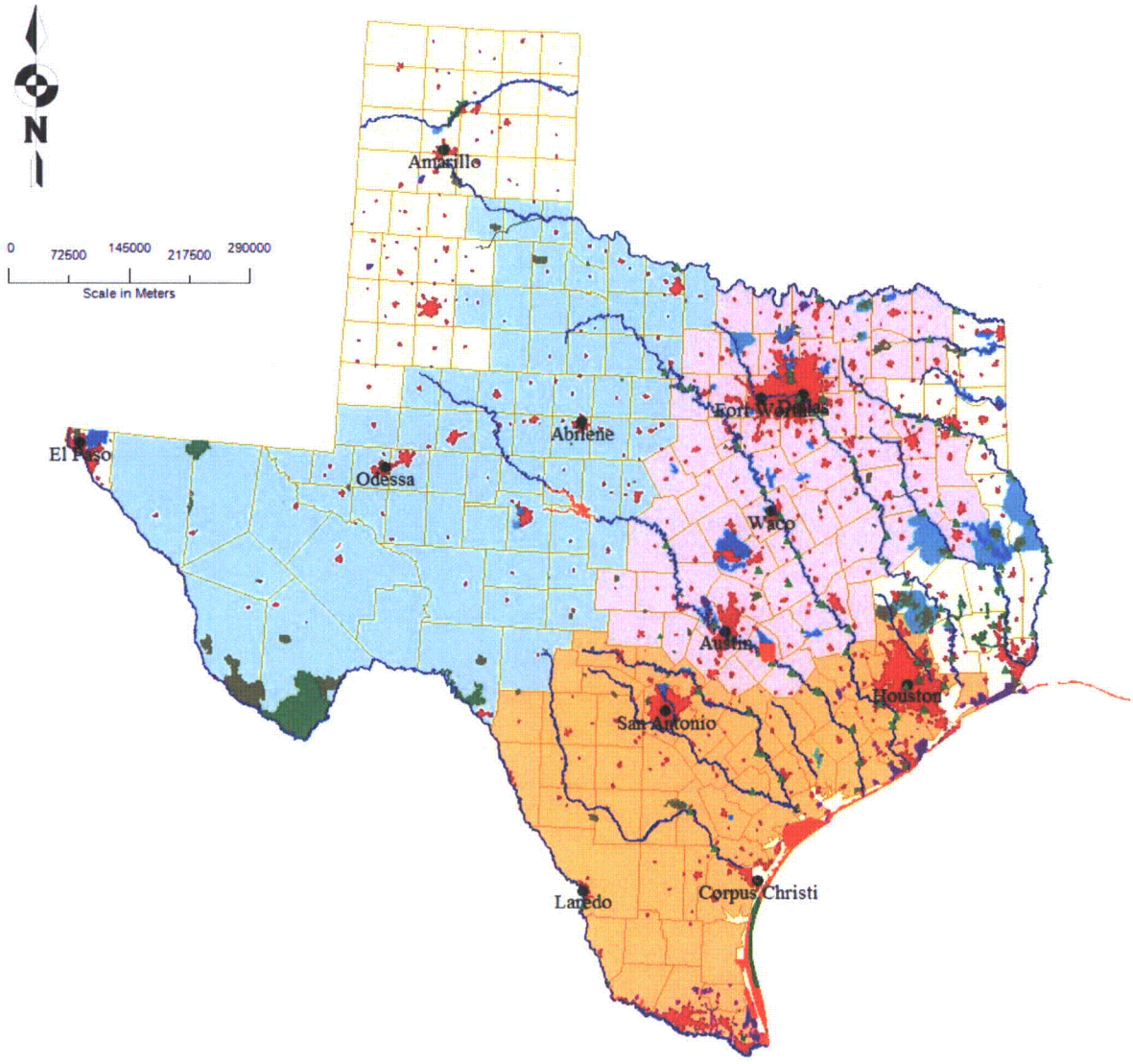


Figure A-5, Composite Map

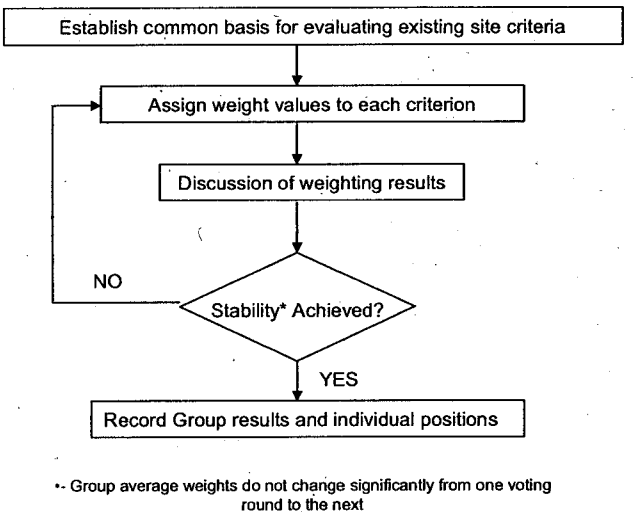


Legends for individual layers are shown on the previous four figures.

Appendix B – Weight Factor Development

Weight factors reflecting the relative importance of the screening and general site evaluation criteria used to evaluate potential sites were developed consistent with the modified Delphi method suggested in the EPRI Siting Guide. The process used for weight factor development is summarized in Figure B-1.

Figure B-1 Weight Factor Development Process



Weight factors reflecting the relative importance of these criteria were developed by a multi-disciplinary committee in the areas of nuclear power plant site suitability that was convened at STPNOC offices on March 19, 2009; this committee was composed of subject matter experts in water use and availability, engineering and licensing, real estate, ecology and environment, transmission, land use, health & safety, geotechnical, socioeconomics, and public relations.

A brief description of the screening criteria, data inputs, and rating methodologies were provided. Weights were assigned (scale of 1 to 10 with 1 = least important and 10 = most important) to each of the criteria based on the view of how important each criterion is in nuclear plant siting. Individual weight scores were averaged to arrive at group composite category weighting factors.

After the first round of voting, a group discussion was held during which committee members provided the rationale for their weight factor assignments. Following this discussion, another polling of the group was conducted and committee members modified their weights, as they deemed appropriate, based on the discussions and arguments presented after the first round. A second discussion was held after the second round of voting. This process continued for a third round of voting. Following the third round of voting no members of the committee indicated,

when polled, that they had been persuaded to change their weight assignments, and the Delphi session was terminated. The resulting weight factors are provided in Table 5-2.

A similar process was conducted to develop criterion weight factors for the general siting criteria. After the first round of voting, a group discussion was held in which committee members provided the rationale for their weight factor assignments. Following this discussion, another polling of the group was conducted and committee members modified their weights, as they deemed appropriate, based on the discussions and arguments presented after the first round. A second discussion was held after the second round of voting. Following a third round of voting, no members of the committee indicated, when polled, that they had been persuaded to change their weight assignments, and the Delphi session was terminated. The resulting weight factors are provided in Table 6-2.

Appendix C
Technical Basis for Screening Criteria Evaluations

Results of the screening criterion evaluations are provided in the following tables. All ratings are assigned on a scale of 1 to 5, with 5 representing the most suitable site from the perspective of each criterion and 1 representing the least suitable site.

Methodology for the criterion evaluations is summarized in Section C.1; individual site/criterion ratings and the associated technical basis is provided in Section C.2.

C.1 Screening Criteria Methodology

The methodology applied for each criterion to develop 1 to 5 suitability ratings for the potential sites is described in the following table.

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P1	Water Supply	Average of two ratings concerning cooling water supply: • Ability to meet cooling water quantity requirements based on current allocation for STP Units 1 & 2 (max. consumption 50,000 acre-ft/yr [69.1 cfs, 31,000 gpm, 44.6 Mgal/day]) • Availability of water rights based on reported percent of months with unappropriated flows	Ability to meet cooling water quantity requirements: 5 = Unlimited capacity exists 4 = Flow > 50 times requirement 3 = Flow 30-50 times requirement 2 = Flow 20-30 times requirement 1 = Flow 10-20 times requirement Availability of water rights: 5 = Currently own water rights 3 = 50-100% of months with unappropriated flow 2 = 25-50% of months with unappropriated flow 1 = 0-25% of months with unappropriated flow
P2	Flooding	Site location with respect to 100/500-year flood zone. Difference between mean site elevation and mean water elevation from USGS topographic maps and USGS gaging station measurements also was considered.	5 = Site located outside 100/500-year flood zone 3 = Site located inside 500-year flood zone or near or on border of 100-year flood zone 1 = Site located inside 100-year flood zone

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P3	Population	Composite ratings are based on an average of the following two sub-ratings: • Distance to nearest incorporated town (with U.S. Census Bureau population data) • Population density of the host county In addition, a rating point will be deducted or added, respectively, if the site is in a particularly densely populated area or not.	Distance to Closest incorporated town or city: 5 = None within 20 miles 4 = Between 15 miles and 20 miles 3 = Between 10 miles and 15 miles 2 = Between 5 miles and 10 miles 1= Within 5 miles Ratings are based on distances from towns using 2000 population data available from the U.S. Census Bureau (USCB). Ratings are based on distances from the closest incorporated town. Note that the listing of towns is representative (and fairly comprehensive) of the mileage categories within which incorporated towns are found, and are sufficient to provide the basis for the ratings. However, the listings do not necessarily include every incorporated town within a 20 mile radius of the site. Unincorporated towns with no official U.S. Census Bureau population are noted but not included in the evaluations. County Population Density Ratings: 5 = Less than 50 persons per square mile (psm) 4 = Between 50 psm and 100 psm 3 = Between 100 psm and 250 psm 2 = Between 250 psm and 500 psm 1 = More than 500 psm A point was added if no densely populated area is found within 40 miles of the site; a point was deducted if a densely populated area is found within 15 miles of the site or if a large grouping of densely populated areas is located within 15-40 miles of the site.

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P4	Hazardous Land Uses	Average of four site sub-ratings for proximity to airports, pipelines, railroads, and other known hazardous industrial facilities.	Airports: 5 = No airports within 10 miles 4 = 1 minor airstrip within 10 miles 3 = Multiple small airstrips within 10 miles 2 = Minor airport (municipal, county, etc.) within 10 miles 1 = Major airport within 10 miles Railroads: 5 = No railroad within 10 miles of site 4 = Railroad 6-10 miles from site 3 = Railroad 4-6 miles from site 2 = Railroad 2-4 miles from site 1 = Railroad within 2 miles of site Pipelines: 5 = No pipelines within 5 miles of site 4 = 1 pipeline within 5 miles of site 3 = 2-3 pipelines within 5 miles of site 2 = 4 pipelines within 5 miles of site 1 = 5 or more pipelines within 5 miles of site Other: 5 = No other hazardous facilities within 10 miles of site 4 = Gravel/mining operation at or near 10 miles from site 3 = 1 minor hazardous facility within 10 miles of site 2 = Multiple hazardous facilities within 10 miles of site 1 = Multiple hazardous facilities in close proximity to site

Criterion Number	Criterion	Measure of Suitability	
		Metric	Rating Rationale
P5	Ecology	Number of Federal Threatened, Endangered and Rare Species in county where site is located (aquatic and terrestrial).	5 = 0 species 4 = 1-5 species 3 = 6-10 species 2 = 11-15 species 1 = More than 15 species Critical habitat and essential fish habitat also factored in where appropriate.
P6	Wetlands	Number of acres or percentage of wetlands within site area (acreages based on nominal 6,000 acres).	5 = Less than 60 acres (<1%) 4 = Between 60 acres and 300 acres (1%-5%) 3 = Between 300 acres and 600 acres (5%-10%) 2 = Between 600 acres and 1,200 acres (10%-15) 1 = More than 1,200 acres (>15%) Riverine acreage is not included in the total acreage.
P7	Heavy Haul Access	Estimated cost of constructing a rail spur to the site, based on distance in miles to the nearest in-service rail line.	Ratings computed by scaling costs from lowest (rating = 5) to highest (rating = 1) using distance from existing rail as a surrogate for rail spur construction costs. 1 = More than 12 miles 2 = Between 6 miles and 12 miles 3 = Between 3 miles and 6 miles 4 = Between 1 mile and 3 miles 5 = Less than 1 mile Local availability of barge access was also considered in the site evaluations.
P8	Transmission Access	Surrogate of costs to construct transmission access, based on sum of distances to the three nearest 345kV transmission lines.	Ratings computed by scaling costs from lowest (rating = 5) to highest (rating = 1) using total combined distance to the three nearest 345kV transmission lines as a surrogate for transmission access construction costs. 5 = Less than 10 miles 4 = Between 10 miles and 25 miles 3 = Between 25 miles and 50 miles 2 = Between 50 miles and 100 miles 1 = More than 100 miles

Criterion Number	Criterion	Measure of Suitability	
		Metric	**Rating Rationale**
P9	Land Acquisition	Estimated cost of acquiring land at the site, based on cost/acre provided by U.S. Census of Agriculture.	5 = Sufficient land at site owned by NRG 4 = Land owned by NRG, but additional acquisition required to develop site (e.g., reservoir) 3 = Land privately owned, estimated land cost < $2,000 per acre 2 = Land privately owned, estimated land cost < $3,000 per acre 1 = Land privately owned, estimated land cost > $3,000 per acre Close proximity to a large city, as an indicator of higher land cost, was also considered by examining the average land price in the adjacent county where the large metropolitan area was located. Note that the ratings were not affected for the majority of sites – i.e., where the average cost per acre of the adjacent county (host to large city) was not significantly different than the cost per acre in the site host county, or the city was at sufficient distance that the land price was assumed not to be affected based on best professional judgment. Land use restrictions, where identified, and additional land requirements for reservoir construction were also considered where appropriate.

C.2 Screening Criterion Ratings

Technical bases for screening criterion ratings are presented in this section. Ratings are presented by criterion, with the rationale for individual site ratings listed within each criterion description.

Criterion P1 – Cooling Water Supply		
Site	**Rating**	**Comments and Discussion**
Nueces 1	1	USGS gaging station 08210000 near Three Rivers, TX (~4 miles north of the site) Average flow = 763 cfs (11 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 0-25% of months.
Nueces 2	1	USGS gaging station 08211000 near Mathis, TX (~9 miles northwest of the site) Average flow = 708 cfs (10 times requirement) Minimum flow = 6.8 cfs Unappropriated flows are available for a new application 0-25% of months.
Guadalupe 1	1	USGS gaging station 08169500 near New Braunfels, TX (~23 miles northwest of site) Average flow = 769 cfs (11 times requirement) Minimum flow = 270 cfs (3.9 times requirement) Flow data is historic – current station records gage height only Unappropriated flows are available for a new application 0-25% of months.
Guadalupe 2	3	USGS gaging station 08175800 near Cuero, TX (~10 miles west of the site) Average flow = 2,030 cfs (29 times requirement) Minimum flow = 28 cfs Unappropriated flows are available for a new application 50-75% of months.
San Antonio 1	3	USGS gaging station 08176500 near Victoria, TX (Guadalupe River ~14 miles north of the site) Average flow = 1,908 cfs (28 times requirement) Minimum flow = 14 cfs USGS gaging station 08188500 near Goliad, TX (San Antonio River ~22 miles west of the site) Average flow = 715 cfs (10 times requirement) Minimum flow = 2.1 cfs Unappropriated flows are available for a new application 50-75% of months.

Criterion P1 – Cooling Water Supply		
Site	**Rating**	**Comments and Discussion**
Colorado 1	2	USGS gaging station 08154510 near Austin, TX (~20 miles southeast of the site) Average flow = 1,460 cfs (21 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 0-25% of months.
Colorado 2	2	USGS gaging station 08159200 near Bastrop, TX (~7 miles south of the site) Average flow = 2,238 cfs (32 times requirement) Minimum flow = 75 cfs Unappropriated flows are available for a new application 0-25% of months.
Colorado 3	2	USGS gaging station 08160400 near LaGrange, TX (~9 miles northwest of the site) Average flow = 2,676 cfs (39 times requirement) Minimum flow = 167 cfs (2.4 times requirement) Unappropriated flows are available for a new application 0-25% of months.
Colorado 4	2	USGS gaging station 08162000 near Wharton, TX (~7 miles east of the site) Average flow = 2,729 cfs (39 times requirement) Minimum flow = 42 cfs Unappropriated flows are available for a new application 0-25% of months.
South Texas Project	5	USGS gaging station 08162500 near Bay City, TX (~12 miles north of the site) Average flow = 2,590 cfs (37 times requirement) Minimum flow = 0 cfs Water rights are currently owned for the additional water requirement.
Brazos 1	1	USGS gaging station 08089000 near Palo Pinto, TX (~6 miles west of the site) Average flow = 990 cfs (14 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 0-25% of months.

Criterion P1 – Cooling Water Supply		
Site	**Rating**	**Comments and Discussion**
Brazos 2	2	USGS gaging station 08090800 near Dennis, TX (~6 miles northeast of the site) Average flow = 1,068 cfs (15 times requirement) Minimum flow = 1.2 cfs Unappropriated flows are available for a new application 25-50% of months.
Brazos 3	3	USGS gaging station 08096500 near Waco, TX (~9 miles northwest of the site) Average flow = 2,423 cfs (35 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 25-50% of months.
Brazos 4	3	USGS gaging station 08098290 near Highbank, TX (Colorado River ~19 miles north of the site) Average flow = 2,834 cfs (41 times requirement) Minimum flow = 23 cfs USGS gaging station 08106500 near Cameron, TX (Little River ~10 miles west of the site) Average flow = 1,729 cfs (25 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 25-50% of months.
Brazos 5	3	USGS gaging station 08110200 near Washington, TX (~7 miles north of the site) Average flow = 5,521 cfs (80 times requirement) Minimum flow = 196 cfs (3 times requirement) Unappropriated flows are available for a new application 25-50% of months.
Allens Creek	3	USGS gaging station 08111500 near Hempstead, TX (~31 miles north of the site) Average flow = 6,843 cfs (99 times requirement) Minimum flow = 137 cfs (2 times requirement) Unappropriated flows are available for a new application 25-50% of months.
Brazos 6	4	USGS gaging station 08116650 near Rosharon, TX (~7 miles northeast of the site) Average flow = 8,125 cfs (118 times requirement) Minimum flow = 27 cfs Unappropriated flows are available for a new application 50-75% of months.

Criterion P1 – Cooling Water Supply		
Site	**Rating**	**Comments and Discussion**
Trinity 1	3	USGS gaging station 08062500 near Rosser, TX (~11 miles northwest of the site) Average flow = 3,062 cfs (44 times requirement) Minimum flow = 32 cfs Unappropriated flows are available for a new application 25-50% of months.
Malakoff	3	USGS gaging station 08062700 near Trinidad, TX (~3 miles west of the site) Average flow = 4,393 cfs (64 times requirement) Minimum flow = 312 cfs (5 times requirement) Unappropriated flows are available for a new application 25-50% of months.
Trinity 2	3	USGS gaging station 08062700 near Trinidad, TX (~24 miles south of the site) Average flow = 4,393 cfs (64 times requirement) Minimum flow = 312 cfs (5 times requirement) Unappropriated flows are available for a new application 25-50% of months.
Trinity 3	3	USGS gaging station 08065350 near Crockett, TX (~5 miles southeast of the site) Average flow = 6,512 cfs (94 times requirement) Minimum flow = 278 cfs (4 times requirement) Unappropriated flows are available for a new application 25-50% of months.
Trinity 4	3	USGS gaging station 08065500 near Midway, TX (~3 miles southeast of the site) Average flow = 5,716 cfs (83 times requirement) Minimum flow = 87 cfs Flow data is historic Unappropriated flows are available for a new application 25-50% of months.
Neches 1	2	USGS gaging station 08032000 near Neches, TX (~6 miles north of the site) Average flow = 731 cfs (11 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 50-75% of months.

Criterion P1 – Cooling Water Supply		
Site	**Rating**	**Comments and Discussion**
Neches 2	2	USGS gaging station 08032500 near Alto, TX (~8 miles northwest of the site) Average flow = 1,165 cfs (17 times requirement) Minimum flow = 0.2 cfs Flow data is historic Unappropriated flows are available for a new application 50-75% of months.
Neches 3	3	USGS gaging station 08033000 near Diboll, TX (~10 miles west of the site) Average flow = 1,587 cfs (23 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 50-75% of months.
Angelina 1	2	USGS gaging station 08036500 near Alto, TX (~11 miles northwest of the site) Average flow = 856 cfs (12 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 25-50% of months.
Sabine 1	2	USGS gaging station 08019200 near Hawkins, TX (~6 miles west of the site) Average flow = 1,277 cfs (18 times requirement) Minimum flow = 4.8 cfs Unappropriated flows are available for a new application 25-50% of months.
Sulphur 1	2	USGS gaging station 07343210 near Talco, TX (~6 miles southwest of the site) Average flow = 1,270 cfs (18 times requirement) Minimum flow = 0.09 cfs Unappropriated flows are available for a new application 50-75% of months.
Red 1	1	USGS gaging station 07308500 near Burkburnett, TX (~31 miles northwest of the site) Average flow = 1,257 cfs (18 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 0-25% of months. Acquisition of water rights could encounter permitability challenges from negotiating with multiple states (Oklahoma).

Criterion P1 – Cooling Water Supply		
Site	**Rating**	**Comments and Discussion**
Red 2	2	USGS gaging station 07331600 near Denison, TX (~16 miles northwest of the site) Average flow = 5,007 cfs (72 times requirement) Minimum flow = 12 cfs Unappropriated flows are available for a new application 0-25% of months. Acquisition of water rights could encounter permitability challenges from negotiating with multiple states (Oklahoma).
Red 3	2	USGS gaging station 07331600 near Denison, TX (~66 miles west of the site) Average flow = 5,007 cfs (72 times requirement) Minimum flow = 12 cfs Unappropriated flows are available for a new application 0-25% of months. Acquisition of water rights could encounter permitability challenges from negotiating with multiple states (Oklahoma).
Coastal 1	4	No water availability limitations on salt water from Copano Bay / Gulf of Mexico. Unappropriated flows are available for a new application 75-100% of months. Pipeline construction to Gulf of Mexico could encounter permitability challenges from crossing critical habitat.
Coastal 2	4	No water availability limitations on salt water from Tres Palacios Bay / Gulf of Mexico. Unappropriated flows are available for a new application 75-100% of months. Pipeline construction to Gulf of Mexico could encounter permitability challenges from crossing critical habitat.

References:

General Water Availability Maps by River Basin, http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wam.html.

USGS Real-Time Water Data for Texas, http://waterdata.usgs.gov/tx/nwis/rt

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
Nueces 1	5	Site elevation = 218 feet Site is located ~ 5 miles south of gaging station on the Nueces River near Three Rivers, TX. Recent river level at gaging station = 101 ft (flood stage is 124 feet). Difference = 117 feet above Nueces River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone).
Nueces 2	5	Site elevation = 105 feet Site is located ~ 10 miles southeast of gaging station on the Nueces River near Mathis, TX. Recent river level at gaging station = 27 ft (flood stage is 52 feet). Difference = 53 feet above Nueces River flood level. Site is located in Flood Zone C (located outside 100/500-year flood zone).
Guadalupe 1	1	Site elevation = 381 feet Site is located in Flood Zone AE (located inside 100-year flood zone, flood level 383 feet). Difference = 2 feet below Guadalupe River 100-year flood level.
Guadalupe 2	5	Site elevation = 205 feet A gaging station west of Cuero, TX (~12 miles west of the site) had a recent river level = 137 ft (flood stage is 153 feet). Difference = 52 feet above Guadalupe River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone).
San Antonio 1	3	Site elevation = 73 feet A gaging station on the Guadalupe River near Bloomington, TX (~7 miles north of the site) had a recent river level = 10 ft (flood stage is 20 feet). Difference = 53 feet above Guadalupe River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone), with some areas near Flood Zone A (located inside 100-year flood zone).

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
Colorado 1	3	Site elevation = 747 feet Normal pool elevation of the Colorado River (Lake Travis) = 681 feet Site is located in Flood Zone X (located outside 100/500-year flood zone), with adjacent areas in Flood Zone X (located inside 500-year flood zone) and Flood Zone AE (located inside 100-year flood zone at elevation of 722 feet). Difference = 25 feet above 100-year flood zone.
Colorado 2	3	Site elevation = 420 feet A gaging station on the Colorado River near Bastrop, TX (~6 miles southeast of the site) had a recent river level = 310 ft (flood stage is 330 feet). Difference = 90 feet above Colorado River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone), with adjacent areas in Flood Zone A (located inside 100-year flood zone, Big Sandy Creek).
Colorado 3	3	Site elevation = 285 feet A gaging station on the Colorado River near LaGrange, TX (~8 miles west of the site) had a recent river level = 214 ft (flood stage is 236 feet). Difference = 49 feet above Colorado River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone), with adjacent areas in Flood Zone AE (located inside 100-year flood zone at elevation of 240 feet). Difference = 45 feet above 100-year flood zone.
Colorado 4	3	Site elevation = 117 feet A gaging station on the Colorado River near Wharton, TX (~8 miles east of the site) had a recent river level = 62 ft (flood stage is 92 feet). Difference = 25 feet above Colorado River flood level. Site is located in Flood Zone X (located inside 500-year flood zone), with adjacent areas in Flood Zone AE (located inside 100-year flood zone at elevation of 113 feet). Difference = 4 feet above 100-year flood zone.

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
South Texas Project	5	Site elevation = 29 feet A gaging station on the Colorado River near Markham, TX (~12 miles north of the site) had a recent river level = 4 ft (flood stage is 44 feet). Note that the elevation decline in the 12 miles between the gaging station and the site is such that the flood stage at the gaging station is not indicative of the conditions observed at the site. Site is located in Flood Zone C (located outside 100/500-year flood zone).
Brazos 1	3	Site elevation = 898 feet A gaging station on the Brazos River near Palo Pinto, TX (~7 miles west of the site) had a recent river level = 836 ft (flood stage is 850 feet). Difference = 48 feet above Brazos River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone), with adjacent areas in Flood Zone A (located inside 100-year flood zone).
Brazos 2	5	Site elevation = 848 feet A gaging station on the Brazos River near Dennis, TX (~6 miles northeast of the site) had a recent river level = 700 ft (flood stage is 723 feet). Difference = 125 feet above Brazos River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone).
Brazos 3	1	Site elevation = 434 feet A gaging station on the Brazos River near Waco, TX (~9 miles northwest of the site) had a recent river level = 351 ft (flood stage is 376 feet). Difference = 58 feet above Brazos River flood level. Site is located in Flood Zone A (located inside 100-year flood zone).
Brazos 4	1	Site elevation = 270 feet FEMA FIRM is unavailable. Area topography and site location between the Brazos and Little Rivers suggests that area is prone to flooding. Site is assumed to be located in the 100-year flood zone.

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
Brazos 5	5	Site elevation = 200 feet A gaging station on the Brazos River near Hempstead, TX (~9 miles south of the site) had a recent river level = 119 ft (flood stage is 158 feet). Difference = 42 feet above Brazos River flood level. FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding provided flood influence of Doe Run is minimal. Site is assumed to be located outside the 100/500-year flood zone.
Allens Creek	5	Site elevation = 143 feet Brazos River @ Richmond, TX flood stage = 76 feet. Difference = 67 feet above flood stage. Site is located in Flood Zone X (outside 100/500-year flood zone).
Brazos 6	5	Site elevation = 51 feet A gaging station on the Brazos River near Rosharon, TX (~7 miles northwest of the site) had a recent river level = 7 ft (flood stage is 43 feet). Difference = 8 feet above Brazos River flood level. Site is located in Flood Zone X (outside 100/500-year flood zone).
Trinity 1	3	Site elevation = 334 feet A gaging station on the Trinity River near Rosser, TX (~11 miles northwest of the site) had a recent river level = 302 ft (flood stage is 329 feet). Difference = 5 feet above Trinity River flood level. FEMA FIRM is unavailable. Area topography suggests that the area may be prone to flooding. Site is assumed to be located near the border of the 100-year flood zone.
Malakoff	1	Site elevation = 264 feet A gaging station on the Trinity River near Trinidad, TX (~4 miles west of the site) had a recent river level = 245 ft (flood stage is 268 feet). Site is located in Flood Zone A (inside 100-year flood zone).

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
Trinity 2	5	Site elevation = 306 feet FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding. Site is assumed to be located outside the 100/500-year flood zone.
Trinity 3	1	Site elevation = 184 feet A gaging station on the Trinity River near Crockett, TX (~5 miles southeast of the site) had a recent river level = 150 ft (flood stage is 182 feet). Difference = 2 feet above Trinity River flood level. FEMA FIRM is unavailable. Area topography suggests that area is prone to flood potential. Site is assumed to be located in the 100-year flood zone.
Trinity 4	1	Site elevation = 160 feet FEMA FIRM is unavailable. Area topography suggests that area is prone to flooding. Site is assumed to be located in the 100-year flood zone.
Neches 1	5	Site elevation = 323 feet A gaging station on the Neches River near Jacksonville, TX (~6 miles north of the site) had a recent river level = 278 ft (flood stage is 276 feet). Difference = 47 feet above Neches River flood level. Site is located outside of Flood Zone A (outside 100/500-year flood zone).
Neches 2	5	Site elevation = 253 feet A gaging station on the Neches River near Alto, TX (~8 miles northwest of the site) had a recent river level = 214 ft (flood stage is 214 feet). Difference = 39 feet above Neches River flood level. Site is located outside of Flood Zone A (outside 100/500-year flood zone).

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
Neches 3	3	Site elevation = 137 feet A gaging station on the Neches River near Diboll, TX (~11 miles west of the site) had a recent river level = 95 ft (flood stage is 114 feet). Difference = 23 feet above Neches River flood level. Site is located on the border of Flood Zone A (border of 100-year flood zone).
Angelina 1	5	Site elevation = 265 feet A gaging station on the Angelina River near Alto, TX (~11 miles northwest of the site) had a recent river level = 174 ft (flood stage is 175 feet). Difference = 90 feet above Angelina River flood level. Site is located outside of Flood Zone A (outside 100/500-year flood zone).
Sabine 1	3	Site elevation = 386 feet A gaging station on the Sabine River near Gladewater, TX (~8 miles east of the site) had a recent river level = 252 ft (flood stage is 270 feet). Difference = 116 feet above Sabine River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone), with adjacent areas in Flood Zone A (located inside 100-year flood zone).
Sulphur 1	5	Site elevation = 334 feet A gaging station on the Sulphur River near Talco, TX (~6 miles southwest of the site) had a recent river level = 284 ft (flood stage is 295 feet). Difference = 39 feet above Sulphur River flood level. FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding. Site is assumed to be located outside the 100/500-year flood zone.
Red 1	5	Site elevation = 900 feet A gaging station on the Red River near Terral, OK (~6 miles southeast of the site) had a recent river level = 777 ft (flood stage is 792 feet). Difference = 108 feet above Red River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone.

Criterion P2 – Flooding		
Site	**Rating**	**Comments and Discussion**
Red 2	5	Site elevation = 629 feet Site is located in Flood Zone X (located outside 100/500-year flood zone. FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding. Site is assumed to be located outside the 100/500-year flood zone.
Red 3	1	Site elevation = 396 feet A gaging station on the Red River near Arthur City, TX (~8 miles west of the site) had a recent river level = 380 ft (flood stage is 402 feet). Site is located in Flood Zone A (inside 100-year flood zone).
Coastal 1	3	Site elevation = 30 feet Site is located in Flood Zone C (on border of 100/500-year flood zone).
Coastal 2	3	Site elevation = 9 feet Site is located on the border of Flood Zone B (500-year flood zone).

References:

FEMA Digital Flood Insurance Rate Maps, http://www.msc.fema.gov.

Google Earth, http://earth.google.com.

NOAA Stream and Flood Data, http://www.weather.gov/ahps/.

USGS Real-Time Water Data for Texas, http://waterdata.usgs.gov/tx/nwis/rt

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Nueces 1 (Live Oak County) 11,349 (2007) 12,309 (2000) -7.8% decline 11.9 psm [2000 data]	5	1	3	4	Towns within 5 miles: • George West, 4 miles (2,524) Towns within 10 miles: • Three Rivers, 6.4 miles (1,878) Towns within 30 miles: • Beeville, 26 miles (13,129) • Mathis, 28 miles (5,034) Closest major metropolitan area: • San Antonio (1,296,682 – 2006 est.) – over 50 miles away
Nueces 2 (San Patricio County) 68,520 (2007) 67,138 (2000) 2.1% growth rate 97.0 psm	4	3	3	3	No incorporated towns within 10 miles. Towns within 15 miles: • Mathis, 10.5 miles (5,034) • Robstown, 12.5 miles (12,727) • Sinton, 13.6 miles (5,676) • Orange Grove, 13 miles (1,288) Towns within 30 miles: • Corpus Christi, 20 miles (285,267) • Alice, 26 miles (19,010) • Kingsville, 30 miles (25,575) Closest major metropolitan area: • Corpus Christi, 20 miles (285,267 – 2006 est.)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Guadalupe 1 (Guadalupe County) 112,777 (2007) 89,023 (2000) 26.7% growth rate 125.2 psm	3	3	3	3	No incorporated towns within 10 miles. Unincorporated towns within 10 miles (no USCB population data): Belmont, 4.8 miles; Leesville, 7.2 miles; Dewville, 9.7 miles; Monthalia, 9.7 miles; Bebe, 10 miles. Towns within 15 miles • Kingsbury, 10.1 miles (652) • Oak Forest, 10.7 miles [no data] • Seguin, 11.6 miles (22,011) Towns within 20 miles: • Gonzales, 18.9 miles (7,202) • McQueeney, 18 miles (2,527) • Marion, 23 miles (1,099) Closest Metropolitan Area: • San Antonio, 38 miles to west (1,296,682 – 2006 est.); Universal City, 30 miles (14,849) [San Antonio suburb]
Guadalupe 2 (DeWitt County) 19,730 (2007) 20,013 (2000) -1.4% decline 22 psm	5	3	4	4	No incorporated towns within 10 miles. Unincorporated towns within 10 miles: (Verhella, 3.6 miles; Thomaston, 2.7 miles; Nursery, 7.8 miles – but no USCB population data]. Towns within 15 miles: • Cuero, 10.1 miles (6,571) Towns within 20 miles • Victoria, 15.6 miles (62,169 – 2006 est.) • Yoakum, 17.6 miles (5,731) Towns within 30 miles: • Goliad, 30 miles (1,975) • Hallettsville, 30 miles (2,345)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
San Antonio 1 (Victoria County) 86,291 (2007) 84,088 (2000) 2.6% growth rate 95.2 psm	4	2	3	3	No incorporated towns within 5 miles. Unincorporated towns within 5 miles: McFaddin at 2.3 miles but no USCB population data. Towns within 10 miles: • Bloomington, 8 miles (2,562) Towns within 15 miles: • Victoria, 14.9 miles (62,169 – 2006 est.) • Guadalupe, 12 miles; Aloe, 12.9 miles; Placedo, 13.4 miles (no population data for these towns) Towns within 20 miles: • Austwell, 16.7 miles (192) Towns within 25 miles: • Port Lavaca, 22.7 miles (12,035)
Colorado 1 (Burnet County) 43,689 (2007) 34,147 (2000) 27.9% growth rate 34.3 psm	5	1	3	3	Towns within 5 miles: • Spicewood, 5.0 miles; Smithwick 3.9 miles [no population data] • Marble Falls, 5 miles (4,959) Towns within 20 miles: • Kingsland, 17 miles (4,584) • Leander, 20.9 miles (7,596) Towns within 30 miles: • Cedar Park, 22.8 miles (26,049) Towns within 35 miles: • Austin, 30-35 miles (709,893 – 2006 est.) • Round Rock, 31.7 miles (61,136) • Georgetown, 31.7 miles (28,339) Closest Metropolitan Area: • Austin at 30 to 35 miles (to western suburb)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Colorado 2 (Bastrop County) 72,248 (2007) 57,733 (2000) 25.2% growth rate 65 psm	4	2	3	3	No incorporated towns within 5 miles. Unincorporated towns within 5 miles include: Phelan at 2.9 miles, Sayersville at 3.5 miles, and Utley at 4.1 miles) Towns within 10 miles: • Bastrop 5.8 miles (5,340) • Butler, 9.4 miles (no population data) Towns within 15 miles: • Elgin, 10.8 miles (5,700) Towns within 25 miles: • Austin, 20-25 miles (709,893 – 2006 est.) • Pflugerville, 23.8 miles (16,335) Towns within 30 miles: • Taylor, 27 miles (13,575) • Giddings, 25 miles (5,105) Closest Major Metropolitan Area: • Austin at 20-25 miles (to southeastern suburb)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Colorado 3 (Fayette County) 22,537 (2007) 21,804 (2000) 3.4% growth rate 23.0 psm	5	2	3	4	No incorporated towns within 5 miles. Numerous unincorporated town (no population data) surrounding site, including: Gay Hill at 1.7 miles, Halstead at 3.0 miles, Ellinger at 3.6 miles, Joiner at 3.0 miles, Rutersville at 6.4 miles, Oldenberg at 7.8 miles, RekHill at 8.5 miles, and Welmar at 10.9 miles. Towns within 10 miles: • LaGrange, 7.2 miles (4,478) • Fayetteville, 6 miles (261) Towns within 20 miles: • Columbus, 16.1 miles (3,916) Towns within 30 miles: • Brenham, 29.6 miles (13,507) Note: Austin, College Station and Houston are each over 50 miles away.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Colorado 4 (Wharton County) 40,897 (2007) 41,188 (2000) -0.7% decline 37.8 psm	5	2	3	3	No incorporated towns within 5 miles. Numerous unincorporated town (no population data) surrounding site, including: Glen Flora at 3.4 miles, Jones Creek at 5.3 miles, Egypt at 6.4 miles, and New Taiton at 6.8 miles. Towns within 10 miles: • Wharton, 7.2 miles (9,237) • El Campo, 7.6 miles (10,945) Towns within 30 miles: • Bay City, 27 miles (18,667) • Rosenberg, 30 miles (24,043) Towns within 40 miles: • Richmond, 33 miles (11,081) • Sugarland, 40 miles (79,943), suburb of Houston Closest major metropolitan area: • Houston, 53 miles to outer loop of beltway (2,144,491 – 2006 est.)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
South Texas Project (Matagorda County) 37,024 (2007) 37,957 (2000) -2.5% decline 34.1 psm	5	3	4	5	No incorporated towns within 10 miles of site. Unincorporated towns (no population data) within 10 miles include: Buckeye, 6.4 miles; Wadsworth, 7.6 miles; Matagorda, 8.9 miles; Collegeport, 8.9 miles; and Elmaton, 7.8 miles Towns within 15 miles: • Blessing, 10.7 miles (861) • Markham, 10.9 miles (1,138) • Bay City, 12..4 miles (18,667) • Palacios, 13 miles (5,153) Towns within 30 miles: • El Campo, 28.9 miles (10,945) Towns within 40 miles: • Lake Jackson, 40 miles (26,386) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site. Note that Houston is over 60 miles away from the STP site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Brazos 1 (Palo Pinto County) 27,321 (2007) 27,026 (2000) 1.1% growth rate 28.4 psm	5	2	3	3	No incorporated towns within 5 miles of site. Towns within 10 miles: • Graford, 5.0 miles (578) • Mineral Wells, 7.5 miles (16,946) No population data for unincorporated towns of Palo Pinto (10 miles), Salesville (6.7 miles), and Oran (5.5 miles) Towns within 25 miles: • Weatherford, 25.4 miles (19,000) • Jacksboro, 24 miles (4,533) Closest Metropolitan Area: • Dallas-Fort Worth, 45 miles to outer loop (1,232,940/653,320 – 2006 est.)
Brazos 2 (Parker County) 108,687 (2007) 88,495 (2000) 22.8% growth rate 97.9 psm	4	3	3	3	No incorporated towns within 10 miles of site. Unincorporated towns (no population data) include: Dennis, 6 miles; Brazos and Brock, both at 8.2 miles; Bennett, 9.6 miles. Towns within 15 miles: • Mineral Wells, 15 miles (16,946) Towns within 20 miles: • Weatherford, 17.7 miles (19,000) • Granbury, 16.6 miles (5,718) Towns within 30 miles: • Stephenville, 27.4 miles (14,921) Closest Metropolitan Area: • Dallas-Fort Worth, 37 miles to outer loop (1,232,940/653,320 – 2006 est.)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Brazos 3 (McLennan County) 228,123 (2007) 213,517 (2000) 6.8% growth rate 204.9 psm	3	2	2	2	No incorporated towns within 5 miles of site. Unincorporated town of Perry is 3.3 miles from site (no population data). Towns within 10 miles of the site: • Robinson, 9.2 miles (7,845) • Marlin, 9.9 miles (6,628) Towns within 15 miles of the site: • Mart, 10.4 miles (2,273) • Waco, 11.3 miles (121,496) Towns within 30 miles of site: • Groesbeck, 26.4 miles (4,291) • Temple, 32 miles (54,514)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Brazos 4 (Milam County) 24,855 (2007) 24,238 (2000) 2.5% growth rate 23.8 psm	5	2	3	3	No incorporated towns within 5 miles of site. Towns within 10 miles: • Hearne, 9.6 miles (4,690) • Calvert, 8.9 miles (1,426) • Unincorporated towns of Maysfield, 5.7 miles; Hanover, 5.8 miles; Gause, 6.2 miles; and Branchville, 1.1 miles Towns within 15 miles: • Cameron, 12.9 miles (5,634) Towns within 20 miles: • Franklin, 19 miles (1,470) Towns within 30 miles: • Rockdale, 20.6 miles (5,439) • Caldwell, 23 miles (3,449) • Bryan, 25.7 miles (67,266) • College Station, 29 miles (74,125) Towns within 40 miles: • Marlin, 31.5 miles (6,628) • Temple, 38 miles (54,514)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Brazos 5 (Washington County) 32,034 (2007) 30,373 (2000) 5.5% growth rate 49.9 psm	5	2	3	3	No incorporated towns within 5 miles of site. Towns within 10 miles: • Navasota, 9.5 miles (6,789) • Mineral Wells, 7.5 miles (16,946) Towns within 20 miles: • Brenham, 15.8 miles (13,507) • Anderson, 18.5 miles (257) No population data for unincorporated towns of Washington, 4.6 miles; Courtney, 5.2 miles; and Hempstead, 11.5 miles Closest Metropolitan Area: • Houston, 50 miles to outer loop (610) (2,144,491)
Allens Creek (Austin County) 26,610 (2007) 23,590 (2000) 12.8%growth rate 36.1 psm	5	1	3	3	Towns within 5 miles: • Wallis, 4.1 miles (1,172) Towns within 10 miles: • San Felipe, 7.1 miles (868) • Sealy, 6.8 miles (5,248) • Brookshire, 10 miles (3,450) Towns within 15 miles: • East Bernard, 11 miles (1,729) Towns within 20 miles: • Katy, 17.1 miles (11,775) • Bellville, 20 miles (3,794) • Rosenberg, 20 miles (24,043) • Richmond, 20 miles (11,081) Closest Metropolitan Area: • Houston – 35 to 40 miles to outer loop (610/western suburb) (2,144,491)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Brazos 6 (Brazoria County) 294,233 (2007) 241,767 (2000) 21.7% growth rate 174.4 psm	3	2	2	2	No incorporated towns within 5 miles of site. Towns within 10 miles: • West Columbia, 7 miles (4,255) [East Columbia is 7.2 miles but no population data available] Towns within 15 miles: • Angleton, 13.9 miles (18,130) Towns within 20 miles: • Lake Jackson, 17.4 miles (26,386) Towns within 30 miles: • Rosenberg, 22 miles (24,043) • Bay City, 27 miles (18,667) • Wharton, 27.6 miles (9,237) No population data for unincorporated towns of Damon and Otey, 6 miles; and Lockridge, 9.5 miles. Closest Metropolitan Area: • Houston 35 miles to outer loop; 25 miles to southern suburbs (Missouri City and Sugarland) Houston Population is 2,144,491 (2006 est.)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Trinity 1 (Navarro County) 49,396 (2007) 45,124 (2000) 9.5% growth rate 44.8 psm	5	2	3	2	No incorporated towns within 5 miles of site. No population data for unincorporated town of Chatfield (4 miles). Towns within 10 miles: • Rice, 8 miles (798) • Alma, 10 miles (302) Towns within 20 miles: • Ennis, 15.2 miles (16,045) • Corsicana, 15.5 miles (24,485) • Kaufman, 20 miles (6,490) Towns within 35 miles: • Waxahachie, 28.9 miles (21,426) • Athens, 31 miles (11,297) • Lancaster, 31 miles (25,894) Closest Metropolitan Area: • Dallas 33 miles to beltway (1,232,940); 33.8 miles to Dallas eastern suburb Mesquite (124,523). Ratings adjustment: Proximity to Dallas and general development along southern border resulted in an additional ratings deduction for this site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Malakoff (Henderson County) 78,897 (2007) 73,277 (2000) 7.7% growth rate 83.8 psm 50 miles southeast of Dallas	4	1	2	3	Towns within 5 miles: • Trinidad, 3.8 miles (1,091) • Malakoff, 3.7 miles (2,257) Towns within 15 miles: • Cross Roads, 6.6 miles (603) • Athens, 12.8 miles (11,297) • Kerens, 10.6 miles (1,681) Towns within 25 miles: • Corsicana, 25 miles (24,485) Closest Metropolitan Area: • Dallas – 53 miles to beltway (1,232,940) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.
Trinity 2 (Freestone County) 18,797 (2007) 17,867 (2000) 5.2% growth rate 20.4 psm	5	3	4	5	No incorporated towns within 10 miles of site. Towns within 15 miles: • Fairfield, 10.5 miles (3,094) Towns within 20 miles: • Teague, 20 miles (4,557) Towns within 30 miles: • Palestine, 21.7 miles (17,598) • Athens, 28.6 miles (11,297) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Trinity 3 (Leon County) 16,462 (2007) 15,335 (2000) 7.3% growth rate 14.3 psm	5	4	4	5	No incorporated towns within 15 miles. Closest town is Nineveh, at 4.8 miles, but it is unincorporated with no population data. Towns within 20 miles: • Centerville, 17.2 miles (903) • Oakwood, 16.2 miles (471) • Crockett, 16.5 miles (7,141) • Buffalo, 20.8 miles (1,804) • Palestine, 26 miles (17,598) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.
Trinity 4 (Houston County) 22,769 (2007) 23,185 (2000) -1.8% decline 18.8 psm	5	4	4	5	No incorporated towns within 15 miles. Closest towns of Sand Ridge, 2.4 miles; Mapleton, 4.1 miles; and Austonio, 7.3 miles are unincorporated and have no population data. Towns within 20 miles: • Madisonville, 15 miles (4,159) • Centerville, 17.9 miles (903) • Crockett, 21.4 miles (7,141) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Neches 1 (Anderson County) 56,760 (2007) 55,109 (2000) 3.0% growth rate 51.5 psm	4	3	3	4	No incorporated towns within 10 miles of site. Numerous unincorporated towns nearby (with no population data), including: Jarvis (3.8 miles), Neches (5.6 miles), Maydelle (7.4 miles), Kossuth (6.2 miles) and Ironton, (8.3 miles). Towns within 15 miles: • Palestine, 12.3 miles (17,598) • Jacksonville, 13.7 miles (13,868) Towns within 20 miles: • Rusk, 16 miles (5.085) Towns within 35 miles: • Crockett, 33 miles (7.141) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Neches 2 (Cherokee County) 48,169 (2007) 46,659 (2000) 3.2% growth rate 44.4 psm	5	2	3	4	No incorporated towns within 5 miles of site. Unincorporated towns nearby (with no population data) include: Kenard at 10.9 miles and Pollok at 12.1 miles. Towns within 10 miles: • Wells, 7.5 miles (769) • Alto, 10 miles (Alto Town, 1,190; Alto City, 4,384 – appear to be same location) Towns within 30 miles: • Lufkin, 20.6 miles (32,709) • Rusk, 21.5 miles (5,085) • Nacogdoches, 26 miles (29,914) Towns within 35 miles: • Jacksonville, 34.6 miles (13,868) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.
Neches 3 (Angelina County) 82,812 (2007) 80,130 (2000) 3.3% growth rate 99.9 psm	4	3	3	4	No incorporated towns within 10 miles of site. Towns within 15 miles: • Palestine, 12.3 miles (17,598) • Jacksonville, 13.7 miles (13,868) • Rusk, 16 miles (5,085) Towns within 35 miles: • Crockett, 33 miles (7,141) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Angelina 1 (Nacogdoches County) 62,435 (2007) 59,203 (2000) 5.5% growth rate 62.5 psm	4	2	3	4	No incorporated towns within 5 miles of site. Towns within 10 miles: • Wells, 7.1 miles (769) • Unincorporated town of Pollok (no population data) at 6.9 miles Towns within 15 miles: • Nacogdoches, 12 miles (29,914) • Lufkin, 13.4 miles (32,709) • Alto, 15 miles (Town, 1,190; City, 4,384) Towns within 30 miles: • Rusk, 25.3 miles (5,085) Towns within 40 miles: • Jacksonville, 37.5 miles (13,868) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Sabine 1 (Smith County) 198,705 (2007) 174,706 (2000) 13.7% growth rate 188.3 psm	3	1	2	2	Towns within 5 miles: • Midway, 3.4 miles (288) • Big Sandy, 3.9 miles (1,288) Unincorporated towns nearby include: Waters Bluff, 1.8 miles, and Starrville, 3.8 miles, (no population data) Towns within 10 miles: • Hawkins, 7.5 miles (133) • Gladewater, 9.5 miles (6,078) Towns within 15 miles: • White Oak, 13.6 miles (5,624) Towns within 20 miles: • Kilgore, 15.8 miles (11,301) • Gilmer, 16.6 miles (4,799) Towns within 25 miles: • Tyler, 15.5 miles (94,146) • Longview, 22 miles (76,524)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Sulphur 1 (Red River County) 13,108 (2007) 14,314 (2000) -8.4% decline 13.6 psm	5	3	4	5	No incorporated towns within 10 miles. Unincorporated towns (no population data) include: Harts Bluff, 2.2 miles; Boxelder, 5.6 miles; Cuthand, 5.8 miles; Wilkinson, 5.6 miles, and Maples Spring, 5.7 miles. Towns within 15 miles: • Clarksville, 13.2 miles (3,883) Towns within 20 miles: • Mt. Pleasant, 17.8 miles (13,935) Towns within 30 miles: • Mr. Vernon, 22.8 miles (2,286) Towns within 50 miles: • Texarkana, 50 miles (34,782; and 89,306 within MSA, Texas portion) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.
Red 1 (Clay County) 11,119 (2007) 11,006 (2000) 1.0% growth rate 10 psm	5	3	4	4	No incorporated towns within 10 miles of site. Several unincorporated towns (no population data) nearby include: Stanfield (2 miles), Terral (5 miles), Ryan (6.1 miles), Ringgold (9 miles) Towns within 15 miles: • Petrolia, 13.4 miles (782) • Henrietta, 13.4 miles (3,264) • Byers, 13.3 miles (517) Towns within 20 miles: • Waurika, OK, 16 miles (1,988) Towns within 30 miles: • Wichita Falls, 26 miles (99,354)

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Red 2 (Fannin County) 33,067 (2007) 31,242 (2000) 5.8% growth rate 35.1 psm	5	1	3	3	Nearby unincorporated towns (no population data) include: Ambrose and Penland, 2.5 miles, Mulberry, 6.5 miles, and Raverne, 7 miles. Towns within 5 miles: • Bells, 3.7 miles (1,190) • Savoy, 3.7 miles (850) Towns within 15 miles: • Whitewright, 10.1 miles (1,740) • Bonham, 13.7 miles (9,990) • Denison, 13.7 miles (22,773) • Sherman, 14.3 miles (35,082) [Note that the Sherman-Denison MSA has a population of 110,595] Towns within 25 miles: • Durant, OK, 22.7 miles (13,549) Note that Dallas is 55 miles to the southwest (1,232,940) to the outer loop. Closer Dallas suburbs are Plano, 46 miles (222,030) and McKinney, 37 miles (54,369).

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Red 3 (Lamar County) 49,255 (2007) 48,499 (2000) 1.6% growth rate 52.9 psm	4	2	3	4	No incorporated towns within 5 miles of site. Nearby unincorporated towns (with no population data) include: Faulkner, 1.2 miles; Slate Shoals, 3 miles; Medill, 5 miles; and Powderly, 9.7 miles [and Shoals and Frogville in Oklahoma]. Towns within 10 miles: • Athens City, 8.5 miles (11,297) Towns within 15 miles: • Fort Towson, OK, 12.3 miles (611) • Hugo, OK, 13 miles (5,536) • Blossom, 12.8 miles (1,439) • Detroit, 14 miles (776) • Paris, 15 miles (25,898) Ratings adjustment: Site received additional point given absence of any major towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	
Coastal 1 (Refugio County) 7,358 (2007) 7,828 (2000) -6.0% decline 10.2 psm	5	1	3	3	Towns within 5 miles: • Bayside, 1.7 miles (360) Towns between 10 and 20 miles: • Woodsboro, 10 miles (1,685) • Rockport, 11.3 miles (7,385) • Refugio, 13 miles (2,941) • Gregory, 13.5 miles (2,318) • Aransas Pass, 15 miles (8,138) • Ingleside, 16.7 miles (9,388, or Ingleside on the Bay, 959) • Portland, 16.6 miles (14,827) • Sinton, 17.4 miles (5,676) Towns within 30 miles: • Corpus Christi, 22 miles (285,267 – 2006 est.) Closest large metropolitan area: • Corpus Christi
Coastal 2 (Matagorda County) 37,024 (2007) 37,957 (2000) -2.5% decline 34.1 psm	5	1	3	4	Towns within 5 miles: • Palacios, 4.6 miles (5,153) • Unincorporated towns of Collegeport, 5.3 miles, and Matagorda, 11.4 miles (no population data) Towns within 25 miles: • Bay City, 25 miles (18,667) Ratings adjustment: Site received additional point given absence of any large towns within 40 miles of site.

Criterion P3 – Population					
Site and County Population (2000 and 2007)	**Rating**				**Comments and Discussion (Incorporated town/city data is for 2000)**
	County Density	**Closest Population Center**	**Average Rating***	**Adjusted Rating****	

Notes:

* Average of rating based on host county population density and rating based on distance to nearest population center (identified using screening map and USGS 1:100,000 scale topographic map).

** Point added if no densely populated area is found within 40 miles of the site; point deducted if a densely populated area is found within 15 miles of the site or if a large grouping of densely populated areas are located within 15-40 miles of the site.

References:

AAA California State Map.

Google Earth, http://earth.google.com.

Rand McNally Road Atlas, 2007.

STP Population Regional Screening Map, March 2007.

U.S. Census Bureau (2000 Census data).

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Nueces 1	2	Airports: No major metropolitan airport within 10 miles; Live Oak County airport located 4 miles east of the site. Rail: Rail is located ~ 2.2 miles northeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: Site is located near the Clayton Oil Field, the West George West Oil Field, the Harris Oil Field, and the Oak Valley-Wilcox Gas Field. Numerous (at least 5) pipelines are located within 5 miles of the site (running southwest-northeast). Other: The Three Rivers gas plant is located 3 miles northeast of the site. The Valero Energy Corp. Three Rivers Refinery is located 6 miles north of the site. The Three Rivers and Corpus Christi refineries are connected by a 70-mile pipeline, which has the capacity to deliver 120,000 barrels per day of crude oil (http://www.valero.com/AboutUs/Refineries/ThreeRivers.htm). Mining/Gravel pits are located 3 miles northwest of the site and 4 miles north of the site.
Nueces 2	3	Airports: No major metropolitan airport within 10 miles; San Patricio International airport (private) located 4 miles west of the site. Rail: Rail is located ~ 0.6 miles northeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: Site is located near the Odem Oil Field. 4 pipelines are located within 5 miles of the site (3 running southwest-northeast, 1 running southeast-northwest). Other: Mining/Gravel pits are located 3 miles south of the site. Site is located ~ 2 miles southwest of Interstate 37.
Guadalupe 1	3	Airports: No major metropolitan airport within 10 miles; Randolph AFB located 9 miles northwest of the site. Smaller landing strips are also located in the site vicinity (nearest is located 2 miles northwest of the site). Rail is located ~ 9.6 miles north of the site. This rail line is operated by Union Pacific RR (Amtrak and Burlington Northern Santa Fe have trackage rights) and supports passenger service. Pipelines within 5 miles: 4 pipelines are located within 5 miles of the site (3 running southwest-northeast, 1 running southeast-northwest). Other: Randolph AFB is located 9 miles northeast of the site. Mining/Gravel pits are located 1 mile north, 3 miles northwest, and 5 miles east of the site.

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Guadalupe 2	2	Airports: No major metropolitan airport within 10 miles; Cuero Municipal airport located 9 miles northwest of the site. Rail is located ~ 2.3 miles southwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway and Texas Mexican Railway have trackage rights) and does not support passenger service. Pipelines within 5 miles: Site is located near the Jennie Bell Oil Field, the Helen Gohlke Oil Field, the Thomaston Oil Field, the Verhelle Oil Field, and the Richard Adcock Gas Field. Numerous (at least 5) pipelines are located within 5 miles of the site (running southwest-northeast and southeast-northwest). Other: Thomaston Compressor Station is located 2 miles south of the site. Sam Rayburn power plant is located 7 miles south of the site. Mining/Gravel pits are located 4 miles east and 5 miles northwest of the site.
San Antonio 1	3	Airports: No major metropolitan airport or regional airport within 10 miles. Rail is located ~ 2.0 miles northwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway, Burlington Northern Santa Fe, and Texas Mexican Railway have trackage rights) and does not support passenger service. Pipelines within 5 miles: Site is located near the McFaddin Oil and Gas Field and the Anqua Oil Field. Numerous (at least 5) pipelines are located within 5 miles of the site (running southwest-northeast). Other: Victoria Barge Canal port is located 7 miles northeast of the site. Air Liquide Victoria plant is located 7 miles northeast of the site. Other industrial facilities located > 10 miles southeast of the site.
Colorado 1	4	Airports: No major metropolitan airport within 10 miles. Horseshoe Bay airpark located 9 miles west of the site, and three landing strips located 2 miles northeast and 4 miles and 6 miles southeast of the site. Rail is located ~ 5.3 miles northwest of the site (across the Colorado River). This rail line is operated by Austin Area Termina RR and does not support passenger service. Pipelines within 5 miles: None identified. Other: Thomas C. Ferguson power plant is located 10 miles west of the site. Mining/Gravel pits are located 4 miles north and 4 miles and 6 miles southwest of the site.

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Colorado 2	3	Airports: No major metropolitan airport or regional airport within 10 miles. Rail is located ~ 1.8 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running west-east and southwest-northeast). Other: Camp Swift Military Reservation (including landing strip) is located 5 miles northeast of the site. Bastrop Energy Center is located 6 miles southeast of the site. Mining/Gravel pits are located 2 miles south and 4 miles west of the site.
Colorado 3	2	Airports: No major metropolitan airport within 10 miles. Guenther Field LaGrange Municipal airport located 9 miles west of the site, and Fayette Regional Air Center located 12 miles east of the site. Rail is located ~ 1.8 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 1 pipeline is located within 5 miles of the site (running west-east). Other: Fayette Power Project is located 4 miles north of the site. Mining/Gravel pits are located 1 mile and 3 miles southwest, 3 miles northeast, 4 miles northwest, 5 miles west, 6 miles southeast, and 8 miles northeast of the site.
Colorado 4	2	Airports: No major metropolitan airport within 10 miles. Wharton Municipal airport located 6 miles southeast of the site and two small landing strips located 7 miles west of the site. Rail is located ~ 5.0 miles southeast of the site. This rail line is operated by Texas Mexican Railway (Kansas City Southern Railway has trackage rights) and does not support passenger service. Rail is also located ~ 3.4 miles northeast of the site (across the Colorado River). This rail line is operated by KCT Railway and does not support passenger service.. Pipelines within 5 miles: Site located near several oil fields. Numerous (at least 5) pipelines are located within 5 miles of the site (running southwest-northeast). Other: Mining/Gravel pits are located 4 miles southwest of the site.

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
South Texas Project	4	Airports: No major metropolitan airport or regional airport within 10 miles. Rail is located ~6.7 miles north of the site. This rail line is served by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 1 pipeline is located within 5 miles of the site (running west-east). Other: Site adjacent to existing South Texas Plant nuclear power plant. Celanese Bay City chemical plant is located 5 miles northwest of the site. Equistar Chemicals Matagorda plastics plant is located 7 miles east of the site.
Brazos 1	4	Airports: No major metropolitan airport within 10 miles. Wharton Municipal airport located 6 miles southeast of the site and two small landing strips located 7 miles west of the site. Rail is located ~ 14.0 miles southeast of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 3 pipelines are located within 5 miles of the site (running northwest-southeast and southwest-northeast).
Brazos 2	4	Airports: No major metropolitan airport within 10 miles. Three small landing strips located 7 miles and 8 miles northeast and 9 miles east of the site. Rail is located ~ 8.4 miles northwest of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running southwest-northeast and west-east). Other: Mining/Gravel pits are located 4 miles north of the site.
Brazos 3	2	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 8 miles northwest and 10 miles southeast of the site. Rail is located ~ 4.4 miles east of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: Numerous (at least 5) pipelines are located within 5 miles of the site. Other: Lake Creek power plant is located 2 miles north of the site. Tradinghouse power plant 9 miles north of the site.

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Brazos 4	4	Airports: No major metropolitan airport within 10 miles. Hearne Municipal airport located 8 miles east of the site. Two small landing strips located 5 miles northeast and 10 miles southeast of the site. Rail is located ~ 5.9 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Rail is also located ~ 4.5 miles northeast of the site (across the Brazos River). This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: None identified. Other: Mining/Gravel pits are located 2 miles and 5 miles east and 6 miles north of the site.
Brazos 5	4	Airports: No major metropolitan airport within 10 miles. Navasota Municipal airport located 8 miles north of the site. Rail is located ~ 4.7 miles east of the site (across the Brazos River). This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: None identified. Other: Mining/Gravel pits are located 6 miles and 8 miles southeast, 6 miles northeast, and 7 miles east of the site.
Allens Creek	3	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 4 miles north of the site, one small landing strip is located 4 miles southwest of the site, and two small landing strips located 4 miles southeast of the site. Rail is located ~ 0.5 miles southwest of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running southwest-northeast). Other: Mining/Gravel pits are located 8 miles west of the site. I-10 is located 6 miles north of the site.
Brazos 6	3	Airports: No major metropolitan airport within 10 miles. Three small landing strips located 7-9 miles northwest of the site and one small landing strip is located 7 miles northeast of the site. Rail is located ~ 12.9 miles southeast of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: Site located near the Nash Dome Oil Field and the West Columbia Oil Field. Numerous (at least 5) pipelines are located within 5 miles of the site (running southwest-northeast and northwest-southeast).

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Trinity 1	4	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 7 miles southeast of the site. Rail is located ~ 8.4 miles southwest of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast and north-south). Additionally, 1 aqueduct is located in the vicinity of the site (running northwest-southeast). Other: Mining/Gravel pits are located 1 mile north, 4 miles and 8 miles east, and 6 miles northwest of the site.
Malakoff	3	Airports: No major metropolitan airport within 10 miles. Three small landing strips located 2 miles and 8 miles west and 4 miles east of the site. Rail is located ~ 2.4 miles north of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: Site located near the South Malakoff Oil Field. 4 pipelines are located within 5 miles of the site (running southwest-northeast, west-east, and north-south). Other: Mining/Gravel pits are located 2 miles northeast, 3 miles south, 4 miles and 8 miles east, and 6 miles northwest of the site.
Trinity 2	3	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 3 miles southeast and 3 miles northwest of the site. Rail is located ~ 18.1 miles west of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast and southwest-northeast). Additionally, 1 aqueduct is located in the vicinity of the site (running east-west). Other: Big Brown power plant located 3 miles west of the site. Freestone Power Generation is located 8 miles northwest of the site. Mining/Gravel pits are located 6 miles west and 7 miles south of the site.
Trinity 3	4	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 2 miles north and 3 miles west of the site. Rail is located ~ 14.8 miles northwest of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: Site located near the Navarro Crossing Oil Field. 2 pipelines are located within 5 miles of the site (running north-south).

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Trinity 4	4	Airports: No major metropolitan airport within 10 miles. One small landing strip located 9 miles northwest of the site. Rail is located ~ 15.6 miles east of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Rail is also located ~ 22.5 miles west of the site (across the Trinity River). This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Pipelines within 5 miles: 1 pipeline is located within 5 miles of the site (running west-east). Other: Mining/Gravel pits are located 7 miles west and 8 miles northeast of the site.
Neches 1	4	Airports: No major metropolitan airport within 10 miles. Rail is located ~ 5.5 miles northwest of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: Site located near the Neches Oil Field. 3 pipelines are located within 5 miles of the site (running west-east and southwest-northeast).
Neches 2	5	Airports: No major metropolitan airport within 10 miles. Rail is located ~ 21.5 miles east of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast).
Neches 3	4	Airports: No major metropolitan airport within 10 miles. East Texas Regional airport located 8 miles northeast of site. One small landing strip located 4 miles northeast of the site. Rail is located ~ 10.8 miles northwest of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast).
Angelina 1	3	Airports: No major metropolitan airport within 10 miles. A.L. Mangham Jr. Regional airport located 8 miles east of the site. Three small landing strips located 2 miles north, 3 miles west, and 8 miles southeast of the site. Rail is located ~ 8.6 miles southeast of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 4 pipelines are located within 5 miles of the site (running northwest-southeast and southwest-northeast). Other: Mining/Gravel pits are located 4 miles north and 5 miles northeast of the site.

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Sabine 1	2	Airports: No major metropolitan airport within 10 miles. Ambassador airfield located 5 miles north of the site. Gladewater Municipal airport located 7 miles east of the site. Three small landing strips located 5 miles southwest and 7-8 miles north of the site. Rail is located ~ 3.3 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Rail is also located ~ 3.8 miles north of the site. This rail line is operated by Union Pacific RR (Amtrak and Burlington Northern Santa Fe have trackage rights) and supports passenger service. Pipelines within 5 miles: Site located near the Hawkins Oil Field and the Wright Mountain Oil Field. Numerous (at least 5) pipelines are located within 5 miles of the site. Other: Mining/Gravel pits are located 4 miles northwest of the site.
Sulphur 1	4	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 6 miles southwest and 9 miles east of the site. Rail is located ~ 23.6 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: None identified. Site located near the Trix Liz Oil Field. Other: River Crest power plant is located 11 miles west of the site. Mining/Gravel pits are located 3 miles north of the site.
Red 1	5	Airports: No major metropolitan airport within 10 miles. Rail is located ~ 6.4 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: None identified. Other: Sheppard Air Force Base located 28 miles west of the site.
Red 2	3	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 2 miles south and 6 miles northwest of the site. Rail is located ~ 3.7 miles south of the site. This rail line is jointly operated by Dallas, Garland and Northeastern RR and Texas Northeastern Division and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast and north-south). Other: Valley power plant located 2 miles south of the site. Mining/Gravel pits are located 2 miles north of the site.

Criterion P4 – Hazardous Land Uses		
Site	**Rating**	**Comments and Discussion**
Red 3	4	Airports: No major metropolitan airport within 10 miles. One small landing strip located 3 miles west of the site. Rail is located ~ 8.8 miles west of the site. This rail line is operated by Kiamichi RR and does not support passenger service. Pipelines within 5 miles: None identified. Other: Camp Maxey Texas National Guard (with associated landing strip) located 10 miles southwest of the site. Paris Generating Station located 15 miles southwest of the site.
Coastal 1	4	Airports: No major metropolitan airport within 10 miles. County airport is located 11 miles east of the site. One small landing strip located 10 miles northwest of the site. Rail is located ~ 9.8 miles northwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway, Burlington Northern Santa Fe and Texas Mexican Railway have trackage rights) and does not support passenger service. Pipelines within 5 miles: Site located near the Plymouth Oil and Gas Field, the LaRosa Oil Field, and the Taft Oil and Gas Field. Numerous (at least 5) pipelines are located within 5 miles of the site.
Coastal 2	4	Airports: No major metropolitan airport within 10 miles. Palacios Municipal airport is located 8 miles northwest of the site. One small landing strip located 6 miles north of the site. Rail is located ~ 11.5 miles northeast of the site at the South Texas Project nuclear power plant. This rail line is served by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 1 pipeline is located within 5 miles of the site (running southwest-northeast). Other: South Texas Project nuclear power plant located 12 miles northeast of the site.

References:

Google Earth, http://earth.google.com.

North American Railroad Map, version 3.0, http://www.RailroadMap.com.

Rand McNally Road Atlas, 2007.

U.S. EPA Envirofacts Data Warehouse, http://www.epa.gov/enviro/.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

Criterion P5 – Ecology/Federal RTE Species		
Site	**Rating**	**Comments and Discussion (See notes at end of table)**
Nueces 1	4	Live Oak County 5 T&E species: 2 birds; 3 mammals [FWS has 3: 2 mammals, 1 bird]
Nueces 2	2	San Patricio County 14 T&E species: 5 birds; 4 mammals; 5 reptiles [FWS has 11: 3 birds, 3 mammals, 5 reptiles]
Guadalupe 1	4	Guadalupe County 3 T&E species: 2 birds; 1 mammal [FWS has 1: 1 bird]
Guadalupe 2	4	De Witt County 3 T&E species: 2 birds; 1 mammal [FWS has 1: 1 bird]
San Antonio 1	4	Victoria County 5 T&E species: 4 birds; 2 mammals [FWS has 3: 3 birds]
Colorado 1	3	Burnet County 8 T&E species: 1 arachnid; 4 birds; 2 mammals; 1 reptile [FWS has 5: 1 arachnid and 4 birds]
Colorado 2	3	Bastrop County 5 T&E species: 1 amphibian; 2 birds; 1 mammal; 1 plant [FWS has 4: 1 amphibian, 2 birds, 1 flowering plant] Ratings adjustment: A portion of the site appears to be just outside (or possibly within) critical habitat for the Houston toad, which extends between towns of Bastrop and Sayersville on east side of Rt. 95. The largest population of this species is currently found in Bastrop County on state lands within Bastrop and Buescher State Park and an adjacent nature preserve (including wetlands area north of Colorado River). Initial rating of 4, based on number of species, was reduced by one point because of proximity to critical habitat [there appears to be sufficient flexibility in siting to avoid critical habitat, thus not warranting the lowest rating of 1].
Colorado 3	4	Fayette County 4 T&E species: 2 birds; 1 mammal; 1 plant [FWS has 3: 2 birds and 1 flowering plant]
Colorado 4	4	Wharton County 5 T&E species: 3 birds; 2 mammals [FWS has 2: 2 birds]

Criterion P5 – Ecology/Federal RTE Species		
Site	**Rating**	**Comments and Discussion (See notes at end of table)**
South Texas Project	3	Matagorda County 14 T&E species: 5 birds; 4 mammals; 5 reptiles (all sea turtles) [FWS has 10: 5 birds and 5 reptiles, all sea turtles] Note that nearby coastal area has been designated as critical habitat for the piping plover[1] and essential fish habitat for various species[2]. However, since development of additional units at the STP site would not include construction within, or water withdrawal directly from, the Gulf of Mexico, no impacts are expected to protected habitat in the Gulf or to the coastal T&E species (5 species of sea turtles). As a result, the 5 sea turtle species were deducted from the species total. Ratings adjustment: In light of the above, the species count has been adjusted to 9 species, resulting in a revised rating of 3, and no additional deduction is made relating to proximity to protected habitat in the Gulf since no construction would occur in this habitat.
Brazos 1	3	Palo Pinto County 6 T&E species: 4 birds; 2 mammals; plus 2 candidate fish species [FWS has 4: 4 birds, plus 2 candidate fish species]
Brazos 2	4	Parker County 5 T&E species: 3 birds; 2 mammals; plus 2 candidate fish species [FWS has 3: 3 birds]
Brazos 3	4	McLennan County 4 T&E species: 3 birds; 1 mammal; plus 2 candidate fish species [FWS has 4: 4 birds, including delisted bald eagle and experimental population of whopping crane]
Brazos 4	4	Milam County 5 T&E species: 1 amphibian; 2 birds; 1 mammal; 1 plant; plus 2 candidate fish species [FWS has 5: 3 birds, 1 amphibian, and 1 plant – birds include delisted bald eagle and experimental whopping crane population , plus 1 candidate fish species]
Brazos 5	3	Washington County 6 T&E species: 1 amphibian; 2 birds; 2 mammals; 1 plant; plus 2 candidate fish species [FWS has 4 species: 3 birds – including delisted bald eagle and experimental whopping crane population, and 1 flowering plant; plus 1 candidate fish species]
Allens Creek	3	Austin County 6 T&E species: 1 amphibian; 3 birds; 2 mammals [FWS has 4: 3 birds and 1 amphibian, plus 2 candidate fish species]

Criterion P5 – Ecology/Federal RTE Species		
Site	**Rating**	**Comments and Discussion (See notes at end of table)**
Brazos 6	3	Brazoria County 14 T&E species: 4 birds; 5 mammals; 5 reptiles (all sea turtles) plus 1 candidate fish species (only count sea turtles if site on coast/uses coastal water) [FWS has 9: 4 birds and 5 reptiles (all sea turtles)] Ratings adjustment: It is assumed that no construction at this site would occur in the Gulf of Mexico such that no coastal sea turtles would be affected from site development; as a result the species total is reduced to 9 species and the rating was raised to a 3.
Trinity 1	4	Navarro County 4 T&E species: 3 birds; 1 mammal [FWS has 2: 2 birds]
Malakoff	4	Henderson County 4 T&E species: 3 birds; 1 mammal; plus 1 mammal (Black bear T/SA; NL – not listed and therefore not included in total count) [FWS has 1 species: 1 bird]
Trinity 2	3	Freestone County 7 T&E species: 1 amphibian; 3 birds; 1 mammal; 2 plants [FWS has 5: 3 birds and 2 plants]
Trinity 3	3	Leon County 7 T&E species: 1 amphibian; 2 birds; 2 mammals; 2 plants]FWS has 6: 3 birds – including delisted bald eagle and experimental population of whopping cranes, 2 plants, 1 amphibian]
Trinity 4	4	Houston County 5 T&E species: 3 birds; 2 mammals; plus 1 mammal (Black bear T/SA; NL); plus 1 candidate plant species and 1 candidate reptile species [FWS has 2: 2 birds, plus 1 candidate plant species]
Neches 1	3	Anderson County 6 T&E species: 3 birds, 2 mammals; 1 plant; plus 1 mammal (Black bear T/SA; NL); plus 1 candidate reptile species [FWS has 3: 1 bird, 1 mammal, 1 plant]
Neches 2	4	Cherokee County 5 T&E species: 3 birds; 2 mammals; plus 1 mammal (Black bear T/SA; NL); plus 1 candidate plant species and 1 candidate reptile species [FWS has 3: 2 birds, 1 mammal; plus 1candidate plant species and 1 candidate reptile species]
Neches 3	4	Angelina County 5 T&E species: 3 birds, 2 mammals, plus 1 mammal (Black bear T/SA; NL); plus 1 candidate reptile species [FWS has 3: 2 birds and 1 mammal; plus 1 candidate reptile species]

Criterion P5 – Ecology/Federal RTE Species		
Site	**Rating**	**Comments and Discussion (See notes at end of table)**
Angelina 1	4	Nacogdoches County 4 T&E species: 2 birds, 2 mammals, plus 1 mammal (Black bear T/SA; NL); plus 1candidate reptile species [FWS has 3: 2 birds, 1 mammal; plus 1 candidate reptile species and 1 candidate flowering plant species]
Sabine 1	4	Smith County 3 T&E species: 2 birds; 1 mammal; plus 1 mammal (Black bear T/SA; NL); plus 1 candidate reptile species [FWS has 2 species: 1 bird and 1 mammal]
Sulphur 1	4	Red River County 5 T&E species: 2 birds; 1 insect; 1 mammal; and 1 mollusk, plus 1 mammal (Black bear T/SA; NL) [FWS has 3: 2 birds and 1 insect]
Red 1	4	Clay County 4 T&E species: 2 birds; 2 mammals [FWS has 3: 3 birds including delisted bald eagle and experimental whopping crane population]
Red 2	4	Fannin County 5 T&E species: 3 birds; 1 insect; 1 mammal; plus 1 mammal (Black bear T/SA; NL) [FWS has 3: 2 birds and 1 mammal]
Red 3	3	Lamar County 6 T&E species: 3 birds, 1 insect; 2 mammals; plus 1mammal (Black bear T/SA; NL) [FWS has 4: 2 birds, 1 mammal, 1 insect]
Coastal 1	1	Refugio County 15 T&E species: 5 birds; 4 mammals; 1 plant; 5 reptiles (all sea turtles) [FWS has 14: 5 birds, 3 mammals, 5 reptiles, and 1 plant] Note: cooling water withdrawal from Gulf of Mexico could adversely impact piping plover critical habitat[1] and essential fish habitat for various species[2], all of which are found along the Texas coastline near the site. Site rating was reduced an additional point to address this concern.

Criterion P5 – Ecology/Federal RTE Species		
Site	**Rating**	**Comments and Discussion (See notes at end of table)**
Coastal 2	1	Matagorda County 14 T&E species: 5 birds; 4 mammals; 5 reptiles (all sea turtles) [FWS has 10: 5 birds and 5 reptiles, all sea turtles] Ratings adjustment: cooling water withdrawal from Gulf of Mexico could adversely impact piping plover critical habitat[1] and essential fish habitat for various species[2], all of which are found along the Texas coastline near the site. Site rating was reduced an additional point to address this concern.

Criterion P5 – Ecology/Federal RTE Species		
Site	**Rating**	**Comments and Discussion (See notes at end of table)**

Note: Evaluations were based on total number of Federally listed threatened and endangered species only, as identified by Texas Parks and Recreation database. USFWS species totals are also provided for reference [brackets]. Note that data presented from State (Texas Parks and Recreation) and Federal (U.S. Fish and Wildlife Service, southwest region) are not consistent. State data generally appears to be more inclusive (thus higher totals), including species that have been delisted or not been sighted for many years. More conservative State data were used in the evaluation, although the following species were not counted in final tally: candidate species, Federally delisted species; or species included because of similarity in appearance but occurrence not threatened or endangered. Species proposed for Federal listing are included.

[1] Various units of critical habitat for piping plover are scattered along the Texas coastline that could be adversely affected by withdrawing cooling water from the Gulf of Mexico. This includes units near Port Aransas (Refugio County, Coastal 1 site) and Matagorda Island (Matagorda County, Coastal 2 site).

[2] Essential Fish Habitat (EFH) is special protected habitat designated by NOAA National Marine Fisheries Service. It can consist of both the water column and the underlying surface (e.g. seafloor) of a particular area. Areas designated as EFH contain habitat essential to the long-term survival and health of our nation's fisheries. Certain properties of the water column such as temperature, nutrients, or salinity are essential to various species. Some species may require certain bottom types such as sandy or rocky bottoms, vegetation such as seagrasses or kelp, or structurally complex coral or oyster reefs. EFH includes those habitats that support the different life stages of each managed species. A single species may use many different habitats throughout its life to support breeding, spawning, nursery, feeding, and protection functions. EFH encompasses those habitats necessary to ensure healthy fisheries now and in the future. http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/index_a.htm. Essential fish habitat has been designated within the Gulf of Mexico along the Texas coastline for the following species: Reef fish, Red drum, Stone crab, Shrimp, and coastal migratory pelagic fish http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx.

References:

Texas Parks and Wildlife Department; http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species/, March 14, 2009, Rare, Threatened and Endangered Species of Texas by County.

U.S. Fish and Wildlife Service, Southwest Region, Texas, http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm, Species list for Texas, by county, March 19, 2009.

Critical habitat data found in USFWS species lists, as well as at FWS website (which also allows access to / search by state and county and species) critical habitat mapper for selected species whose critical habitat has been digitized): http://criticalhabitat.fws.gov/.

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Nueces 1	5 percent or less (300 acres, associated with onsite stream)	4	No digitized wetlands data for this site. Site lies south and west of the Nueces River Salt Branch, which is a major drainage running through site. Based on satellite photos (Google Earth), wetland areas may be associated with Salt Branch, especially in the middle of the site. However, extensive linear features within this same area (possible pipelines) indicate previous disturbance. The southeast portion of the site has been cleared. Assuming wetlands are found along South Branch, a conservative estimate is that 5% of the site could be covered in wetlands.
Nueces 2	< 2 acres	5	Only 1 small wetland appears within site area, and it is approximately 1.7 acres. A small creek (Hondo Creek) is also found in the northeastern portion of the site.
Guadalupe 1	300-600 acres	3	No digitized wetlands data. Guadalupe River runs through the northern portion of the site area, and both sides of the river are forested. The area immediately surrounding the site center point is cleared and appears to be farmed. A few isolated ponds appear to be scattered in southern portion of the site based on USGS Quad maps. Satellite photos show the southern portion of the site to be forested. Additional drainages (intermittent) were identified south of the Guadalupe River in the eastern portion of the site (from Quad maps). Based on these data and best professional judgment, it is assumed that wetlands could be associated with the Guadalupe River and other forested onsite drainages. Total acreage is conservatively estimated to be between 5 and 10 percent of the total 6,000 acre area.
Guadalupe 2	< 300 acres (5%)	4	Very few wetlands are found in the eastern portion of the site area which is digitized for wetlands; and this portion includes one of the larger onsite drainages (Price Creek). The largest feature is a freshwater pond and other features adjacent to the pond (possible manmade expansion) that totals 10-15 acres. There are other smaller freshwater emergent wetlands areas scattered in the eastern portion, totaling less than 10 acres; most are 0.1 acre or less in size and they lie in the southeastern portion just south of Price Creek. With respect to the other 75% of the site that is non-digitized for wetlands, no evidence of wetlands except for that which may be associated with the onsite drainage of Reeds Branch (small stream running in western portion of the site) was identified. Satellite photos show another small pond (5-10 acres) west of the site center point. Much of the central portion of the site appears to be forested, with evidence of past timbering operations (much of the site is crossed with dirt roads). The Guadalupe River lies to the west of the site area. Based on these data and best professional judgment, a conservative 100-300 acres of wetlands are estimated on the site (within smaller onsite drainages within forested areas).

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
San Antonio 1	400 acres	3	Numerous freshwater emergent wetlands are found on the site, particularly in the center and along the southeastern portion. Small isolated freshwater ponds are also scattered throughout the western and southern portions. Total acreage is estimated between 300 and 400 acres. Several streams also run through the site, including: Dry Kuy Creek which runs along the northern half of the site, and Kuy Creek that runs along the southwestern portion.
Colorado 1	1-5% (60-300 acres)	4	No digitized wetlands data available for site. The Colorado River runs through the northeastern quadrant of site. Other drainages include Double Horn Creek (runs east and west in western half of the site and empties into the Colorado River) and Gridiron Branch (also located in the western portion of the site and joins the Double Horn Creek to the north). Any wetland areas would appear to be associated with the Colorado River and other onsite streams. Satellite photos also show a large pond (likely man made) west of where the Colorado River runs through the site (northeast portion). It is estimated to be approximately 10-20 acres. Numerous intermittent streams and small ponds were also found north and south of Double Horn Creek. While numerous surface water bodies are found onsite, the majority of the site area appears to have been cleared/timbered or otherwise disturbed. Total wetland acreage is estimated to be low, at less than 5%, given the extensive clearing that has been done at the site.
Colorado 2	1-5% (60-300 acres)	4	No digitized wetlands data available for site. Big Sandy Creek is a major drainage running through the middle of the site (north south), draining into the Colorado River to the south of the site. Other small intermittent streams and small isolated ponds are scattered around the site. Big Sandy Creek and Little Sandy Creek merge just to the north of the site, and then flow south through the site to join the Colorado River. The onsite drainages, particularly in the southern portion of the site, are lined with vegetation and are likely to include some wetland areas. Small scattered ponds are also noted throughout the site (satellite photos), likely averaging 1 to 2 acres in size or less. The majority of the site area appears to have been cleared. Total wetland acreage for the site is estimated to be low, at less than 5%, given the extensive clearing found in the area.
Colorado 3	206 acres	4	A portion of the Colorado River runs through the western central portion of the site, although no major wetlands were associated with the river based on the Mapper database, and Colorado riverine acreage is not included in the total wetlands acreage. Another large onsite water body is a 36-acre oxbow lake in the southern portion of the site. The remainder of the site includes small, numerous freshwater emergent wetlands and freshwater ponds scattered throughout the site. The total acreage is conservatively estimated at 170 acres; resulting in site total of approximately 206 acres (170+36). Note that most of the area appears to have been cleared, although there is a small forested area in the central/eastern portion of the site (based on satellite photos).

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Colorado 4	12 acres	5	Onsite streams include the East Fork Jones Creek. A few small scattered wetlands are found onsite; these consist mainly of freshwater emergent and freshwater ponds. Total wetlands are estimated to be approximately 12 acres (or less). The majority of the site area appears to be farmed.
South Texas Project	10 acres	5	Isolated, small, scattered wetland areas totaling approximately 10 acres are found in the northern portion of the site. The site also contains one small lake (man-made, 46 acres) and one large man-made reservoir associated with operations of existing plant. The total reservoir size is 6,952 acres, although only about one third is located within the 6,000 acre site area (2,300 acres). Note that total STP ownership at site is over 12,000 acres. Because the lake and reservoir are both man-made and would remain (and continue to support) two new units at STP – they were constructed to support 4 units, their acreage is not included in the total (i.e., they would not be destroyed/disturbed from new development at site).
Brazos 1	1,200 acres	2	No digitized wetlands data for this site. Data were taken from USGS Quads. Soda Springs Creek runs through the site (east west), and the larger Keech Creek runs along the western portion of the site (north-south run). A small stream was noted to the south of Soda Springs as well but no name was identified. All the onsite streams/drainages appear to be forested (from satellite photos) and could contain wetland areas. Much of the central and southern portions of the site appear to be forested, with cleared areas (farming) in the northwestern and east central portions. Based on these data and best professional judgment, total wetland acreage at the site is assumed to be 15% of the site (1,200 acres), or possibly higher; however, a rating of 2 is assumed to be sufficiently conservative to reflect wetlands presence at the site.
Brazos 2	60-300 acres	4	No digitized wetlands data for this site. Rock Creek runs through the middle of the site and the only wetlands that appear to be onsite are associated with this creek. Hill Creek runs west of site, as seen on Atlas. Overall, the site appears to support very little wetlands. The majority of the site area has been cleared/disturbed (possible timbering). The total wetland acreage is estimated to be less than 5 percent, and most likely at less than 1%. The site rating is based on a conservative wetland acreage total between 60 and 300 acres.

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Brazos 3	>10% (600 to 1,000 acres)	2	No digitized wetlands data for site. Satellite photo resolution is poor at this site. The largest onsite water features appear to be the Brazos River, which runs across the western portion of the site, and Lake Creek Lake in the northwestern portion of the site. Lake Creek Lake is estimated to be over 500 acres in size, with slightly more than half of the lake located within the 6,000 acre site area (estimated at 300 acres). There could also be small wetland areas associated with a small stream/drainage on the eastern side of the site area (Big Sandy Creek runs in north-south direction). Finally, other small freshwater ponds (2-3) appear to be scattered around the center part of the site area (tens of acres each). Based on these data and best professional judgment, the total wetlands acreage is conservatively estimated to be between 600 and 1,000 acres counting Lake Creek Lake (10-15%).
Brazos 4	300 -600 acres	3	No digitized wetlands data for site. Two creeks run through the middle of the site (east-west): Polecat Creek (larger of two) and McLaughlin Creek. Little River runs along the southern edge of the site (just outside the 6,000 acre area). Several other smaller, intermittent streams are also found onsite based on the USGS Quad map. Wetland areas appear to be associated with the onsite streams/drainages, based on satellite photos, mainly in the western half of the site and the northeastern portion of the site. Much of the site area has been cleared, including the areas along both sides of the onsite streams. Based on these data and best professional judgment,, the total wetlands acreage is conservatively estimated to be between 5 and 10% (300 to 600 acres).
Brazos 5	300 -600 acres	3	No digitized wetlands data for site. Doe Run is a major drainage that runs through the middle of the site (north south). There is also a large drainage that runs into the Brazos River south of the site. Much of the site area has been cleared, but heavy vegetation can be seen along the numerous onsite drainages from satellite photos. Wetlands may be associated with these drainages. Based on these data and best professional judgment, the total wetlands acreage is conservatively estimated between 5 and 10% (300 to 600 acres), with a conservative rating of 3 assigned at this time.
Allens Creek	1,000 acres	2	Extensive wetlands are found in the northern portion of the site, all of which appear to be freshwater forested wetlands. Two other large wetland areas are found in the southwestern portion of the site. Total acreage is estimated at 1,000 acres.

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Brazos 6	700 acres	2	Large wetland areas are found primarily in the northern half of the site; these consist mainly of freshwater emergent wetlands. The uppermost portion of Eagle Nest Lake is found in the southeastern portion of the site (estimated at 50 acres of the 2135-acre lake) and a forested wetland area is found within the site area just above the lake along an unnamed stream that cuts across the site (northwest to southeast). Other wetland areas are found along this same stream in the northwestern portion of the site. Total wetland acreage, including Eagle Lake, is estimated at approximately 700 acres.
Trinity 1	300-600 acres	3	No digitized wetlands data for site. The Trinity River is north of the site, and Grays Creek is a major drainage that runs to the south of the site. Based on the Texas Atlas, most of wetlands are associated with the Trinity River to the east of the site area. Several small ponds are located to the south of Grays Creek but not found on site. A quarry area appears to be located in the northwestern part of the site (just below south of Trinity River), and the older Quad maps show wetland areas in the northeastern portion of site that are probably affiliated with the Trinity River. Much of the site area is cleared but some vegetation is noted along the northeastern and southern portions of the site associated with onsite streams. Based on these data and best professional judgment, total wetland acreage is conservatively estimated to be between 5% and 10% (300 to 600 acres).
Malakoff	600 acres	3	No digitized wetlands available for site. Two major drainages occur: Cedar Creek (largest) and Walnut Creek (cuts across largest portion of the site). Several ponds are also scattered around the site area. Drainage areas to the south and north of the site appear to be forested and could include wetland areas. Some of the forested areas appear to have been heavily traversed, however, as cleared paths are seen in satellite photos. The remaining site areas are mostly cleared. Based on these data and best professional judgment, total wetland acreage is estimated to be 10 percent of the site area (up to 600 acres).
Trinity 2	5% (300 acres)	4	No digitized wetlands data for site. Lake Fairfield is found just outside the site area, to the west, and the Trinity River lies just east of the site area. Big Brown Creek lies in the northwest quadrant of the site area. Small isolated ponds were identified along Big Brown Creek. Rock Springs Branch runs through the western half of site (northwest-southeast direction). Based on Atlas, most of wetlands appear to be found along the Trinity River outside of the site area, to the east and northeast closer to the river. The site includes some forested areas along the onsite creeks, and in the eastern half of the site near the Trinity River. Much of the site to the south is also forested; however, an extensive network of roads or cleared swaths cuts through it. Given the level of disturbance found in the general site area, the total wetland acreage is estimated to be low, at 5% or less.

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Trinity 3	300-600 acres	3	No digitized wetlands data for site. Trinity River runs through a small eastern portion of the site. A major drainage cutting across the site (east-west) is Upper Keechi Creek (drains into Trinity River). Haley Creek also runs along the southwestern portion of the site. The USGS Quad map also shows several lakes in the northern part of the site area, between Upper Keechi Creek and the river: Buzzard Lake, the majority of Clear Lake, and a portion of Zeke Lake. Much of the site has been cleared. Wetland areas onsite are most likely associated with the Trinity River and onsite drainages; vegetation was observed (from satellite photos) along these waters. Several large ponds were also noted in satellite photos along eastern side of site and one to the south; these are presumably the same as those seen on the Quad map and more recent Texas Atlas. Total pond acreage is estimated at 200 acres. Based on these data and best professional judgment, and assuming wetland habitat along all onsite rivers and streams, total wetlands acreage is conservatively estimated at 300 to 600 acres.
Trinity 4	60-300 acres	4	No digitized wetlands data for site. The Trinity River borders 3 sides of the site area (north, west, south), and cuts very slightly into the 6,000 acre area in the most southern portion. The majority of the site is cleared and appears to have been farmed. Any wetlands areas were assumed to be associated with the Trinity River or in the two freshwater ponds observed at the site (from satellite photos). Total pond acreage is estimated at 50 acres. Total wetlands acreage is estimated between 1 and 5 percent (60 and 300 acres).

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Neches 1	600 acres	3	No digitized wetlands data for site. The Neches River runs down the far eastern side of the site. Two drainages on-site (cut across in east-west flow) include Hurricane Creek (appears to be same as Wells Creek as named on USGS Quad) and Beech Creek to the south. The Quad map shows wetland areas to the west of the river (and so within the site area), primarily associated with two large ponds just west of the river: Phillips Lake (lying directly east of site center point) where the wetlands extend northward from the lake; and Indian Pond which lies in the southeastern quadrant of the sites area, down towards Rt. 84). Wetland areas near Indian Pond appear to be more extensive than those near Phillips Lake – occurring along lower elevations of the river between the pond and the river. Finally, the Quad map also shows several small freshwater ponds along the western bank of the river and also within the site area. The site is heavily forested, although this site appears to be part of timber operations, with various sections shown as clear-cut (logging roads were also visible throughout site). Onsite wetlands would appear to be associated with the Neches River and other onsite drainages. A couple of freshwater ponds were also observed onsite (via satellite photos), primarily in the eastern half. Based on the older Quad map and more recent satellite imagery, the assumption that much of site area has been previously disturbed from logging operations, and best professional judgment, the total wetlands acreage is conservatively estimated at 10% or less (600 acres).
Neches 2	300-600 acres	3	No digitized wetlands data for site. The Neches River runs through the western and southern portion of site. Another major drainage on site is Snake Creek (runs east west). Other smaller intermittent streams were also identified on site. Identified wetlands were mainly associated with the Neches River in the western portion of the site area in low areas along the river (as seen in Kennard NE Quad map). Several small ponds/lakes were noted in northern and western portions of site, including McCall Lake north of Snake Creek. The site is heavily forested and any wetlands would appear to be associated with onsite drainages including, primarily, the Neches River to the west and southwest. A couple of freshwater ponds were also noted from satellite photos. Some portions of site area have been cleared of all trees and some of the forested parts appear to have been logged in the past. Given the level of general disturbance noted within the site area, total wetlands acreage is conservatively estimated between 5 and 10 percent (300 to 600 acres).

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Neches 3	600 acres or higher	2	No digitized wetlands data for site. Drainages include Cowpen Branch in the northern part of the site; Buck Creek and Biloxi Creek running through the middle (north-south) of the site; and Dry Creek running from the middle western portion towards the southeastern quadrant. Wetlands area may be found along the Neches River to the south of the site, south of Dry Creek (based on USGS Quad map). Quad maps (north of site) also show several intermittent draws feeding into Biloxi and Buck Creeks. The site is heavily forested and onsite drainages, as identified in the mapper database, are difficult to observe using satellite imagery. It is assumed that wetlands are associated with these onsite drainages; and a couple of freshwater ponds were also noted on satellite photos. Based on these data and best professional judgment, a conservative estimate of 600 acres wetlands (or higher) has been assumed.
Angelina 1	Less than 300 acres	4	No digitized wetlands data are available for site. A major stream runs along eastern portion of site, and Bayou Loco runs north-south from Lake Nacogdoches to the north. The major water feature in site area is Lake Nacogdoches although it is located just outside the 6,000 acre area. The site is cleared in the middle and surrounded by heavy timber on all sides. Any wetlands are assumed to be associated with the stream on the eastern side and possible wetlands along the Angelina River (west side of site) even though the river itself is beyond the 6,000 acre area. Given the general level of disturbance, and the small number of onsite streams/drainages, the total wetlands acreage is assumed to be less than 5%.
Sabine 1	Up to 600 acres	3	No digitized wetlands data for the site. The Sabine River runs through the northeast corner of the site. Most wetlands in the area appear to be associated with the Sabine River in the top northern portion of the site (mostly beyond 6,000 acre area). Some intermittent drainages exist on site but are unnamed. The site includes cleared as well as forested areas, especially in the northern portion near the Sabine River. A couple of freshwater ponds are also found onsite. Based on these data and best professional judgment, the wetlands acreage is conservatively estimated to be at 10 percent, or 600 acres.
Sulphur 1	320 acres	3	Several linear segments of forested wetlands lie within the site along onsite drainages: Maples Creek which cuts across the northern portion of the site, and Flat Creek which runs across the middle of the site. A conservative estimate of the wetlands area is approximately 300 acres. In addition, small, scattered isolated freshwater ponds appear mainly throughout the western and southern portions of the site, totaling up to 20 acres.

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**
Red 1	85 acres	4	The largest wetland area is found in the southern portion of the site and is associated with Smith Creek which runs to the south of the site. There is a large forested wetland area that covers around 400 acres throughout this drainage area, although only about 20 acres is estimated to be found within in the 6,000 acre site area. The remaining wetland areas include numerous small scattered freshwater ponds that total approximately 65 acres.
Red 2	555 acres (including half of Valley Lake)	3	The major water feature at this site is a 965 acre lake (Valley Lake) found in the southwestern portion of the site area; about half of the lake (480 acres) is included within the 6,000 acre site area. In addition, small, numerous freshwater ponds are scattered throughout the site area; these total between 50 and 75 acres. Onsite streams include Brushy Creek, Sheep Creek, and Patillo Branch, although no extensive wetlands were identified with these streams.
Red 3	600 acres (10%)	3	Onsite streams include Pine Creek which runs down the middle of the site. Streams that lie to the east of the site area include Big Pine and Little Pine Creeks and Nolan Creek (out of 6,000 acre area). Wetlands mapper results for this site are suspect and appear to be incomplete (acreages are provided in excel but no polygons/areas shown on accompanying map against which to compare, and area shown exceeds that of site area). Therefore the evaluation was based on a review of satellite photo (using Google Earth) showing forested areas running along onsite streams and within scattered pockets around the site that were assumed to be wetland areas. Based on satellite imagery and best professional judgment in reconciling spreadsheet acreages with the satellite imagery, and excluding the stream mile/acreage itself, a conservative wetland acreage estimate for this site is approximately 600 acres. Also note that much of area appears to be farmed based on satellite imagery.
Coastal 1	160 acres	4	A major wetland area is in the southwestern portion of the site where marine/estuarine waters move upstream from the Nueces Bay (estimated at approximately 150 acres). Other smaller scattered wetlands in the site area include small freshwater emergent wetlands and freshwater ponds, totaling approximately 10 acres.
Coastal 2	Over 50% of site area (3,000 to 4,000 acres)	1	More than half of the 6,000 acre site area (estimated as high as 60%) includes marine/estuarine wetlands and freshwater emergent wetlands, extending from Matagorda Bay and Tres Palacios Bay. These are all found in the southern portion of the site, as well as along the eastern portion. Total wetlands acreage was estimated to be as high as 3,400 to 4,000 acres.

Criterion P6 – Wetlands			
Site	**Wetlands Acreage**	**Rating**	**Comments and Discussion**

Notes:

The majority of sites did not have digitized wetlands data available and so ratings were based primarily on satellite photos (best professional judgment/visual observation using Google Earth) and USGS Quad maps and the Texas Atlas. For the non-digitized sites, the FWS wetlands mapper database was used to generate maps showing onsite surface water streams (rivers, creeks, drainages). It is not clear whether the identified smaller creeks and streams are intermittent or have water all year long. In the absence of definitive data on the non-digitized sites, conservative estimates were developed primarily from comparing known site surface water stream routings with features observed from satellite photos/Google Earth.

Percentage estimates were based on a total site area of 6,000 acres.

References:

Google Earth, http://earth.google.com.

NWI Wetlands Mapper, http://wetlandsfws.er.usgs.gov/NWI/webatx/atx.html, March 2009 (provides digitized wetland areas).

Texas Atlas and Gazetter Detailed Topographic Maps. DeLorme, 2005.

USGS Topographic "Quad" Maps (1:24,000 scale).

Digitized wetlands data were not available for all potential site locations. A sensitivity analysis on the results of this evaluation was conducted whereby the wetlands criterion was removed from the overall evaluation results. The sensitivity analysis showed no change to the top nine rated sites.

Criterion P7 – Heavy Haul Access		
Site	**Rating**	**Comments and Discussion**
Nueces 1	4	Rail is located ~ 2.2 miles northeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service.
Nueces 2	3	Rail is located ~ 1 mile northeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Additionally, one rating point was deducted as the existing rail line would likely require relocation, thereby extending the potential impacts associated with construction of railroad access.
Guadalupe 1	2	Rail is located ~ 9.6 miles north of the site. This rail line is operated by Union Pacific RR (Amtrak and Burlington Northern Santa Fe have trackage rights) and supports passenger service.
Guadalupe 2	4	Rail is located ~ 2.3 miles southwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway and Texas Mexican Railway have trackage rights) and does not support passenger service.
San Antonio 1	4	Rail is located ~ 2.0 miles northwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway, Burlington Northern Santa Fe, and Texas Mexican Railway have trackage rights) and does not support passenger service.
Colorado 1	2	Rail is located ~ 5.3 miles northwest of the site (across the Colorado River). This rail line is operated by Austin Area Termina RR and does not support passenger service. Additionally, one rating point was deducted as the new rail access would require crossing a major river.
Colorado 2	4	Rail is located ~ 1.8 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service.
Colorado 3	4	Rail is located ~ 1.8 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service.
Colorado 4	3	Rail is located ~ 5.0 miles southeast of the site. This rail line is operated by Texas Mexican Railway (Kansas City Southern Railway has trackage rights) and does not support passenger service. Rail is also located ~ 3.4 miles northeast of the site (across the Colorado River). This rail line is operated by KCT Railway and does not support passenger service.
South Texas Project	5	Rail is located ~6.7 miles north of the site. This rail line is served by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail spur connecting the main track to the existing STP plant exists but has not been maintained. However, a barge slip is located on the Colorado River adjacent to the existing plant to facilitate transportation of large and/or heavy items.

Criterion P7 – Heavy Haul Access		
Site	**Rating**	**Comments and Discussion**
Brazos 1	1	Rail is located ~ 14.0 miles southeast of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail line located ~ 7.0 miles southeast of the site (near Mineral Wells, TX) was abandoned in 1992.
Brazos 2	2	Rail is located ~ 8.4 miles northwest of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service.
Brazos 3	3	Rail is located ~ 4.4 miles east of the site. This rail line is operated by Union Pacific RR and does not support passenger service.
Brazos 4	3	Rail is located ~ 5.9 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Rail is also located ~ 4.5 miles northeast of the site (across the Brazos River). This rail line is operated by Union Pacific RR and does not support passenger service.
Brazos 5	2	Rail is located ~ 4.7 miles east of the site (across the Brazos River). This rail line is operated by Union Pacific RR and does not support passenger service. Additionally, one rating point was deducted as the new rail access would require crossing a major river.
Allens Creek	5	Rail is located ~ 0.5 miles southwest of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service.
Brazos 6	1	Rail is located ~ 12.9 miles southeast of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail line located ~ 10.9 miles northwest of the site (near Guy, TX) has been abandoned.
Trinity 1	2	Rail is located ~ 8.4 miles southwest of the site. This rail line is operated by Union Pacific RR and does not support passenger service.
Malakoff	4	Rail is located ~ 2.4 miles north of the site. This rail line is operated by Union Pacific RR and does not support passenger service.
Trinity 2	1	Rail is located ~ 18.1 miles west of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service.
Trinity 3	1	Rail is located ~ 14.8 miles northwest of the site. This rail line is operated by Union Pacific RR and does not support passenger service.
Trinity 4	1	Rail is located ~ 15.6 miles east of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Rail is also located ~ 22.5 miles west of the site (across the Trinity River). This rail line is operated by Burlington Northern Santa Fe and does not support passenger service.

Criterion P7 – Heavy Haul Access		
Site	**Rating**	**Comments and Discussion**
Neches 1	3	Rail is located ~ 5.5 miles northwest of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A tourist rail line is located ~ 3.1 miles south of the site (operated by Texas State RR Museum).
Neches 2	1	Rail is located ~ 21.5 miles east of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail line located ~ 3.5 miles northeast of the site was abandoned in 1996.
Neches 3	2	Rail is located ~ 10.8 miles northwest of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail line located ~ 11.4 miles east of the site was abandoned in 1994.
Angelina 1	2	Rail is located ~ 8.6 miles southeast of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail line located ~ 6.4 miles southwest of the site was abandoned in 1996.
Sabine 1	3	Rail is located ~ 3.3 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Rail is also located ~ 3.8 miles north of the site. This rail line is operated by Union Pacific RR (Amtrak and Burlington Northern Santa Fe have trackage rights) and supports passenger service.
Sulphur 1	1	Rail is located ~ 23.6 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. A rail line located ~ 10.7 miles north of the site was abandoned in 1996.
Red 1	2	Rail is located ~ 6.4 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service.
Red 2	3	Rail is located ~ 3.7 miles south of the site. This rail line is jointly operated by Dallas, Garland and Northeastern RR and Texas Northeastern Division and does not support passenger service. A rail line located ~ 3.3 miles west of the site was abandoned in 1988.
Red 3	2	Rail is located ~ 8.8 miles west of the site. This rail line is operated by Kiamichi RR and does not support passenger service.
Coastal 1	2	Rail is located ~ 9.8 miles northwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway, Burlington Northern Santa Fe and Texas Mexican Railway have trackage rights) and does not support passenger service.

Criterion P7 – Heavy Haul Access		
Site	**Rating**	**Comments and Discussion**
Coastal 2	2	Rail is located ~ 11.5 miles northeast of the site at the South Texas Project nuclear power plant. This rail line is served by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail line located ~ 5.3 miles northwest of the site (near Palacios, TX across Tres Palacios Bay) was abandoned in 1996.

References:

North American Railroad Map, version 3.0, http://www.RailroadMap.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

Criterion P8 – Transmission Access		
Site	**Rating**	**Comments and Discussion**
Nueces 1	2	Site is ~20 miles west of 345kV line (S/N) between Lon Hill and Pawnee substations. Site is ~20 miles south of 345kV line (W/E) between San Miguel plant and Pawnee substation. Site is ~35 miles southeast of 345kV connection at San Miguel plant. Total combined distance ~75 miles.
Nueces 2	4	Site is ~5 miles southwest of 345kV line (S/N) between Lon Hill and Pawnee substations. Site is ~ 10 miles west of 345kV line (S/N) between Lon Hill and Coleto substations. Site is ~ 10 miles north of 345kV line between Lon Hill and Echlong substations. Total combined distance ~ 25 miles.
Guadalupe 1	3	Site is~ 15 miles southeast of 345kV line (SW/NE) between Guadalupe power plant and Rio Nogales power plant. Line is a double-circuit line. Site is ~ 15 miles northeast of 345kV line (E/W) between STP plant and Elm Creek substation. Line is a double-circuit line. Site is ~20 miles northeast of 345kV line (SW/NE) between San Miguel plant and Elm Creek substation. Line is a double-circuit line. Total combined distance ~ 50 miles.
Guadalupe 2	2	Site is ~ 5 miles south of 345kV line (E/W) between STP plant and Elm Creek substation. Line is a double-circuit line. Site is ~25 miles northeast of 345kV line (E/W) between Pawnee and Coleto substations. Site is ~ 35 miles northwest of 345kV line (NE/SW) between STP plant and White Point substation. Total combined distance ~ 65 miles.
San Antonio 1	2	Site is ~ 10 miles northwest of 345kV line (NE/SW) between STP plant and White Point substation. Site is ~20 miles southeast of 345kV line (E/W) between Pawnee and Coleto substations. Site is ~ 35 miles south of 345kV line (E/W) between STP plant and Elm Creek substation. Line is a double-circuit line. Total combined distance ~ 65 miles.
Colorado 1	1	Site is ~ 45 miles southwest of 345kV connection at Killeen substation. Site is ~ 45 miles west of 345kV line near Lost Pines power plant. Line is a double-circuit line. Site is ~ 55 miles northeast of 345kV connection at Kendall substation. Total combined distance ~ 145 miles.

Criterion P8 – Transmission Access		
Site	**Rating**	**Comments and Discussion**
Colorado 2	4	Site is ~ 5 miles south of 345kV line (SE/NW) between Fayette power plant and Lost Pines power plant. Line is a double-circuit line. Site is ~ 10 miles south of 345kV line (S/N) between Lost Pines power plant and Sandow substation. Line is a double-circuit line. Site is ~ 10 miles east of 345kV line (N/S) between Lost Pines power plant and Garfield substation. Total combined distance ~ 25 miles.
Colorado 3	4	Site is ~ 5 miles southeast of 345kV line (NE/SW) between Fayette power plant and Holman substation. Line is a double-circuit line. Site is ~ 5 miles north of 345kV line (NW/SE) between Holman and Hill substations. Site is ~ 10 miles south of 345kV line (SE/NW) between Fayette power plant and Lost Pines power plant. Line is a double-circuit line. Total combined distance ~ 20 miles.
Colorado 4	3	Site is ~ 15 miles northwest of 345kV line (SW/NE) between Hill substation and W.A. Parish power plant. Line is a triple-circuit line. Site is ~ 15 miles northeast of 345kV line (NW/SE) between Holman and Hill substations. Site is ~ 20 miles north of 345kV connection at Hill substation. Total combined distance ~ 50 miles.
South Texas Project	5	Site is located at the existing South Texas Project nuclear power plant. Multiple 345kV connections are available at the site.
Brazos 1	2	Site is located ~ 5 miles southwest of 345kV line (NW/SE) between Graham power plant and Parker substation. Line is a double-circuit line. Site is ~ 20 miles southwest of 345kV connection at Willow Creek power plant. Site is ~ 30 miles north of 345kV connection at Wolf Hollow power plant. Total combined distance ~ 55 miles.
Brazos 2	3	Site is ~ 5 miles north of 345kV connection at Wolf Hollow power plant. Site is ~ 10 miles west of 345kV line (SW/NE) between Wolf Hollow power plant and Parker substation. Line is a double-circuit line. Site is located ~ 25 miles south of 345kV line (NW/SE) between Graham power plant and Parker substation. Line is a double-circuit line. Total combined distance ~ 40 miles.

Criterion P8 – Transmission Access		
Site	**Rating**	**Comments and Discussion**
Brazos 3	3	Site is ~ 5 miles east of 345kV line (N/S) between Tradinghouse power plant and Temple substation. Line is a double-circuit line. Site is ~ 5 miles southwest of 345kV line (W/E) between Lake Creek and Jewitt substations. Site is ~ 30 miles northwest of 345kV connection at Twin Oak substation. This substation connects to multiple double-circuit lines. Total combined distance ~ 40 miles.
Brazos 4	2	Site is ~ 20 miles northeast of 345kV line (NW/SE) between Temple and Sandow substations. Line is a double-circuit line. Site is ~ 20 miles southwest of 345kV connection at TNP One power plant. Site is ~ 30 miles southwest of 345kV line (NW/SE) between Twin Oak substation and Gibbons Creek power plant. Line is a double-circuit line. Total combined distance ~ 70 miles.
Brazos 5	2	Site is ~ 15 miles west of 345kV line running south from Gibbons Creek power plant. Line is a double-circuit line. Site is ~ 25 miles west of 345kV line (N/S) between Roans Prairie power plant and Tomball substation. Line is a double-circuit line. Site is ~ 30 miles northeast of 345kV connection at Salem substation. Total combined distance ~ 70 miles.
Allens Creek	2	Site is ~ 20 miles west of 345kV connection at O'Brien substation. This substation connects to multiple double-circuit lines. Site is ~ 30 miles northwest of 345kV line (NE/SW) between W.A. Parish power plant and Hill Substation. Line is a triple-circuit line. Site is ~ 35 miles northeast of 345kV line (NW/SW) between Holman and Hill substations. Total combined distance ~ 85 miles.
Brazos 6	3	Site is ~ 10 miles south of 345kV connection at W.A. Parish power plant. Site is ~ 10 miles southeast of 345kV line (NE/SW) between W.A. Parish power plant and Hill Substation. Line is a triple-circuit line. Site is ~ 15 miles west of 345kV line (S/N) between Dow power plant and Oasis substation. Line is a double-circuit line. Total combined distance ~ 35 miles.

Criterion P8 – Transmission Access		
Site	**Rating**	**Comments and Discussion**
Trinity 1	3	Site is ~ 5 miles southwest of 345kV line (NW/SE) between Tricorner and Trinidad substations. Line is a double-circuit line. Site is ~ 15 miles south of 345kV line (W/E) between Tricorner and Elkton substations. Site is ~ 20 miles northeast of 345kV line (N/S) between Watmill substation and Limestone power plant. Line is a double-circuit line. Total combined distance ~ 40 miles.
Malakoff	3	Site is ~ 5 miles east of 345kV line (N/S) between Trinidad substation and Richland power plant. Line is a double-circuit line. Site is ~ 5 miles south of 345kV line (W/E) between Trinidad substation and Stryker Creek power plant. Line is a double-circuit line. Site is ~ 30 miles south of 345kV line (W/E) between Tricorner and Elkton substations. Total combined distance ~ 40 miles.
Trinity 2	5	Site is ~ 5 miles east of 345kV connection at Big Brown power plant. Multiple 345kV connections are located at this point.
Trinity 3	4	Site is ~ 20 miles east of 345kV connection at Jewitt substation. Multiple 345kV connections are located at this point.
Trinity 4	2	Site is ~ 15 miles east of 345kV line (N/S) between Jewitt substation and Gibbons Creek power plant. Line is a double-circuit line. Site is ~ 30 miles east of 345kV line (NW/SE) between Twin Oak substation and Gibbons Creek power plant. Line is a double-circuit line. Multiple 345kV connections are also available at the Jewitt substation, ~ 25 miles northwest of the site. Total combined distance ~ 70 miles.
Neches 1	2	Site is ~ 20 miles south of 345kV line (W/E) between Trinidad substation and Stryker Creek power plant. Line is a double-circuit line. Site is ~ 35 miles east of 345kV line (NW/SE) between Stryker Creek power plant and Lufkin substation. Site is ~ 40 miles east of 345kV connection at Big Brown power plant. Total combined distance ~ 95 miles.

Criterion P8 – Transmission Access		
Site	**Rating**	**Comments and Discussion**
Neches 2	1	Site is ~ 20 miles west of 345kV connection at Lufkin substation. Site is ~ 30 miles south of 345kV connection at Stryker Creek power plant. Site is ~ 55 miles east of 345kV connection at Jewitt substation. Total combined distance ~ 105 miles.
Neches 3	1	Site is ~ 20 miles south of 345kV connection at Lufkin substation. Site is ~ 35 miles south of 345kV connection at Nacogdoches substation. Site is ~ 75 miles east of 345kV line (N/S) between Jewitt substation and Gibbons Creek power plant. Line is a double-circuit line. Total combined distance ~ 130 miles.
Angelina 1	2	Site is ~ 10 miles northwest of 345kV connection at Lufkin substation. Site is ~ 30 miles south of 345kV connection at Stryker Creek power plant. Site is ~ 25 miles west of 345kV connection at Nacogdoches substation. Total combined distance ~ 65 miles.
Sabine 1	2	Site is ~ 5 miles northeast of 345kV line (W/E) between Shamburger substation and Martin Lake power plant. Site is ~ 15 miles north of 345kV line (W/E) between Elkton substation and Martin Lake power plant. Site is ~ 40 miles south of 345kV connection at Moses power plant. Total combined distance ~ 60 miles.
Sulphur 1	4	Site is ~ 20 miles north of 345kV connection at the Moses power plant. Multiple 345kV connections are located at this point.
Red 1	1	Site is ~ 25 miles east of 345kV connection at Fisher Road substation. Site is ~ 40 miles north of 345kV line (W/E) between Jacksonboro and West Denton substations. Site is ~ 90 miles northwest of 345kV connection at Anna substation. Total combined distance ~ 155 miles.
Red 2	5	Site is ~ 5 miles north of multiple 345kV connections at the Valley power plant.

Criterion P8 – Transmission Access		
Site	**Rating**	**Comments and Discussion**
Red 3	2	Site is ~ 15 miles northeast of 345kV line (NW/SE) between Paris substation and Moses power plant. Site is ~ 25 miles northeast of 345kV line (E/W) between Paris substation and Valley power plant. Line is a double-circuit line. Site is ~ 40 miles north of 345kV line (E/W) between Moses power plant and Farmersville substation. Line is a double-circuit line. Total combined distance ~ 80 miles.
Coastal 1	2	Site is ~ 5 miles southeast of 345kV line (SW/NE) between STP power plant and White Point substation. Site is ~ 20 miles east of 345kV line (S/N) between Lon Hill and Coleto substations. Site is ~ 35 miles east of 345kV line (S/N) between Lon Hill and Pawnee substations. Total combined distance ~ 60 miles.
Coastal 2	4	Site is ~ 15 miles southwest of multiple 345kV connections at STP power plant.
References: ERCOT Transmission System Map. USGS Topographic Maps (1:100,000 and 1:24,000 scale).		

Criterion P9 – Land Acquisition		
Site	**Rating**	**Comments and Discussion**
Nueces 1	3	Live Oak County **$1,491** per acre (2007); $710 (2002); average farm size (559 acres in 2007; 622 acres in 2002)
Nueces 2	3	San Patricio County **$1,239** per acre (2007); $888 (2002); average farm size (567 acres in 2007; 601 acres in 2002) Note that site is near Corpus Christi in Nueces County; but no further ratings adjustment (reduction) has been applied since farm land costs are comparable between San Patricio and Nueces Counties.
Guadalupe 1	2	Guadalupe County **$2,602** per acre (2007), $2,021 (2002); average farm size (156 acres in 2007, 158 acres in 2002) Note that site is in adjacent county to San Antonio (and host Bexar County), but no further ratings adjustment has been applied given distance of 35 miles to San Antonio suburbs and fact that farm costs are not significantly higher in Bexar County.
Guadalupe 2	3	DeWitt County **$1,856** per acre (2007); $1,199 (2002); average farm size (303 acres in 2007, 323 acres in 2002)
San Antonio 1	3	Victoria County **$1551** per acre (2007), $898 (2002); average farm size (366 acres in 2007, 400 acres in 2002)
Colorado 1	2	Burnet County **$2,263** per acre (2007); $1,815 (2002); average farm size (315 acres in 2007, 413 acres in 2002) Note farm land costs remain under $3,000 per acre in adjacent Travis County ($2,832), which includes City of Austin, therefore no further ratings adjustment has been applied.
Colorado 2	2	Bastrop County **$2,743** per acre (2007); $1859 (2002); average farm size (182 acres in 2007, 193 acres in 2002) Note farm land costs remain under $3,000 per acre in adjacent Travis County ($2,832), which includes City of Austin; therefore no further ratings adjustment has been applied..
Colorado 3	2	Fayette County **$2,757** per acre (2007), $1,879 (2002); average farm size (189 acres in 2007, 186 acres in 2002)
Colorado 4	3	Wharton County **$1,765** per acres (2007), $1,164 (2002); average farm size (409 acres in 2007, 415 acres in 2002)

Criterion P9 – Land Acquisition		
Site	**Rating**	**Comments and Discussion**
South Texas Project	5	Matagorda County STP existing plant site (12,220 acres) owned by STPNOC and NRG [and City Public Service Board of San Antonio/CPS Energy, and City of Austin also partial owners; NRG and CPS will own new units 3 & 4] For comparison, average cost per acre for this county: $1,380 per acre (2007), $1,014 (2002)
Brazos 1	3	Palo Pinto County **$1,938** per acre (2007), $800 (2002); average farm size (462 acres in 2007, 503 acres in 2002) [Note that site is beyond 40 miles from Fort Worth area]
Brazos 2	1	Parker County **$3,648** per acre (2007), $2,287 (2002); average farm size (120 acres in 2007, 151 acres in 2002) [Note that site is within 40 miles of Fort Worth metropolitan area]
Brazos 3	2	McLennan County **$2,062** per acre (2007), $1,248 (2002); average farm size (189 acres in 2007, 209 acres in 2002)
Brazos 4	3	Milam County **$1,914** per acre (2007), $1,186 (2002); average farm size (263 acres in 2007, 290 acres in 2002)
Brazos 5	1	Washington County **$3,708** per acre (2007), $2,459 (2002); average farm size (141acres in 2007, 154 acres in 2002)
Allens Creek	3	Austin County Ratings adjustment: NRG owns 1,722 acres; however, this does not include the proposed 9,500 acre reservoir that is planned (and would have to be purchased); City of Houston and BRA purchased land for the reservoir and proposed a water supply reservoir for the property (to be built between 2018 and 2030 to meet water needs for City of Houston). In addition, there is a restriction attached to the NRG land that specifies it cannot be developed as a nuclear site. Given these limitations, the site rating has been reduced two points to a 3. For comparison, average farm cost in this county is $3,412 in 2007 and $2,176 in 2002. Also note that site is 35-40 miles from Houston.
Brazos 6	2	Brazoria County **$2,188** per acre (2007); $1,516 (2002); average farm size (205 acres in 2007, 250 acres in 2002) Site is adjacent to Fort Bend County and City of Houston, but farm prices are comparable in Fort Bend County. Given this and site distance of 35 miles from Houston, no further ratings adjustment (deduction) has been applied

Criterion P9 – Land Acquisition		
Site	**Rating**	**Comments and Discussion**
Trinity 1	2	Navarro County **$1,612** per acre (2007), $868 (2002); average farm size (282 acres in 2007, 288 acres in 2002) Ratings adjustment: Note that site is in reasonably close proximity to Dallas (30 miles to southern suburbs), and on border with Ellis County, where average farm cost in 2007 is $2,445 per acre. Overall cost assumed to be higher at this site than host county data would indicate, so rating has been reduced one point to a 2.
Malakoff	5	Henderson County NRG owns 5,239 acres at this site. In addition, NRG owns additional land in Henderson County (but not adjacent to Malakoff); this includes 2,009 acres (Stewart Tile Ranch) and 4,843 acres (MJV Ranch). It is assumed that this is sufficient acreage to support any new reservoir that may be required For comparison, price per acre in this county is $2,446 per acre (2007) and $1,636 (2002).
Trinity 2	3	Freestone County **$1,744** per acre (2007), $900 (2002); average farm size (271 acres in 2007, 292 acres in 2002)
Trinity 3	2	Leon County **$2,019** per acre (2007), $1,067 (2002); average farm size (275 acres in 2007, 295 acres in 2002)
Trinity 4	2	Houston County **$2,051** per acre (2007), $1,080 (2002); average farm size (282 acres in 2007, 307 acres in 2002)
Neches 1	2	Anderson County **$2,232** per acre (2007); $1,038 (2002); average farm size (195 acres in 2007, 210 acres in 2002)
Neches 2	2	Cherokee County **$2,327** per acre (2007), $1,357 (2002); average farm size (181 acres in 2007, 190 acres in 2002)
Neches 3	2	Angelina County **$2,798** per acre (2007); $2,320 (2002); average farm size (104 acres in 2007, 125 acres in 2002)
Angelina 1	2	Nacogdoches County **$2,421** per acre (2007), $1,368 (2002); average farm size (208 acres in 2007, 212 acres in 2002)
Sabine 1	1	Smith County **$3,136** per acre (2007), $1,566 (2002); average farm size (120 acres in 2007, 127 acres in 2002)
Sulphur 1	3	Red River County **$1,329** per acre (2007), $879 (2007); average farm size (373 acres in 2007, 347 acres in 2002)

Criterion P9 – Land Acquisition		
Site	**Rating**	**Comments and Discussion**
Red 1	3	Clay County **$1,322** per acre (2007), $636 (2002); average farm size (711 acres in 2007, 734 acres in 2002)
Red 2	3	Fannin County **$1,939** per acre (2007), $1,150 (2002); average farm size (225 acres in 2007, 245 acres in 2002)
Red 3	3	Lamar County **$1,646** per acre (2007), $880 (2002); average farm size (287 acres in 2007, 273 acres in 2002)
Coastal 1	4	Refugio County **$732** per acre (2007), $430 (2002); average farm size (1,663 acres in 2007, 1,847 acres in 2002) Additional ratings adjustment: original rating of 3, based on land cost per acre, is raised one point to a 4 since no onsite reservoir is assumed to be needed (once-through cooling), thus less acreage would have to be acquired at this site than at other sites that do require a reservoir.
Coastal 2	4	Matagorda County **$1,380** per acre (2007), $1,014 (2002); average farm size (640 acres in 2007, 625 acres in 2002) Additional ratings adjustment: original rating of 3, based on land cost per acre, is raised one point to a 4 since no onsite reservoir is assumed to be needed (once-through cooling), thus less acreage would have to be acquired at this site than at other sites that do require a reservoir.

Notes:

Land requirements of 2,000 acres per site (coastal sites where assume no reservoir is required) up to 11,000 acres per site (all other sites, where assume reservoir is required) where NRG does not already own.

Ratings are based primarily on land cost per acre (2007). Land ownership has been considered, but insufficient information is available at this time to factor into the ratings. In general, acquisition from multiple landowners is considered less suitable than from one landowner.

References:

NRG Real Estate personal communication (3/19/09) relating to NRG-owned sites.

U.S. Census of Agriculture 2007 results: http://www.agcensus.usda.gov/Publications/2007/Full_Report/index.asp
Table 8. Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002 [data available for both 2002 and 2007 available and provided for completeness, but ratings based on 2007 data. Cost based on farmland and assumed to be rural.]

Appendix D
Technical Basis for General Site Criteria Evaluations

General siting criteria used in the nuclear power plant siting study were derived from those presented in Chapter 3.0 of the *Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application*, EPRI, Palo Alto, CA: 2002 (Siting Guide).

The following information is provided in this appendix for each criterion:

- Objective – what aspect of site suitability is being measured;
- Evaluation Approach – technical basis/methodology used to develop site ratings from available data;
- Discussion – data and information available for the sites under consideration; and
- Results – ratings results and rationale.

Technical bases for site ratings developed for each of the general site criteria are provided in the following sections. Criterion/section numbering is designed to reflect section numbers in Chapter 3 of the EPRI Siting Guide where the criteria is discussed, e.g., Criterion D.1.1.1 – Geology/ Seismology appears in Section 3.1.1.1 of the Siting Guide.

With the exception of the South Texas Project site, the primary sites evaluated in this appendix are all considered to be greenfield sites, and the level of site specific information available is significantly less than for the South Texas Project site. In order to ensure a balanced site evaluation and comparison in the site selection process, the general site criteria evaluations rely on a consistent set of "higher level" data available on the general site area (e.g., typically county level) rather than known site specific conditions. Note that consideration of site specific information at the South Texas Project, if included in this evaluation, would result in higher ratings for several of the criteria evaluations; these are noted in the appropriate sections of this appendix.

D.1 HEALTH AND SAFETY CRITERIA

D.1.1 ACCIDENT CAUSE-RELATED

D.1.1.1 Geology/Seismology

Objective – The objective of this criterion is to rank the suitability of the sites with respect to the geologic and seismic setting.

Evaluation approach – A numerical system of weights and ratings based upon suitability criteria were assigned to each geologic/seismic category, including vibratory ground motion, capable tectonic sources, surface faulting and deformation, geologic hazards, and soil stability (Sections D.1.1.1.1 through D.1.1.1.4) and used to compute (i.e., rate times weight) an index number for each category. (To enable the comparative evaluation of sites, the weights and rating schemes adopted herein are the same for all sites.) The index numbers for each site were summed to compute an overall geological (GEOL) index (Tables D.1.1-1 through D.1.1-4). The range of GEOL indexes was then used to develop a rating system for the sites (Section D.1.1.1.6). The sites were rated on a scale of 1 to 5, based on the GEOL scale, with the most suitable sites receiving an overall rating of 5. Weights and the basis for deriving correlating site ratings from the GEOL scale are discussed with respect to each of the sub-criteria in the sections below. NOTE: Within the GOEL index sub-criteria an inverse rating basis is used, with lower numbers indicating most suitable and 5 the least suitable; for the composite GEOL index, higher numbers indicate more suitable sites.

D.1.1.1.1 Vibratory Ground Motion

Objective – The purpose of this sub-criterion is to rate sites according to the expected magnitude of ground motion that can be expected. As long as expected peak ground accelerations do not exceed that for the certified designs under consideration, there are no exclusionary or avoidance components to this sub-criterion.

Evaluation approach – Peak Ground Acceleration (PGA) is a measure of the maximum force experienced by a small mass located at the surface of the ground during an earthquake and is an index of hazard for some structures. The units for PGA are in percent of gravity (%g); i.e. an acceleration of 0.30g is expressed as 30%g. PGA provided herein, as for other sites, is for a probability of exceedance (PE) of 2% in 50 years (once in 2,500 years). PGA data for the sites were obtained from the USGS National Seismic Hazards Mapping Project, 2002 (http://earthquake.usgs.gov/research/hazmaps/design/).

Discussion/Results – The locations evaluated for each of the sites have PGA values as shown in the table below.

Probabilistic ground motion values in %g

Site	PGA (%g) with 2% PE in 50 years
Guadalupe 2	11.3
Colorado 3	9.7
South Texas Project	8.7
Allens Creek	9.5
Malakoff	11.6
Trinity 2	11.2
Sulphur 1	15.8
Red 1	21.5
Red 2	18.7

The following table shows the assigned weight and rating scheme for vibratory ground motion.

Weight	Range	Rating	Index Range
	PGA (%g)		
5	0 – 3	1	0 - 50
	3 – 6	2	
	6 – 9	3	
	9 – 12	4	
	12 – 15	5	
	15 – 18	6	
	18 – 21	7	
	21 – 24	8	
	24 – 27	9	
	27 – 30	10	

Based upon the information provided in Tables D.1.1-1 through D.1.1-4, each site receives the following ratings based on the computed index numbers for vibratory ground motion.

Site	Rating	Index No.
Guadalupe 2	4	20
Colorado 3	4	20
South Texas Project	3	15
Allens Creek	4	20
Malakoff	4	20
Trinity 2	4	20
Sulphur 1	6	30
Red 1	8	40
Red 2	7	35

D.1.1.1.2 Capable Tectonic Structure or Source

Objective – No absolute exclusionary criteria have been identified. Capable tectonic structures are addressed as avoidance criteria; therefore, the objective of this sub-criterion is to identify the existence of capable or potentially capable tectonic structures within 200 miles of each site. Sites that are farthest from capable or potentially capable tectonic structures are considered more suitable.

Evaluation Approach – A database compiled by USGS (Quaternary Fault and Fold Database, http://earthquake.usgs.gov/regional/qfaults/) and Crone and Wheeler (2000) was utilized to identify capable and potentially capable tectonic sources within 200 miles of each of the sites. It was assumed that capable and potential capable tectonic sources, which are Quaternary features that may generate strong ground motion, fall into two categories as defined by Crone and Wheeler (2000, p5):

> Class A features have good geologic evidence of tectonic origin and are potentially seismogenic; and
>
> Class B features have geologic evidence that supports the existence of a seismogenic fault or suggests Quaternary deformation, but the currently available geologic evidence for Quaternary tectonic activity is less compelling than for a Class A feature.

Discussion/Results –The following Class A and Class B features are located within 200 miles of the sites:

Feature	Class	Site	Notes
Meer's Fault	A	Red 1	Between 50 and 100 miles.
Meer's Fault	A	Red 2	Between 100 and 200 miles.
Gulf Margin Faults	B	Guadalupe 2	Within 25 miles.
Gulf Margin Faults	B	Colorado 3	Within 25 miles.

Feature	Class	Site	Notes
Gulf Margin Faults	B	South Texas Project	Within 25 miles.
Gulf Margin Faults	B	Allens Creek	Within 25 miles.
Gulf Margin Faults	B	Malakoff	Within 25 miles.
Gulf Margin Faults	B	Trinity 2	Within 25 miles.
Gulf Margin Faults	B	Sulphur 1	Within 25 miles.
Gulf Margin Faults	B	Red 2	Between 25 and 50 miles.
Gulf Margin Faults	B	Red 1	Between 100 and 200 miles.
Monroe Uplift	B	Sulphur 1	Between 100 and 200 miles.
Saline River Fault Zone	B	Sulphur 1	Between 100 and 200 miles.

The following table shows the assigned weight and the rating scheme for capable tectonic sources.

Weight	Range (miles)	Rating	Index Range
Class A	None within 200 mile radius	0	0 – 10
2	Between 100 and 200 miles	2	
	Between 50 and 100 miles	3	
	Between 25 and 50 miles	4	
	Within 25 miles	5	
Class B	None within 200 mile radius	0	0 – 5
1	Between 100 and 200 miles	2	
	Between 50 and 100 miles	3	
	Between 25 and 50 miles	4	
	Within 25 miles	5	

Based on the information provided in Tables D.1.1-1 through D.1.1-4, each site receives the following ratings and computed index numbers.

Class A

Site	Rating	Index No.
Guadalupe 2	0	0
Colorado 3	0	0
South Texas Project	0	0
Allens Creek	0	0
Malakoff	0	0
Trinity 2	0	0
Sulphur 1	0	0
Red 1	3	6
Red 2	2	4

Class B

Site	Rating	Index No.
Guadalupe 2	5	5
Colorado 3	5	5
South Texas Project	5	5
Allens Creek	5	5
Malakoff	5	5
Trinity 2	5	5
Sulphur 1	5	5
Red 1	2	2
Red 2	4	4

Class A Features

Meer's Fault (Class A) is reported to occur within 100 miles of the Red 1 site and within 200 miles of the Red 2 site. Studies of the fault indicate a temporal clustering of events in the late Quaternary.

Class B Features

Gulf-margin faults (Class B) are reported to occur within 25 miles of 7 of the sites and within 200 miles of all of the sites. They are assigned to Class B due to their low seismicity and the lack of evidence for a direct connection to the underlying crust, and it is unknown whether these features can cause meaningful soil rupture that could result in damaging ground motion. Thorough investigation of such features near the site will be necessary.

The Monroe Uplift (Class B) is reported to occur within 200 miles of the Sulphur 1 site. It is assigned to Class B because of the results of a study that suggests the possibility of Quaternary deformation, but the available evidence is not compelling.

The Saline River Fault Zone (Class B) is reported to occur within 200 miles of the Sulphur 1 site. The zone is a northwesterly trending alignment of earthquake epicenters that follow the Saline River.

Class C Features

Crone and Wheeler (2000) and the USGS Fault Database also identify Class C and Class D features. Class C features are defined by Crone and Wheeler (2000) as features where:

> Geologic evidence is insufficient to demonstrate (1) the existence of a tectonic fault, or (2) Quaternary slip or deformation associated with the feature.

The Criner Fault is rated Class C and is located ~ 40 miles east of the Red 1 site, ~ 60 miles northwest of the Red 2 site, ~ 140 miles northwest of the Sulphur 1 site, ~ 150 miles northwest of the Malakoff site, and ~ 170 miles northwest of the Trinity 2 site.

The Washita Valley Fault is rated Class C and is located ~ 40 miles east of the Red 1 site, ~ 60 miles northwest of the Red 2 site, ~ 140 miles northwest of the Sulphur 1 site, ~ 150 miles northwest of the Malakoff site, and ~ 170 miles northwest of the Trinity 2 site.

The Humboldt Fault Zone is rated Class C and is located ~ 180 miles north of the Red 1 site.

Louisiana Wrench faults are rated Class C and is located ~ 190 miles east of the Sulphur 1 site.

Class D Features

Class D features are defined by Crone and Wheeler (2000) as features where:

> Geologic evidence demonstrates that the feature is not a tectonic fault or feature; this category includes features such as demonstrated joints or joint zones, landslides, erosional or fluvial scarps, or landforms resembling fault scarps, but of demonstrable non-tectonic origin.

No Class D features are identified within 200 miles of the sites.

D.1.1.1.3 Surface Faulting and Deformation

Objective – Develop site ratings for site suitability relative to surface faulting and deformation in the site vicinity.

Evaluation approach – No absolute exclusionary criteria have been identified with regard to surface faulting and deformation. Suitability criteria have been established based on the

occurrence of surface faulting and tectonic and non-tectonic structures within a 25-mi and 5-mi radius of the sites, as follows (EPRI 2000, p.3-7):

Within 25 miles
- No such structures altogether (Most Suitable)
- Potential non-capable structures
- Potential capable structures (Least Suitable)

Within 5 miles
- No such structures altogether (Most Suitable)
- Potential non-capable structures
- Potential capable structures
- Fault exceeding 1,000 feet in length (Least Suitable)

The potential for surface faulting or deformation primarily concerns plant design; therefore, features identified within 5 miles of a site receive a higher weight. Following are the assigned weights and ratings for surface faulting and deformation.

Weight	Range	Rating	GEOL Index Range
Between 5 and 25 miles – 1	No structures Potential non-capable structures Potential capable structures	0 1 5	0–5
Within 5 miles – 2	No structures Potential non-capable structures Potential capable structures Fault exceeding 1,000 feet in length Capable fault exceeding 1,000 feet in length	0 1 3 4 5	0–10

Discussion/Results – Based upon the information presented below and in Tables D.1.1-1 through D.1.1-4 at the end of this section, the sites receive the following ratings and computed index numbers for surface faulting and deformation.

Within 25 miles

Site	Rating	Index No.
Guadalupe 2	1	1
Colorado 3	0	0
South Texas Project	0	0
Allens Creek	0	0
Malakoff	0	0
Trinity 2	0	0
Sulphur 1	1	1
Red 1	0	0
Red 2	0	0

Within 5 miles

Site	Rating	Index No.
Guadalupe 2	0	0
Colorado 3	1	2
South Texas Project	1	2
Allens Creek	1	2
Malakoff	1	2
Trinity 2	1	2
Sulphur 1	0	0
Red 1	0	0
Red 2	0	0

Gulf-margin faults are reported near several of the sites. These features are believed to be non-tectonic growth faults, subject to very slow movement without seismic activity. Thorough investigation and evaluation will be required.

D.1.1.1.4 Geologic Hazards

Objective – Based on EPRI guidance (2000, p. 3-7), sites having the following geologic and man-made conditions should be avoided:

- Areas of active (and dormant) volcanic activity,
- Subsidence areas caused by withdrawal of subsurface fluids such as oil or groundwater, including areas which may be affected by future withdrawals,
- Potential unstable slope areas, including areas demonstrating paleolandslide characteristics,

- Areas of potential collapse (e.g. karst areas, salt, or other soluble formations),
- Mined areas, such as near-surface coal mined-out areas, as well as areas where resources are present and may be exploited in the future, and
- Areas subject to seismic and other induced water waves and floods.

Evaluation approach – Sites farthest away from these features would be considered the most suitable sites; sites were rated in accordance with the presence of – and distance from – these features. Following are the assigned weight and rating used for geologic hazards:

Weight	Range	Rating	GEOL Index Range
1	Geologic hazard(s) present	1	0–1

Discussion/Results – The following Geologic Hazard applies to the sites:

The South Texas Project site is located in an area that has seen 0-1 feet of subsidence.

The following sites are located in areas of significant withdrawal of subsurface fluids: Guadalupe 2, Malakoff, and Sulphur 1.

Design specifications for a new nuclear facility must address the possibility of solutioning and sinkhole formation, and of large water waves and floods. The sites received the following computed rating and index number for geologic hazards:

Site	Rating	Index No.
Guadalupe 2	1	1
Colorado 3	0	0
South Texas Project	1	1
Allens Creek	0	0
Malakoff	1	1
Trinity 2	0	0
Sulphur 1	1	1
Red 1	0	0
Red 2	0	0

D.1.1.1.5 Soil Stability

Objective – Evaluate the sites with respect to the difficulty of expected soil conditions.

Evaluation approach – No absolute exclusionary criteria have been identified with respect to soil stability. Soil stability is addressed as an avoidance criterion. Certain soil properties have unfavorable characteristics in association with vibratory ground motion. These soil properties include poor mineralogy, low density soil (lack of compaction), and high water content (or high water table). Sites with the highest values of PGA in combination with deleterious site soils would receive a relatively lower rating. Sites having rock foundations or more suitable soil conditions are considered to be better sites.

Following are the assigned weights and ratings for soil stability:

Weight	Range	Rating	Index Range
2	Rock site	0	0 – 4
	Deep soil site, no known deleterious soil conditions	1	
	Deep soil site with potential stability issues, or insufficient information available to assign a rating of 1	2	

Discussion/Results – According to geologic maps and other maps and reports, most of the sites is underlain by thousands of feet of predominately unconsolidated sediments (sands, silts and clays). Deep soil sites will require specific site investigations to determine if deleterious soil conditions occur, including evaluations for potential liquefaction.

Based upon this information the sites receive the following rating and computed index number for soil stability:

Site	Rating	Index No.
Guadalupe 2	1	2
Colorado 3	1	2
South Texas Project	1	2
Allens Creek	1	2
Malakoff	1	2
Trinity 2	1	2
Sulphur 1	1	2
Red 1	0	0
Red 2	1	2

C.1.1.1.6 Overall Rating for Geology/Seismology

The index numbers for this ranking scheme range from 5 to 85. This range of indexes was used to develop a ranking system to compare the suitability of sites as follows:

Index Range	Rating
5 – 21	5
22 – 37	4
38 – 53	3
54 – 69	2
70 – 85	1

The index numbers for each site were summed. The resulting index was compared to the index ranges in the above table to determine the overall rating for each site. Based upon this evaluation, the sites are ranked as follows:

Site	Index Number	Rating
Guadalupe 2	29	4
Colorado 3	29	4
South Texas Project	25	4
Allens Creek	29	4
Malakoff	30	4
Trinity 2	29	4
Sulphur 1	39	3
Red 1	48	3
Red 2	45	3

Table D.1.1-1 Ratings for Guadalupe 2 Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 11.3 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	4	20
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site. Seismicity is low in this zone.	1	1	1
Surface Faulting & Deformation within 5 miles	No surface faulting or deformation is known to occur at the site.	2	0	0
Geologic Hazards	The site is located in an area of significant withdrawal of underground fluids.	1	1	1
Soil Stability	The site is a deep soil site that overlies unconsolidated sands and muds. No known deleterious soil conditions exist.	2	1	2
			Total Index	**29**

Table D.1.1-2 Ratings for Colorado 3 Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 9.7 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	4	20
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site, but has been accounted for (within 5 miles). No other surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	The Gulf-margin fault zone is reported within 5 miles of the site. Seismicity is low in this zone.	2	1	2
Geologic Hazards	The site is not located near geologic hazards.	1	0	0
Soil Stability	The site is a deep soil site that overlies unconsolidated sands and muds. No known deleterious soil conditions exist.	2	1	2
			Total Index	**29**

Table D.1.1-3 Ratings for South Texas Project Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 8.7 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	3	15
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site, but has been accounted for (within 5 miles). No other surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	The Gulf-margin fault zone is reported within 5 miles of the site. Seismicity is low in this zone.	2	1	2
Geologic Hazards	The site is located in an area of potential subsidence.	1	1	1
Soil Stability	The site is a deep soil site that overlies deltaic sands and muds. No known deleterious soil conditions exist.	2	1	2
			Total Index	**25**

Table D.1.1-4 Ratings for Allens Creek Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 9.5 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	4	20
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site, but has been accounted for (within 5 miles). No other surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	The Gulf-margin fault zone is reported within 5 miles of the site. Seismicity is low in this zone.	2	1	2
Geologic Hazards	The site is not located near geologic hazards.	1	0	0
Soil Stability	The site is a deep soil site that overlies deltaic sands and muds. No known deleterious soil conditions exist.	2	1	2
			Total Index	**29**

Table D.1.1-5 Ratings for Malakoff Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 11.6 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	4	20
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site, but has been accounted for (within 5 miles). No other surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	The Gulf-margin fault zone is reported within 5 miles of the site. Seismicity is low in this zone.	2	1	2
Geologic Hazards	The site is located in an area of significant withdrawal of underground fluids.	1	1	1
Soil Stability	The site is a deep soil site that overlies unconsolidated sands and muds. No known deleterious soil conditions exist.	2	1	2
			Total Index	**30**

Table D.1.1-6 Ratings for Trinity 2 Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 11.2 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	4	20
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site, but has been accounted for (within 5 miles). No other surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	The Gulf-margin fault zone is reported within 5 miles of the site. Seismicity is low in this zone.	2	1	2
Geologic Hazards	The site is not located near geologic hazards.	1	0	0
Soil Stability	The site is a deep soil site that overlies unconsolidated sands and muds. No known deleterious soil conditions exist.	2	1	2
			Total Index	**29**

Table D.1.1-7 Ratings for Sulphur 1 Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 15.8 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	6	30
Capable Tectonic Source (Class A)	No Class A features occur within 200 miles of the site (USGS Fault and Fold Database).	2	0	0
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within 25 miles of the site (USGS Fault and Fold Database). The Monroe Uplift and the Saline River fault zone occur within 200 miles of the site (USGS Fault and Fold Database).	1	5	5
Surface Faulting & Deformation within 25 miles	The Gulf-margin fault zone is reported within 25 miles of the site. Seismicity is low in this zone.	1	1	1
Surface Faulting & Deformation within 5 miles	No surface faulting or deformation is known to occur at the site.	2	0	0
Geologic Hazards	The site is located in an area of significant withdrawal of underground fluids.	1	1	1
Soil Stability	The site is a deep soil site that overlies chalks and marls. No known deleterious soil conditions exist.	2	1	2
			Total Index	**39**

Table D.1.1-8 Ratings for Red 1 Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 21.5 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	8	40
Capable Tectonic Source (Class A)	Meer's Fault is located ~ 60 miles northwest of the site (USGS Fault and Fold Database).	2	3	6
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within ~ 125 miles of the site (USGS Fault and Fold Database).	1	2	2
Surface Faulting & Deformation within 25 miles	No surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	No surface faulting or deformation is known to occur at the site.	2	0	0
Geologic Hazards	The site is not located near geologic hazards.	1	0	0
Soil Stability	The site is a rock site that overlies limestones, sandstones, and shale. No known deleterious soil conditions exist.	2	0	0
			Total Index	**48**

Table D.1.1-9 Ratings for Red 2 Site

Feature	Source	Weight	Rating	Index No.
Vibratory Ground Motion	PGA 18.7 %g with 2% PE in 50 years (USGS National Seismic Hazards Mapping Project).	5	7	35
Capable Tectonic Source (Class A)	Meer's Fault is located ~ 140 miles northwest of the site (USGS Fault and Fold Database).	2	2	4
Capable Tectonic Source (Class B)	Gulf-margin normal faults occur within ~ 35 miles of the site (USGS Fault and Fold Database).	1	4	4
Surface Faulting & Deformation within 25 miles	No surface faulting or deformation is known to occur near the site.	1	0	0
Surface Faulting & Deformation within 5 miles	No surface faulting or deformation is known to occur at the site.	2	0	0
Geologic Hazards	The site is not located near geologic hazards.	1	0	0
Soil Stability	The site is a deep soil site that overlies chalks and marls. No known deleterious soil conditions exist.	2	1	2
			Total Index	**45**

References

Crone, A.J. and Wheeler, R.L. 2000. Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front. USGS Open File Report 00-260.

EPRI. 2001. Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application. Electric Power Research Institute, August 2001.

Frankel, A. et. al. 1996. National Seismic Hazard Maps, Documentation. USGS Open File Report 96-532. June 1996.

Google Earth, http://earth.google.com.

NRC. 1997. Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion Regulatory Guide 1.165.

Physiographic Map of Texas, http://www.lib.utexas.edu/geo/physiography.html.

Texas Hazard Mitigation Package, http://www.thmp.info.

U.S. Geological Survey and Texas Bureau of Economic Geology, 2006, Quaternary fault and fold database for the United States, accessed July 11, 2007, from USGS web site: http//earthquake.usgs.gov/regional/qfaults/.

USGS Earthquakes Hazards Program. National Seismic Hazard Mapping Project. Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude Longitude, 2002 data.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.1.2 Cooling System Requirements

Objective – Cooling system requirements are important siting considerations for new power generating facilities. The objective of this criterion is to rate the sites with respect to specific cooling system quantity requirements.

Evaluation approach – The principle requirements of interest are the quantity of cooling water available and the ambient air temperature (EPRI, 2001, Section 3.1.1.2.1). Exclusionary and avoidance conditions apply to the evaluation of the sites with respect to these cooling system requirements. The water requirements for the site selection study are presented below.

Cooling System Type	Cooling System Requirement
Closed-cycle, Wet	• Maximum design consumption per 2-unit plant = 50,000 acre-ft/yr (31,000 gpm, 69.1 cfs, 44.6 Mgal/day) based on current allocation for STP Units 1/2.

Ambient air temperature characteristics of a potential site affect the design of heat removal systems. The sites are all located within a region of similar ambient air characteristics; this aspect is evaluated in section D.1.1.2.2.

Discussion/Results – Site data and results are presented for each of the sub-criteria in Sections D.1.1.2.1 and D.1.1.2.2, below. Overall ratings for the Cooling System Requirements criterion are provided in Section D.1.1.2.3.

D.1.1.2.1 Cooling Water Quantity Available

The sites were evaluated with respect to cooling water availability during the initial screening phase, and all were found to have some potential (quantity available) to develop capacity to support the requirements of a closed-cycle cooling water system.

For the screening phase, the metrics of flow and availability of water rights were considered in developing the screening phase ratings. These metrics were combined to form the cooling water supply screening criteria ratings and are incorporated into the evaluation of the general site criteria. Additionally, this evaluation expands on the current ownership of water rights and the established allocation of water rights in the Red River. Active industrial, irrigation, and mining uses were considered as potential candidates for water rights sale/transfer – municipal/domestic,

hydroelectric, navigation, recreation, recharge, and storage uses were not considered viable water rights for sale/transfer.

Site	Evaluation	Rating
Guadalupe 2	USGS gaging station 08169500 near New Braunfels, TX (~23 miles northwest of site) Average flow = 769 cfs (11 times requirement) Minimum flow = 270 cfs (3.9 times requirement) Flow data is historic – current station records gage height only. Unappropriated flows are available for a new application 0-25% of months. At present, there are 487 water rights owners in the Guadalupe Basin that are industrial, irrigation, or mining uses totaling 653,050 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 7.7% of these existing water rights.	2
Colorado 3	USGS gaging station 08160400 near LaGrange, TX (~9 miles northwest of the site) Average flow = 2,676 cfs (39 times requirement) Minimum flow = 167 cfs (2.4 times requirement) Unappropriated flows are available for a new application 0-25% of months. At present, there are 1,490 water rights owners in the Colorado Basin that are industrial, irrigation, or mining uses totaling 1,229,813 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 4.1% of these existing water rights.	2
South Texas Project	USGS gaging station 08162500 near Bay City, TX (~12 miles north of the site) Average flow = 2,590 cfs (37 times requirement) Minimum flow = 0 cfs Water rights are currently owned for the additional water requirement.	5
Allens Creek	USGS gaging station 08111500 near Hempstead, TX (~31 miles north of the site) Average flow = 6,843 cfs (99 times requirement) Minimum flow = 137 cfs (2 times requirement) Unappropriated flows are available for a new application 25-50% of months. At present, there are 1,368 water rights owners in the Brazos Basin that are industrial, irrigation, or mining uses totaling 4,349,464 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 1.1% of these existing water rights.	3

Site	Evaluation	Rating
Malakoff	USGS gaging station 08062700 near Trinidad, TX (~3 miles west of the site) Average flow = 4,393 cfs (64 times requirement) Minimum flow = 312 cfs (5 times requirement) Unappropriated flows are available for a new application 25-50% of months. At present, there are 475 water rights owners in the Trinity Basin that are industrial, irrigation, or mining uses totaling 1,168,745 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 4.3% of these existing water rights.	3
Trinity 2	USGS gaging station 08062700 near Trinidad, TX (~24 miles south of the site) Average flow = 4,393 cfs (64 times requirement) Minimum flow = 312 cfs (5 times requirement) Unappropriated flows are available for a new application 25-50% of months. At present, there are 475 water rights owners in the Trinity Basin that are industrial, irrigation, or mining uses totaling 1,168,745 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 4.3% of these existing water rights.	3
Sulphur 1	USGS gaging station 07343210 near Talco, TX (~6 miles southwest of the site) Average flow = 1,270 cfs (18 times requirement) Minimum flow = 0.09 cfs Unappropriated flows are available for a new application 50-75% of months. At present, there are 38 water rights owners in the Sulphur Basin that are industrial, irrigation, or mining uses totaling 312,622 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 16.0% of these existing water rights.	2

Site	Evaluation	Rating
Red 1	USGS gaging station 07308500 near Burkburnett, TX (~31 miles northwest of the site) Average flow = 1,257 cfs (18 times requirement) Minimum flow = 0 cfs Unappropriated flows are available for a new application 0-25% of months. Acquisition of water rights could encounter permitability challenges from negotiating with multiple states (Oklahoma). The Red River Compact divides the river into 5 reaches. The Red 1 site is located in Reach I. Within Reach I, Texas is allocated 50% of the storage in Lake Texoma and 50% of the flow from the mainstem of the Red River. Therefore, the cooling water availability is 50% of the flow volumes reported above. At present, there are 249 water rights owners (Texas) in the Red Basin that are industrial, irrigation, or mining uses totaling 455,971 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 11.0% of these existing water rights.	1
Red 2	USGS gaging station 07331600 near Denison, TX (~16 miles northwest of the site) Average flow = 5,007 cfs (72 times requirement) Minimum flow = 12 cfs Unappropriated flows are available for a new application 0-25% of months. Acquisition of water rights could encounter permitability challenges from negotiating with multiple states (Oklahoma). The Red River Compact divides the river into 5 reaches. The Red 2 site is located in Reach II. Within Reach II, the four signatory states have equal rights to the use of runoff originating in Reach II and undesignated water flowing into Reach II, so long as the flow of the Red River at the Arkansas-Louisiana state boundary is 3,000 cfs or more. Therefore, the cooling water availability is reduced from the flow volumes reported above. At present, there are 249 water rights owners in the Red Basin that are industrial, irrigation, or mining uses totaling 455,971 acre-ft/yr. Assuming no unappropriated flows exist, the new plant would need to acquire 11.0% of these existing water rights.	1

Cooling Water	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	2	5	3	3
Cooling Water	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**3**	**2**	**1**	**1**	

References

Google Earth, http://earth.google.com.

Texas Commission on Environmental Quality, Water Rights Database, April 2, 2009, http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wr_databases.html.

Texas Water Code, Section 46.013, Text of the Red River Compact, http://law.onecle.com/texas/water/46.013.00.html.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.1.2.2 Ambient Temperature Requirements

Temperature data were obtained from local weather stations as compiled by the Southern Regional Climate Center's (TX, OK, AR, LA, MS, TN) historical climate summaries and normals, which is part of the National Oceanic and Atmospheric Administration's National Climate Data Center (NOAA NCDC). Closest daily weather stations with a reasonable period of record (e.g., more than 20 years) were selected for each site. Data indicate that each site meets the ambient temperature exclusionary and avoidance criteria addressed in EPRI 2001 (Section 3.1.1.2.2). Maximum and minimum annual temperature values, as well as the highest and lowest average monthly temperatures values, and the annual average monthly mean values, were compared between sites. Actual meteorological conditions at the sites, however, may vary from the data collected and evaluated for the closest reporting (representative) weather stations: Victoria for Guadalupe 2; La Grange for Colorado 3; Bay City for South Texas Project; Sealy for Allens Creek; Athens for Malakoff; Fairfield for Trinity 2; Mount Pleasant for Sulphur 1; Henrietta for Red 1; and Sherman for Red 2. The period of record for all sites is 1971-2000.

Ambient Temp. (degrees F)	Highest Temp. of record	Highest monthly average	Lowest Temp. of record	Lowest monthly average	Annual Monthly Average Mean
Guadalupe 2 (Victoria)	111	93.7	9	43.6	70
Colorado 3 (La Grange)	110	89.5	3	43.3	69.3
South Texas Project (Bay City)	109	92.7	7	45.7	70.9
Allens Creek (Sealy)	111	87.8	0	42.2	68.6
Malakoff (Athens)	109+	87.8	- 6	36.1	65.4
Trinity 2 (Fairfield)	110+	88.7	-2	37.2	66.3

Ambient Temp. (degrees F)	Highest Temp. of record	Highest monthly average	Lowest Temp. of record	Lowest monthly average	Annual Monthly Average Mean
Sulphur 1 (Mount Pleasant)	118	89	-12	31.3	62.7
Red 1 (Henrietta)	116+	89.6	-8	28.9	61.7
Red 2 (Sherman)	113	89	-2	31.9	63

Source: http://cdo.ncdc.noaa.gov/climatenormals/clim20/state-pdf/ [for TX]
NOAA Climatography of the United States No. 20, 1971-2000.

Discussion/Results – The sites were compared to one another to assess their relative suitability with respect to selected temperature extremes and frequency values. With the exception of extreme low temperature values, sites with the lowest dry bulb temperatures are considered to be the most suitable.

The findings are that all of the sites are similar with respect to the highest monthly average temperatures. The more northern sites tend to have slightly lower monthly average temperatures than the more southern sites; although two of the most northern sites (Sulphur 1 and Red 1) show the greatest extremes in temperature – both high and low. The highest temperature of record at all sites is well above 100 degrees F. Finally, the annual monthly average mean temperature appears to be several degrees cooler at the northernmost sites as well.

The overall comparison would appear to slightly favor the more northern sites – Sulphur 1, Red 1 and Red 2 – because of their slightly lower (lowest) average and monthly mean temperatures (and Malakoff and Trinity 2 to a lesser extent). As a result, these three sites are given a slightly higher rating (0.5 point) than the other sites. Because all of the daily high temperatures exceeded 100 degrees F, the highest rating given to the northern sites is a conservative "3".

Ambient Temperature	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Ambient Temperature	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**2.5**	**3**	**3**	**3**	

References

Climatography of the United States, No. 20. Monthly Station Climate Summaries, 1971-2000. Texas. NOAA National Climatic Data Center. February 2004

D.1.1.2.3 Cooling System Summary Rating

The sites were assigned relative ratings for the suitability of the cooling system based on the average of the ratings for cooling water supply (80% weight) and the ambient air temperature characteristics (20% weight).

Cooling System Requirements	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Cooling Water Supply (80%)	2	2	5	3	3
Ambient Temperature (20%)	2.5	2.5	2.5	2.5	2.5
OVERALL RATING	2	2	5	3	3
Cooling System Requirements	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Cooling Water Supply (80%)	3	2	1	1	
Ambient Temperature (20%)	2.5	3	3	3	
OVERALL RATING	3	2	1	1	

D.1.1.3 Flooding

Objective – The objective of this criterion is to evaluate the suitability of the sites with respect to potential flooding.

Evaluation Approach – The relative suitability of the sites was evaluated with respect to flooding in the Preliminary Screening Evaluation, but was limited to a comparison of existing surface water elevations and anticipated (and approximate) plant elevations. A comparison was also conducted between site grade elevation and the 100-year flood elevation. The 100-year flood elevations were based on Flood Insurance Rate Maps (FIRM) from FEMA for the site locations. Primary emphasis was on flood elevations for the main water bodies (rivers and reservoirs) and their major tributaries where flood elevations were identified. The flooding analysis is expanded in the general criteria evaluations to consider other potential flooding sources (e.g., upstream dam failure concerns).

Because of the more accurate floodplain data and consideration of upstream dam failure concerns and other flooding concerns (e.g., alluvial fan flooding), the rating scale was modified from that used in the Preliminary Screening Evaluation. The revised scale is as follows:

5 = Site is not located within 100-year floodplain, and no potential upstream flooding concerns exist (e.g., dam failure).
4 = Site is not located within 100-year floodplain, but potential upstream flooding concerns exist.
3 = Site is on border of 100-year floodplain, and potential upstream flooding concerns may or may not exist.
2 = Site is located within 100-year floodplain, but no potential upstream flooding concerns exist.
1 = Site is located within 100-year floodplain, and potential upstream flooding concerns exist.

Discussion/Results – Additional pertinent flood-related information for the sites is shown in the following table. Ice jam flooding, storm surge flooding, and tsunami flooding are of no concern (no impact) to the sites. Studies show that predicted impacts of peak tsunamis to the Texas Gulf Coast are measured in centimeters of increased wave height and do not present an actual flooding concern to these sites.

Site	Evaluation	Rating
Guadalupe 2	Site elevation = 205 feet A gaging station west of Cuero, TX (~12 miles west of the site) had a recent river level = 137 ft (flood stage is 153 feet). Difference = 52 feet above Guadalupe River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone). No dams or other unique features are present upstream of the proposed site that may cause flooding concerns.	5
Colorado 3	Site elevation = 285 feet A gaging station on the Colorado River near LaGrange, TX (~8 miles west of the site) had a recent river level = 214 ft (flood stage is 236 feet). Difference = 49 feet above Colorado River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone), with adjacent areas in Flood Zone AE (located inside 100-year flood zone at elevation of 240 feet). Difference = 45 feet above 100-year flood zone. Cedar Creek Dam is located ~ 4 miles north of the site. Failure of this dam could impact the Colorado River and the site. Lake Bastrop Dam is located ~ 38 miles northwest of the site.	3

Site	Evaluation	Rating
South Texas Project	Site elevation = 29 feet A gaging station on the Colorado River near Markham, TX (~12 miles north of the site) had a recent river level = 4 ft (flood stage is 44 feet). Note that the elevation decline in the 12 miles between the gaging station and the site is such that the flood stage at the gaging station is not indicative of the conditions observed at the site. Site is located in Flood Zone C (located outside 100/500-year flood zone). No dams or other unique features are present upstream of the proposed site that may cause flooding concerns.	5
Allens Creek	Site elevation = 143 feet Brazos River @ Richmond, TX flood stage = 76 feet. Difference = 67 feet above flood stage. Site is located in Flood Zone X (outside 100/500-year flood zone). No dams or other unique features are present upstream of the proposed site that may cause flooding concerns.	5
Malakoff	Site elevation = 264 feet A gaging station on the Trinity River near Trinidad, TX (~4 miles west of the site) had a recent river level = 245 ft (flood stage is 268 feet). Site is located in Flood Zone A (inside 100-year flood zone). Joe B. Hogsett Dam (Cedar Creek Reservoir) is located ~ 4 miles north of the site. Failure of this dam would impact the site.	1
Trinity 2	Site elevation = 306 feet FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding. Site is assumed to be located outside the 100/500-year flood zone. Fairfield Dam is located ~ 2 miles west of the site. Failure of this dam could impact the site. Richland Creek Dam (Richland-Chambers Reservoir) is located ~ 11 miles north of the site. Failure of this dame could impact the site.	4
Sulphur 1	Site elevation = 334 feet A gaging station on the Sulphur River near Talco, TX (~6 miles southwest of the site) had a recent river level = 284 ft (flood stage is 295 feet). Difference = 39 feet above Sulphur River flood level. FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding. Site is assumed to be located outside the 100/500-year flood zone. No dams or other unique features are present upstream of the proposed site that may cause flooding concerns.	5

Site	Evaluation	Rating
Red 1	Site elevation = 900 feet A gaging station on the Red River near Terral, OK (~6 miles southeast of the site) had a recent river level = 777 ft (flood stage is 792 feet). Difference = 108 feet above Red River flood level. Site is located in Flood Zone X (located outside 100/500-year flood zone. Lake Arrowhead Dam is located ~ 24 miles southwest of the site. Failure of this dam could impact the site.	4
Red 2	Site elevation = 629 feet Site is located in Flood Zone X (located outside 100/500-year flood zone. FEMA FIRM is unavailable. Area topography suggests that area is not prone to flooding. Site is assumed to be located outside the 100/500-year flood zone. Valley Lake Dam is located ~ 1 mile south of the site. Failure of this dam could impact the site. Denison Dam (Lake Texoma) is located ~ 17 miles northwest of the site. Failure of this dam could impact the site.	4

Flooding – Accident Related	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	5	3	5	5	1
Flooding – Accident Related	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**4**	**5**	**4**	**4**	

References

FEMA Digital Flood Insurance Rate Maps, http://www.msc.fema.gov.

Google Earth, http://earth.google.com.

Model Predictions of Gulf and Southern Atlantic Coast Tsunami Impacts from a Distribution of Sources, B. Knight, West Coast and Alaska Tsunami Warning Center, 2006.

National Atlas of the United States, Major Dams of the United States, March 2006. http://nationalatlas.gov/atlasftp.html?openChapters=chpwater#chpwater.

NOAA Stream and Flood Data, http://www.weather.gov/ahps/.

USGS Real-Time Water Data for Texas, http://waterdata.usgs.gov/tx/nwis/rt.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.1.4 Nearby Hazardous Land Uses

D.1.1.4.1 Existing Facilities

D.1.1.4.2 Projected Facilities

Objective – The objective of this criterion is to include NRC guidance on considerations regarding the nature and proximity of man-related hazards (dams, airports, transportation routes, and military and chemical manufacturing and storage facilities).

Evaluation approach – For the purpose of this evaluation, it was assumed that all of the sites can be developed to meet the exclusionary criteria outlined in 10 CFR 100. The suitability of the sites was, therefore, evaluated based on the relative number and distance of the following off-site man-made hazards that could be identified on USGS topographic maps, supplemented by relevant information found in existing environmental reports for certain sites; potential hazards relating to military operations, where appropriate, was also considered. The evaluation was limited to only existing hazards within a 5- to 10-mile radius of each site, to the extent such information was available. This included primarily airports, pipelines, and rail. Note that information relating to projected man-made hazards was not readily available and could not be evaluated during this phase of the siting process.

Discussion – Identified hazards at each of the sites are as follows:

Site	Evaluation	Rating
Guadalupe 2	Airports: No major metropolitan airport within 10 miles; Cuero Municipal airport located 9 miles northwest of the site. Rail is located ~ 2.3 miles southwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway and Texas Mexican Railway have trackage rights) and does not support passenger service. Pipelines within 5 miles: Site is located near the Jennie Bell Oil Field, the Helen Gohlke Oil Field, the Thomaston Oil Field, the Verhelle Oil Field, and the Richard Adcock Gas Field. Numerous (at least 5) pipelines are located within 5 miles of the site (running southwest-northeast and southeast-northwest). Other: Thomaston Compressor Station is located 2 miles south of the site. Sam Rayburn power plant is located 7 miles south of the site. Mining/Gravel pits are located 4 miles east and 5 miles northwest of the site.	2

Site	Evaluation	Rating
Colorado 3	Airports: No major metropolitan airport within 10 miles. Guenther Field LaGrange Municipal airport located 9 miles west of the site, and Fayette Regional Air Center located 12 miles east of the site. Rail is located ~ 1.8 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 1 pipeline is located within 5 miles of the site (running west-east). Other: Fayette Power Project is located 4 miles north of the site. Mining/Gravel pits are located 1 mile and 3 miles southwest, 3 miles northeast, 4 miles northwest, 5 miles west, 6 miles southeast, and 8 miles northeast of the site.	2
South Texas Project	Airports: No major metropolitan airport or regional airport within 10 miles. Rail is located ~6.7 miles north of the site. This rail line is served by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Pipelines within 5 miles: 1 pipeline is located within 5 miles of the site (running west-east). Other: Site adjacent to existing South Texas Plant nuclear power plant. Celanese Bay City chemical plant is located 5 miles northwest of the site. Equistar Chemicals Matagorda plastics plant is located 7 miles east of the site.	4
Allens Creek	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 4 miles north of the site, one small landing strip is located 4 miles southwest of the site, and two small landing strips located 4 miles southeast of the site. Rail is located ~ 0.5 miles southwest of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running southwest-northeast). Other: Mining/Gravel pits are located 8 miles west of the site. I-10 is located 6 miles north of the site.	3
Malakoff	Airports: No major metropolitan airport within 10 miles. Three small landing strips located 2 miles and 8 miles west and 4 miles east of the site. Rail is located ~ 2.4 miles north of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: Site located near the South Malakoff Oil Field. 4 pipelines are located within 5 miles of the site (running southwest-northeast, west-east, and north-south). Other: Mining/Gravel pits are located 2 miles northeast, 3 miles south, 4 miles and 8 miles east, and 6 miles northwest of the site.	3

Site	Evaluation	Rating
Trinity 2	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 3 miles southeast and 3 miles northwest of the site. Rail is located ~ 18.1 miles west of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast and southwest-northeast). Additionally, 1 aqueduct is located in the vicinity of the site (running east-west). Other: Big Brown power plant located 3 miles west of the site. Freestone Power Generation is located 8 miles northwest of the site. Mining/Gravel pits are located 6 miles west and 7 miles south of the site.	3
Sulphur 1	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 6 miles southwest and 9 miles east of the site. Rail is located ~ 23.6 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: None identified. Site located near the Trix Liz Oil Field. Other: River Crest power plant is located 11 miles west of the site. Mining/Gravel pits are located 3 miles north of the site.	4
Red 1	Airports: No major metropolitan airport within 10 miles. Rail is located ~ 6.4 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Pipelines within 5 miles: None identified. Other: Sheppard Air Force Base located 28 miles west of the site.	5
Red 2	Airports: No major metropolitan airport within 10 miles. Two small landing strips located 2 miles south and 6 miles northwest of the site. Rail is located ~ 3.7 miles south of the site. This rail line is jointly operated by Dallas, Garland and Northeastern RR and Texas Northeastern Division and does not support passenger service. Pipelines within 5 miles: 2 pipelines are located within 5 miles of the site (running northwest-southeast and north-south). Other: Valley power plant located 2 miles south of the site. Mining/Gravel pits are located 2 miles north of the site.	3

Nearby Hazardous Land Uses	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	2	4	3	3
Nearby Hazardous Land Uses	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	4	5	3	

References

Google Earth, http://earth.google.com.

North American Railroad Map, version 3.0, http://www.RailroadMap.com.

Rand McNally Road Atlas, 2007.

U.S. EPA Envirofacts Data Warehouse, http://www.epa.gov/enviro/.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.1.5 Extreme Weather Conditions

D.1.1.5.1 Winds
D.1.1.5.2 Precipitation

Objective – The objective of this criterion is to rate the suitability of the sites with respect to extreme weather conditions. Extreme weather conditions of interest are related to specific PPE criteria regarding tornado design, wind and precipitation (EPRI Siting Guide, Section 3.1.1.5).

Evaluation approach – Rating of the sites was performed based on a comparison of maximum wind speed (e.g., fastest mile where available), maximum 24-hour precipitation and severe storm records, although greater emphasis was placed on the most distinguishing site feature – site location in relation to the coast – as an indicator of greater probability of hurricane threat – and the number of hurricanes to hit Texas (broken up into geographic quadrants) as follows:

Hurricane direct hits on the mainland U.S. coastline and for individual states 1851-2004 by Saffir/Simpson category.

Area	Category Number					All (1-5)	Major (3-5)
	1	2	3	4	5		
U.S. (Texas to Maine)	109	72	71	18	3	273	92
Texas	23	17	12	7	0	59	19
(North)	12	6	3	4	0	25	7
(Central)	7	5	2	2	0	16	4
(South)	9	5	7	1	0	22	8

Source: National Hurricane Center at http://www.nhc.noaa.gov/paststate.shtml

Site	Peak Gust (miles per hour)	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* (1851-2004)	Maximum 24-hr precip.
Guadalupe 2	67 mph (Corpus Christi)	139 overall state average. 29 / 5.2 per 10,000 sq. mi. 6-10 per 1,000 miles**	Semi-coast/inland	16	9.87 inches (Victoria)
Colorado 3	81 mph (Austin)	139 overall state average. 29 / 5.2 per 10,000 sq. mi. 6-10 per 1,000 miles**	Semi-coast/inland	16	9.41 inches (La Grange)
South Texas Project	78 mph (Houston)	139 overall state average. 29 / 5.2 per 10,000 sq. mi. 6-10 per 1,000 miles**	Coast/Semi-coast	16	8.95 inches (Bay City)
Allens Creek	78 mph (Houston)	129 overall state average. 29 / 5.2 per 10,000 sq. mi. 6-10 per 1,000 miles**	Semi-coast/inland	16	11.0 inches (Sealy)
Malakoff	58 mph (Waco)	129 overall state average. 29 / 5.2 per 10,000 sq. mi. In/near tornado alley with >15 per 1,000 sq mi; F5 in Waco	Inland	N/A	7.19 inches (Athens)

Site	Peak Gust (miles per hour)	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* (1851-2004)	Maximum 24-hr precip.
Trinity 2	58 mph (Waco)	129 overall state average. 29 / 5.2 per 10,000 sq. mi. In/near tornado alley with >15 per 1,000 sq mi; F5 in Waco	Inland	N/A	7.9 inches (Fairfield)
Sulphur 1	81 mph (Dallas)	129 overall state average. 29 / 5.2 per 10,000 sq. mi. 6-10 per 1,000 miles**	Inland	N/A	8.06 inches (Mount Pleasant)
Red 1	74 mph (Wichita Falls)	129 overall state average. 29 / 5.2 per 10,000 sq. mi. In/near tornado alley**	Inland	N/A	6.07 inches (Henrietta)
Red 2	84 mph (Sherman)	129 overall state average. 29 / 5.2 per 10,000 sq. mi. In/near tornado alley**	Inland	N/A	8.4 inches (Sherman)

* 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, therefore containing all the potentially affected sites.
** Majority of sites appear to be in band of 6-10 per 1,000 square miles; Red 1 and 2, Malakoff and Trinity 2 sites sit next to/just inside tornado alley (southern tip) – one spot near Malakoff and Trinity 2 (Dallas area) shows >15 tornadoes per 1,000 square miles with an F5 in Waco in 1953 – one of deadliest. Tornado alley is one of two regions in the United States that get proportionally more tornadoes than anywhere else (other region if Florida). Although its boundaries are debatable (depending on which criteria are used - frequency, intensity, per unit area), the area from central Texas, northward to northern Iowa, and from central Kansas and Nebraska east to western Ohio is often collectively known as Tornado Alley. Climatologically, Tornado Alley is ideally positioned for the formation of super-cell thunderstorms, and therefore is also home to many violent tornadoes.

Source for PGU (wind climatology): http://www.ncdc.noaa.gov/oa/mpp/wind1996.pdf.

Source for Tornado frequency: NOAA National Climatic Data Center, Tornado Climatology (Extreme weather), http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html.

http://www.tornadochaser.net/images/frequency.gif.

Source for maximum precipitation: NOAA National Climatic Data Center, Ashville, NC: February 2004. Monthly State Climate Summaries, 1971-2000. Texas. Climatography of the United States No. 20. http://cdo.ncdc.noaa.gov/climatenormals/clim20/state-pdf/tx.pdf.

Discussion/Results – Wind speeds ranged from a low of 58 to a high of 84 mph, and maximum precipitation ranged from 6 to 11 inches. However, the sites with the lowest wind speeds and precipitation levels (e.g., Red 1 for precipitation and Malakoff and Trinity 2 for wind speed), are also found in areas at higher risk for tornadoes. In general, the threat of hurricanes to the southern sites balanced out the threat of tornadoes to the sites in or near tornado alley and most sites received the same conservative rating of 3. The southern sites are located in either a coastal or semi-coastal area and all have higher potential for extreme storm events (precipitation, winds, and direct hit by hurricanes) compared to the more northern sites; South Texas Project was given a slightly lower rating given its closer proximity to the coast. The remaining inland sites are farther from the coast, and therefore at a reduced risk for hurricanes; however, Malakoff, Trinity 2, Red 1 and Red 2 also appear to be at greater risk for tornadoes given their location in proximity to tornado alley. Sulphur 1 was given a slightly higher rating of 4 given its more favorable inland location away from both the coast and tornado alley.

Extreme Weather Conditions	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	3	3	2	3	3
Extreme Weather Conditions	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	4	3	3	

References

Climatography of the United States, No. 20. Monthly Station Climate Summaries, 1971-2000. Texas. NOAA National Climatic Data Center. February 2004

NOAA Climatic Wind Data for the United States [selected cities] November 1998

D.1.2 ACCIDENT EFFECTS-RELATED

Objective – The overall objective of this criterion is to evaluate sites with respect to the evaluation of design-related accident evaluations and potential effects of accidents.

Evaluation approach – Site ratings for this criterion are developed as a composite of three sub-criteria that address site characteristics relevant to consideration of accidents: Population, Emergency Planning Considerations, and Atmospheric Dispersion.

Discussion/Results – A discussion of each of the sub-criteria appears in the following sections D.1.2.1, D.1.2.2, and D.1.2.3. A discussion of the roll-up of the sub-criterion ratings into a single rating for the Accident-Effects-Related criterion appears in Section D.1.2.4.

D.1.2.1 Population

Objective – The objective of this criterion is to evaluate the relative suitability of the sites with respect to the population density in the vicinity of the sites. Population density conditions are codified in 10 CFR 100.21 and include the following conditions:

- the sites have exclusion area authority,
- a low population zone exists beyond the exclusion area, and
- sufficient distance exists to high population centers.

Evaluation approach – As outlined in Regulatory Guide 4.7, low population areas are preferred and low population zones should have densities less than 500 people per square mile (EPRI 2001) (equivalent to less than 25,000 persons within 4 miles).

All sites meet population density exclusion criteria since population density was a criterion in the regional screening process. Available census data regarding the nearest population centers and area population densities were reviewed for the sites in the screening criteria report (Criterion P3), and confirmed that each met the exclusion criteria. On-line data were obtained from the U.S. Census Bureau.

Ratings and the population data and distance to population centers that drive the ratings are presented for each site in the following table.

Texas's seasonal population was also factored in as follows:

- Total population calculated based on Census Bureau year-round population data plus tourist population (for host county).
- Assume increase due to seasonal/tourist population is directly related to the percentage of housing units classified for seasonal, recreational or occasional use multiplied by the number of persons per household (average household size); only population increases of greater than 10% were factored into the evaluation.

Discussion/Results – Ratings and the population data for and distance to the nearest incorporated areas (with U.S. Census Bureau population data) are presented for each site in the following table. Closest population centers (25,000 persons or more) and major metropolitan areas are also identified.

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Guadalupe 2 (De Witt County)			
Cuero (6,751); Victoria (62,169 in 2006); Yoakum (5,731) Goliad (1,975); Halletsville (2,345); Port Lavaca (12,035)	10 – 20 miles 30 – 40 miles	19,730 (2007) 20,013 (2000) -1.4% decline Population Density: 22 psm Seasonal population: 318 seasonal housing units x 2.53 per household = 804.5 persons (4% of 2000 population). No impact on rating (less than 10% increase and given low county population and population density levels.	Closest incorporated town is Cuero at just over 10 miles from the site. Cuero is the county seat for DeWitt County. Victoria is the only population center*, and in fact the largest metropolitan area, within 50 miles of the site (located 15.6 miles from the site). Nearest major metropolitan areas: Corpus Christi and San Antonio – each greater than 70 miles from site. Two small unincorporated towns (no population data) are found within 5 miles of the site (Verhella and Thomaston) but these did not factor into the overall site rating.

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Colorado 3 (Fayette County)			
LaGrange (4,478); Fayetteville (261) Columbus (3,916) Brenham (13,507)	5 – 10 miles 10 – 20 miles 20 – 30 miles	22,537 (2007) 21,804 (2000) 3.4% growth rate Population Density: 23.0 psm Seasonal population: 819 housing units x 2.44 average persons per household = 1,998.4 persons (9.1% of 2000 population). No impact on rating (less than 10% increase and given low county population and population density levels. See also Notes column.	Closest incorporated towns are Fayetteville and La Grange (county seat), both located between 5 and 10 miles from the site. Next largest town is Brenham, located approximately 30 miles from the site. There are no population centers or large metropolitan areas within 50 miles of the site. Nearest major metropolitan areas: Houston (70 miles), Austin (61 miles) and Bryan/College Station (55 miles). Several small unincorporated towns (no population data) are found within 5 miles of the site (Gay Hill, Halstead, Ellinger and Joiner) but these did not factor into the overall site rating. *Ratings adjustment: Site received additional point given absence of any large towns within 50 miles of site. Seasonal population: ER 9.3 indicated Fayette plant site was discounted, in part, because of high transient population. Assuming that the population influx is associated with cooling pond for Fayette Power Project (Cedar Creek Reservoir), this could be considered a substantive increase. However, for purposes of this evaluation, the increase was not assumed to increase county population density significantly enough to affect overall county population density sub-rating. With respect to distance to nearby population, the site is located between 5 and 10 miles from the reservoir where seasonal influx assumed to reside. This distance is no closer than other nearby towns already identified in the evaluation, thus the existing site population distance sub-rating would not be expected to change either.

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
South Texas Project (Matagorda County)			
Bay City (18,667); Palacios (5,153); Blessing (861); Markham (1,138) El Campo (10,945) Wharton (9237); Port Lavaca (12,035); Lake Jackson (27,614 in 2006)	10 – 15 miles 20 – 30 miles 30 – 40 miles	37,024 (2007) 37,957 (2000) -2.5% decline Population Density: 34.1 psm Seasonal population: 2,407 units x 2.7 average persons per household size = 6,500 persons **(17.1% of 2000 population).** Increase in seasonal population affects ratings for the distance to population sub-rating but not the county population density rating. See Notes.	Closest incorporated towns are Blessing, Markham, Bay City (county seat) and Palacios, all between 10 and 15 miles from the site. Bay City is the largest city in the county and also the county seat. Several towns between 25 and 40 miles (El Campo, Wharton and Port Lavaca). The closest population center is Lake Jackson (26,386) located 40 miles away. There are no large metropolitan areas within 50 miles of the site. Nearest major metropolitan area: Houston – over 60 miles. Several small unincorporated towns (no population data) are found between 5 and 10 miles of the site (Buckeye, Wadsworth, Elmaton, Matagorda and Collegeport) but these did not factor into the overall site rating. Seasonal population: Increase does not affect county population density rating given low county population and population density levels in 2000 (and negative growth rate between 2000 and 2007). Regarding distance to population, it is conservatively assumed that the majority of the seasonal population influx would be to the unincorporated coastal town of Matagorda such that this town is now considered in the distance to population sub-rating. Given its proximity to the site (less than 10 miles), the ratings subcomponent for distance is now reduced from a 3 to a 2; this also reduces the average rating from a 4 to a 3. Final ratings adjustments: Site received additional point to overall composite rating given absence of any large towns within 40 miles of site.

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Allens Creek (Austin County)			
Wallis (1,172) Sealy (5,248); San Felipe (868); Brookshire (3,450) East Bernard (1,729) Katy (11,755); Bellville (3,794); Rosenberg (24,043); Richmond (11,081) Sugarland (74,943 in 2006) Houston (2,144,491 in 2006)	0-5 miles 5-10 miles 10 – 15 miles 15 – 20 miles 20 – 30 miles 40 miles	26,610 (2007) 23,590 (2000) 12.8% growth rate Population Density: 36.1 psm Seasonal population: 562 units x 2.67 per household = 1,500.5 persons (6.4% of 2000 population). No impact on rating (less than 10% increase and given low county population and population density levels.	Closest incorporated town is Wallis at less than 5 miles. Multiple towns within 20 miles. Nearest population center is Sugar Land at 28 miles. Closest major metropolitan area: Houston – approximately 40 miles from the site (to western suburbs).

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Malakoff (Henderson County)			
Trinidad (1,091); Malakoff (2,257) Cross Roads (603) Athens (11,297); Kerens (1,681) Corsicana (24,485) Palestine (17,598); Ennis (16,054); Lancaster (33,790 in 2006) Jacksonville (13,868); Tyler (94,146 in 2006); Waxahachie (21,426) Dallas (1,232,940, 2006 estimate)	0 – 5 miles 5 – 10 miles 10 – 15 miles 20 – 25 miles 30 – 40 miles 40 – 50 miles 53 miles	78,897 (2007) 73,277 (2000) 7.7% growth rate Population Density: 83.8 psm Seasonal population: 3,882 units x 2.5 per household = 9,705 persons **(13.2% of 2000 population).** Slight ratings change. See Notes.	Closest towns are Trinidad and Malakoff at less than 5 miles. Athens (county seat) is at approximately 13 miles. Multiple towns between 25 and 50 miles (Corsicana, Palestine, Jacksonville). Closest population centers are Tyler and Waxahachie, each at approximately 48 miles. Largest major metropolitan area: Dallas – with southern suburbs within 50 to 55 miles. Seasonal Population: Population influx assumed to be associated with vacation rentals/housing on nearby lakes: Cedar Creek Reservoir in Henderson County (just northwest of site) and Richland Chambers Reservoir (just southwest of site, mostly in adjacent Navarro County). While this is considered to be a substantive increase, it would not increase the county population density enough to change the sub-rating. It also would not reduce the population distance sub-rating given that this sub-rating is already a "1." However, the final ratings adjustment (point increase) given to this site during the screening phase has not been made at this stage. The previous ratings adjustment was based on the absence of large towns/metropolitan area between 15 and 40 miles. However, for this more detailed evaluation that compares conditions at a fewer number (9) of sites, consideration of the seasonal population influx and this site's proximity to the large metropolitan area of Dallas (southern suburbs at 53 miles) factors in more heavily and the one point increase/final ratings adjustment to the population rating has not been given.

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Trinity 2 (Freestone County)			
Fairfield (3,094); Teague (4,557) Palestine (17,598); Athens (11,297); Corsicana (24,45)	10 – 20 miles 20 – 30 miles	18,797 (2007) 17,867 (2000) 5.2% growth rate Population Density: 20.4 psm Seasonal population: 642 units x 2.48 per household = 1,592.2 persons (8.9% of 2000 population). No impact on rating (less than 10% increase and given low county population and population density levels. See also Notes.	Closest town is Fairfield (County seat) at 10.5 miles. Palestine and Corsicana (largest town near site) are between 20 and 25 miles from site. Athens is between 25 and 30 miles. No large population centers or metropolitan areas within 50 miles of site. Seasonal population: If the seasonal influx were to be centered around Fairfield Lake, this could affect the distance to population subrating given the site's close proximity to the lake. However, it is assumed that the seasonal influx would reside mostly around the southeastern shores of Richland Chambers Reservoir (more than 10 miles to the north) and not Fairfield Lake, given the extensive industrial development (coal plant and lignite mine) currently found around the lake. There are also no signs of residential development around the lake based on GoogleEarth imagery. Final ratings adjustment: Site received additional point to overall composite rating given absence of any large towns within 40 miles of site. [Note: ER dropped Big Brown site because of population concerns, and Fairfield town website indicates they have housing additions outside the city for up to 16,712 people – current population is 3,349.]

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Sulphur 1 (Red River County)			
Clarksville (3,883) Mt. Pleasant (13,939) Mt. Vernon (2,286) Boston/New Boston (4,808) Texarkana (36,054 in 2006); 89,306 in the Texarkana MSA (Texas portion)	10 – 15 miles 15 – 20 miles 25 – 30 miles 50 miles	13,108 (2007) 14,314 (2000) -8.4% decline Population Density: 13.6 psm Seasonal population: 280 x 2.41 (average household size) = 674.8 persons (4.7%). No impact on rating (less than 10% increase and given low county population and population density levels.	Closest incorporated town is Clarksville at 13.2 miles. Closest population center is Texarkana at 50 miles. One small unincorporated town within 5 miles (Harts Bluff at 2.2 miles) and several other small unincorporated towns between 5 and 10 miles (e.g., Boxelder, Cuthand, Wilkinson, Maples Spring). Closest population center and MSA is Texarkana at 50 miles. Ratings adjustment: Site received additional point to composite site rating given absence of any large towns within 40 miles of site.

Closest Incorporated Towns (2000 population unless otherwise noted)	Distance from Site	Population and Population Density (By County)	Notes
Red 1 (Clay County)			
Petrolia (782); Henrietta (3,264); Byers (517) Waurika, OK (1,988) Wichita Falls (99,354 in 2006)	10 – 15 miles 15 – 20 miles 20 – 30 miles	11,119 (2007) 11,006 (2000) 1.0% growth rate Population Density: 10 psm Seasonal population: 205 units x 2.52 per household = 516.6 persons (4.7%). No impact on rating (less than 10% increase and given low county population and population density levels.	Closest incorporated towns are Byers, Petrolia and Henrietta, all at about 13 miles. Two small unincorporated towns within 5 miles (Stanfield and Terral); and other small unincorporated towns between 5 and 10 miles (Ryan and Ringgold). Closest population center (and largest town) is Wichita Falls at 26 miles.
Red 2 (Fannin County)			
Bells (1,190); Savoy (850) Whitewright (1,740); Bonham (9,990); Denison (22,773); Sherman (37,623 in 2006) [Sherman/ Denison MSA population is 110,595) Durant, OK (13,549) McKinney (54,369) Gainesville (15,538); Paris (25,898); Plano (222,030; Dallas suburb) Dallas (1,232,940)	0 – 5 miles 10-15 miles 20 – 30 miles 30 – 40 miles 40 – 50 miles 55 miles	33,067 (2007) 31,242 (2000) 5.8% growth rate Population Density: 35.1 psm Seasonal population: 385 units x 2.51 per household = 966.3 persons (3.1%). No impact on rating (less than 10% increase and given low county population and population density levels.	Closest towns are Bells and Savoy at 3.7 miles. Closest population center is Sherman at 14.3 miles. Sherman-Denison MSA is large at 110,595 persons. Closest large MSA is Dallas at 55 miles (to outer loop), but northern suburbs – McKinney and Plano – are within 50 miles (at 37 and 46 miles respectively). One small unincorporated town within 5 miles (Penland) and two others within 10 miles (Mulberry and Raverne).

* Population center defined as a town or city with 25,000 or more persons.

Based on the above information, the following site ratings were assigned.

Population	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
County Population	5	5	5	5	4
Distance to Pop. Center	3	2	2	1	1
Average Rating*	4	3	3	3	2
Adjusted Rating**	4	4	4	3	2

Population	Trinity 2	Sulphur 1	Red 1	Red 2
County Population	5	5	5	5
Distance to Pop. Center	3	3	3	1
Average Rating*	4	4	4	3
Adjusted Rating**	5	5	4	3

Notes:

* Average of rating based on host county population density and rating based on distance to nearest incorporated town (having U.S. Census Bureau data).

** Point added if no densely populated area is found within 40 miles of the site; point deducted if a densely populated area is found within 15 miles of the site or if a large grouping of densely populated areas are located within 15-40 miles of the site.

Transient population evaluation/assumptions greater than 5 percent increase was considered further.

References

Google Earth, http://earth.google.com.

Texas Atlas & Gazetteer Detailed Topographic Maps. DeLorme 2005.

U.S. Census Bureau (2000 Census data).

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.2.2 Emergency Planning

Objective – The objective of this criterion is to evaluate the relative suitability of the sites with respect to emergency planning characteristics of the general area around each site. (No exclusionary or avoidance criteria apply to this issue.) In particular, this evaluation relied on

information pertaining to general population in surrounding area, road conditions near site, access to major traffic networks, terrain features, and climatic conditions.

Evaluation approach – Sites with the least constrained evacuation planning issues (low population, good access from site to major traffic networks, and no terrain or climate limitations) were considered the most suitable and were assigned a score of 5. Ratings are based on review of county websites (transportation information), USGS topographic maps, and best professional judgment. Ratings relate to extent of development in the general area, the number of roads providing egress from the site area, and proximity to major U.S. highway systems.

Discussion/Results – A summary of information for each site is shown in the table below. In general, the sites with lower populations were found in the more rural areas with less developed traffic networks, so the two factors balanced each other out.

Site	Evaluation	Rating
Guadalupe 2	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 2 miles northeast of US-87, providing primary access to the area. Special Populations: The nearest schools and hospital are located in Cuero, TX, ~ 10 miles northwest of the site. Schools and hospitals are also located in Victoria, TX, ~ 17 miles southeast of the site. Stevenson Prison (1,342 maximum capacity) is located ~ 12 miles northwest of the site. Natural Hazards: The Texas Gulf Coast is prone to impact by hurricanes, and site evacuations coinciding with such climatic conditions would be hampered.	3
Colorado 3	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 12 miles north of I-10, providing primary access to the area. Special Populations: The nearest schools are located in LaGrange, TX, ~ 7 miles northwest of the site. The nearest hospital is located in Weimer, TX, ~ 11 miles south of the site. Schools are also located in Weimer, TX. No prisons are located in the vicinity of the site. Natural Hazards: Area evacuation should not be limited due to natural/climatic conditions. Flash floods could hamper local evacuation routes, but alternate evacuation routes would likely be available.	4

Site	Evaluation	Rating
South Texas Project	Egress Limitations: Area evacuation is limited to the south due to the location of the STP cooling reservoir and the Gulf Coast (~ 10-15 miles south of the site). The site is located ~ 8 miles east of SH-60, providing primary access to the area. Special Populations: The nearest schools and hospital are located in Palacios, TX, ~ 11 miles southwest of the site. Schools and a hospital are also located in Bay City, TX, ~ 14 miles northeast of the site. No prisons are located in the vicinity of the site. Natural Hazards: The Texas Gulf Coast is prone to impact by hurricanes, and site evacuations coinciding with such climatic conditions would be hampered. Due to the neighboring location of STP Units 1 and 2, area evacuation plans are already in place, and cooperative agreements with local emergency response agencies have been established.	3
Allens Creek	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 6 miles south of I-10, providing primary access to the area. Special Populations: The nearest schools are located in Sealy, TX, ~ 7 miles northwest of the site. The nearest hospitals are located in Belleville, TX (~ 20 miles northwest of the site) and in the Houston, TX suburbs ~ 25 miles east of the site. The Jester prison complex (2,004 maximum capacity) is located ~ 24 miles east of the site, and the Central Prison (1,060 maximum capacity) is located ~ 26 miles east of the site. Natural Hazards: The Texas Gulf Coast is prone to impact by hurricanes, and site evacuations coinciding with such climatic conditions would be hampered.	4
Malakoff	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 3 miles south of SH-31, providing primary access to the area. Special Populations: The nearest schools are located in Trinidad, TX (~ 3 miles west of the site) and Malakoff, TX (~ 4 miles northeast of the site). The nearest hospital is located in Athens, TX, ~ 12 miles east of the site. No prisons are located in the vicinity of the site. Natural Hazards: Area evacuation should not be limited due to natural/climatic conditions. Flash floods could hamper local evacuation routes, but alternate evacuation routes would likely be available.	3

Site	Evaluation	Rating
Trinity 2	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 11 miles northeast of I-45, providing primary access to the area. Special Populations: The nearest schools and hospital are located in Fairfield, TX, ~ 10 miles southwest of the site. The Coffield State Prison (4,139 maximum capacity) is located ~ 7 miles east of the site. Natural Hazards: Area evacuation should not be limited due to natural/climatic conditions. Flash floods could hamper local evacuation routes, but alternate evacuation routes would likely be available.	3
Sulphur 1	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 11 miles south of US-82, providing primary access to the area. Special Populations: The nearest school is located in Talco, TX, ~ 9 miles southwest of the site. The nearest hospital is located in Clarksville, TX, ~ 15 miles northwest of the site. No prisons are located in the vicinity of the site. Natural Hazards: Area evacuation should not be limited due to natural/climatic conditions. Flash floods could hamper local evacuation routes, but alternate evacuation routes would likely be available.	4
Red 1	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 9 miles north of US-82, providing primary access to the area. Special Populations: The nearest schools are located in Henrietta, TX, ~ 13 miles southwest of the site. The nearest hospital is located in Wichita Falls, TX, ~ 27 miles west of the site. No prisons are located in the vicinity of the site. Natural Hazards: Area evacuation should not be limited due to natural/climatic conditions. Flash floods could hamper local evacuation routes, but alternate evacuation routes would likely be available. Due to the neighboring location of Oklahoma, area evacuation plans would impact multiple states and require dual safety plans.	2

Site	Evaluation	Rating
Red 2	Egress Limitations: Area evacuation is adequate in all directions. The site is located ~ 3 miles north of US-82, providing primary access to the area. Special Populations: The nearest schools are located in Bells, TX and Savoy, TX, ~ 3 miles southwest of the site. The nearest hospitals are located in Denison, TX (~ 14 miles northwest of the site) and Sherman, TX (~ 14 miles west of the site). Cole State Jail (900 maximum capacity) is located ~ 9 miles southeast of the site. Natural Hazards: Area evacuation should not be limited due to natural/climatic conditions. Flash floods could hamper local evacuation routes, but alternate evacuation routes would likely be available. Due to the neighboring location of Oklahoma, area evacuation plans would impact multiple states and require dual safety plans.	1

Emergency Planning	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	3	4	3	4	3
Emergency Planning	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	4	2	1	

References

Google Earth, http://earth.google.com.

Rand McNally Road Atlas.

Texas Department of Criminal Justice Unit Directory, http://www.tdcj.state.tx.us/stat/unitdirectory/all.htm.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.2.3 Atmospheric Dispersion

Objective – The objective of this criterion is to evaluate the suitability of the sites with respect to short-term atmospheric dispersion characteristics, as a measure of the relative level of concentrations that could occur during accident conditions at the sites.

Evaluation Approach – The efficiency of atmospheric diffusion is primarily dependent on wind speed, wind direction, and the change in air temperature with height which affects atmospheric stability. These factors are used to calculate an atmospheric dispersion function referred to X/Q.

Discussion/Results – The best way to calculate atmospheric dispersion (X/Q) is using on-site meteorological data; however, no such data were readily available for the sites. Additionally, annual average values cannot be extrapolated with confidence to approximate the X/Q value. However, the equation to determine X/Q is driven by wind speed, with higher wind speeds proving more beneficial to diffusing an accidental release of radiological material. As shown below, the Guadalupe 2, Red 1, and Red 2 sites have a slightly higher annual average wind speed, and therefore are slightly more preferred with respect to atmospheric dispersion. Should atmospheric dispersion become a sensitive criterion for site selection, site-specific meteorological data should be obtained to calculate an atmospheric dispersion function (X/Q) for more accurate site comparison.

Site	Evaluation	Rating
Guadalupe 2	Annual average wind speed = 9.0 – 9.9 mph.	5
Colorado 3	Annual average wind speed = 8.0 – 8.9 mph.	4
South Texas Project	Annual average wind speed = 8.0 – 8.9 mph.	4
Allens Creek	Annual average wind speed = 8.0 – 8.9 mph.	4
Malakoff	Annual average wind speed = 8.5 – 9.5 mph.	4
Trinity 2	Annual average wind speed = 8.5 – 9.5 mph.	4
Sulphur 1	Annual average wind speed = 8.0 – 8.9 mph.	4
Red 1	Annual average wind speed = 9.0 – 9.9 mph.	5
Red 2	Annual average wind speed = 10.0 – 10.9 mph.	5

The proposed site ratings with respect to radionuclide exposure via accidental airborne releases are as follows:

Atmospheric Dispersion	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	5	4	4	4	4
Atmospheric Dispersion	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	4	4	5	5	

References

Climate Atlas of the United States, Mean Wind Speed, http://mobot.org/education/mapping/mapatlas.html.

Environmental Engineering Reference Manual, M. R. Lindeburg, 2001.

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.2.4 Accident-Effect Related Summary Rating

Composite ratings for this criterion (Accident Effects) are a composite of those for sub-criteria D.1.2.1, D.1.2.2, and D.1.2.3; the ratings for these sub-criteria, along with the summary rating for this criterion, are provided in the following table.

Accident-Related Effects	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Population	4	4	4	3	2
Emergency Planning	3	4	3	4	3
Atmospheric Dispersion	5	4	4	4	4
OVERALL RATING	4	4	4	4	3
Accident-Related Effects	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Population	5	5	4	3	
Emergency Planning	3	4	2	1	
Atmospheric Dispersion	4	4	5	5	
OVERALL RATING	4	4	4	3	

D.1.3 OPERATIONAL EFFECTS-RELATED

D.1.3.1 Surface Water – Radionuclide Pathway
D.1.3.1.1 Dilution Capacity
D.1.3.1.2 Baseline Loadings
D.1.3.1.3 Proximity to Consumptive Users

Objective – The purpose of this criterion is to evaluate sites with respect to potential liquid pathway dose consequences. (No site exclusionary or avoidance criteria apply to this issue.) Besides potential source terms, dilution in the receiving surface water body is of primary importance. Three factors considered in evaluating the potential dilution for a receiving water body are dilution capacity, baseline loadings, and proximity to consumptive users.

Evaluation Approach – Site ratings for this criterion are developed as a composite of three sub-criteria that address site characteristics relevant to consideration of operation: Dilution Capacity, Baseline Loadings, and Proximity to Consumptive Users.

- Dilution Capacity – The purpose of this sub-criterion is to rate sites based on the overall capacity of the receiving water body to dilute effluents from a nuclear power plant. Information on the radioactive source term dilution at a new power plant will be site specific. For siting consideration where such information is not available, however, surrogate parameters, representing the dilution capacity of a stream, can be used. The greater the dilution capacity of the receiving water body, the shorter will be the mixing length downstream defined as the zone within which complete mixing of a discharge contaminant occurs. Sites with higher dilution capacity are rated higher.
- Baseline Loadings – The capacity of a stream to impact health and safety of downstream consumers is related to the existing, or baseline loadings of, radionuclides that are present in the system or can be anticipated in the future. The purpose of this sub-criterion is to characterize sites in accordance with existing levels of radioactive contamination in the receiving water body. Sites are given a rating of 5 for no baseline loadings; proportionally lower ratings are assigned as higher existing levels of radionuclide contamination are identified.
- Proximity to Consumptive Users – The purpose of this sub-criterion is to rate sites in accordance with the proximity of plant effluent release point to the location(s) public water supply withdrawal(s). More proximal withdrawals present higher potential for dose impacts from the surface water ingestion pathway and can require additional design and licensing efforts. Downstream locations of public water supply withdrawals and recreational contact were identified for each site. Sites with greater pathway lengths to users were more suitable and were assigned a score of 5.

Discussion/Results – An evaluation of each site and a summary of the sub-criterion and overall ratings for the surface water-radionuclide pathway criterion are presented in the following tables.

Site	Evaluation	Rating
Guadalupe 2	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Guadalupe River (average flow = 2,030 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose, although capacity is less than the other sites for comparative purposes. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Downstream locations of public water supply withdrawals include the City of Victoria (~ 18 miles southeast of the site), the Guadalupe-Blanco River Authority – Calhoun County (~ 40 miles southeast of the site), and Port O'Connor MUD (~ 50 miles southeast of the site).	4

Site	Evaluation	Rating
Colorado 3	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Colorado River (average flow = 2,676 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose, although capacity is slightly less than the other sites for comparative purposes. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: No downstream locations of public water supply withdrawals were identified for the site.	5
South Texas Project	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the South Texas Project cooling water reservoir and ultimately the Colorado River (2,590). The reservoir and river have sufficient capacity to adequately dilute the effects of the blowdown discharge. Baseline Loading: The STP Units 1 and 2 are co-located at the proposed site. While an existing nuclear power plant is located at the proposed site, the receiving body of water is sufficiently large to render any baseline radionuclide loadings negligible. Additionally, discharge from the cooling reservoir to the Colorado River is an uncommon operating condition. Proximity to Consumptive Users: No downstream locations of public water supply withdrawals were identified for the site. Nuclear power plant operations are currently located at the site, and construction of a new nuclear power plant would not introduce a new pathway concern to the area.	5
Allens Creek	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Brazos River (average flow = 6,843 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Downstream locations of public water supply withdrawals include Gulf Coast Water Authority (Alvin, TX ~ 55 miles southeast of site), Brazosport Water Authority (Lake Jackson, TX ~ 60 miles southeast of site), and City of Freeport, TX (~ 65 miles southeast of site).	5

Site	Evaluation	Rating
Malakoff	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Trinity River (average flow = 4,393 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Numerous downstream locations of public water supply withdrawals include the City of Corsicana, Tarrant Regional Water District (Richland-Chambers Reservoir, ~ 10 miles south of the site), Trinity River Authority – Freestone County, the City of Fairfield (~ 25 miles south of the site), and ultimately the City of Houston.	4
Trinity 2	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Trinity River (average flow = 4,393 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Downstream locations of public water supply withdrawals include the Trinity River Authority – Freestone County, the City of Fairfield (~ 25 miles south of the site), and ultimately the City of Houston.	4
Sulphur 1	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Sulphur River (average flow = 1,270 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose, although capacity is less than the other sites for comparative purposes. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Numerous downstream locations of public water supply withdrawals include the Cities of Annona, Avery, DeKalb (~ 17 miles east of the site), Maud, New Boston (~ 35 miles east of the site), Hooks, Wake Village, Texarkana (~ 46 miles east of the site), the Red River Redevelopment Authority – Bowie County, and other potential users in Arkansas and Louisiana.	4

Site	Evaluation	Rating
Red 1	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Red River (average flow = 1,257 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose, although capacity is less than the other sites for comparative purposes. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Numerous downstream locations of public water supply withdrawals include the City of Bowie, North Montague County (~ 20 miles east of the site), the City of Gainesville (~ 50 miles east of the site), the Red River Authority – Grayson County, the Greater Texoma Utility Authority (~ 95 miles east of the site), the North Texas Municipal Water District, the City of Denison (~ 100 miles east of the site), the City of Bonham (~ 105 miles east of the site), the Lamar County Water Supply District, the City of Paris (~ 140 miles east of the site), the City of Texarkana (~ 230 miles east of the site), and other potential users in Oklahoma, Arkansas and Louisiana.	4
Red 2	Dilution Capacity: The proposed site is anticipated to discharge cooling water blowdown to the Red River (average flow = 5,007 cfs). The receiving body of water is likely capable of diluting potential liquid pathway dose. Baseline Loading: No sources of existing radionuclide loadings were identified for the site. Proximity to Consumptive Users: Numerous downstream locations of public water supply withdrawals include the City of Bonham (~ 12 miles east of the site), the Lamar County Water Supply District, the City of Paris (~ 50 miles east of the site), the City of Texarkana (~ 130 miles east of the site), and other potential users in Oklahoma, Arkansas and Louisiana.	4

Site	Dilution Capacity	Baseline Loadings	Proximity to Downstream public water supply	Composite Rating
Guadalupe 2	3	5	3	4
Colorado 3	4	5	5	5
South Texas Project	5	5	5	5
Allens Creek	5	5	4	5
Malakoff	5	5	3	4
Trinity 2	5	5	3	4
Sulphur 1	3	5	3	4
Red 1	3	5	3	4
Red 2	5	5	3	4

References

Google Earth, http://earth.google.com.

NOAA Stream and Flood Data, http://www.weather.gov/ahps/.

Texas Commission on Environmental Quality, Water Rights Database, April 2, 2009, http://www.tceq.state.tx.us/permitting/water_supply/water_rights/wr_databases.html.

USGS Office of Surface Water, http://water.usgs.gov/osw/

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.3.2 Groundwater Radionuclide Pathway

Objective – The purpose of this section is to evaluate the sites with respect to the relative vulnerability of groundwater resources to potential contamination.

Evaluation Approach – All sites overlie aquifers that have not been designated by EPA's (1986) classification scheme. EPA guidelines were, however, used to assign a designation to site aquifers. In addition, the relative vulnerability of these aquifers to groundwater pollution was evaluated using a standard numerical ranking system called DRASTIC (Aller et al. 1987). Sites considered most suitable are those that are least vulnerable to groundwater contamination within a 2-mile radius of a site.

Discussion/Results – Class I groundwater is addressed as an avoidance criteria (EPRI 2000). This classification includes groundwater resources of unusually high value. They are highly vulnerable to contamination and are irreplaceable sources of drinking water and or ecologically vital. Groundwater underlying the sites are either currently used or are potential sources of drinking water, hence, they would be considered Class II aquifers according to the EPA classification guidelines. None of the sites overlay groundwater aquifers designated as a Sole Source Aquifer by EPA (the only sole source aquifer in Texas is the Edwards Aquifer I/II).

The DRASTIC evaluation was completed using site-specific data, where available, or data from published sources. The most important variables that control the groundwater pollution potential are:

- D–Depth to water,
- R–Recharge (net),
- A–Aquifer media,
- S–Soil media,
- T–Topography (slope),
- I–Impact of the vadose zone,
- C–Conductivity (hydraulic) of the groundwater flow system.

DRASTIC assigns a weighted numeric value to each characteristic, depending on its relative contribution to risk of groundwater contamination. This results in a numeric ranking for each site, allowing the sites to then be ranked in order of suitability. The higher an area scores on the DRASTIC index, the more susceptible a site is to groundwater contamination. Following is a summary of the DRASTIC evaluations.

Guadalupe 2				
Groundwater region = 10 (Atlantic and Gulf Coastal Plain) Groundwater subregion = Bb (River Alluvium without Overbank Deposits) Underlying Basin = Guadalupe River Basin Predicted groundwater classification = Class IIA / IIB Potential evapotranspiration exceeds annual precipitation by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	75 ft bgs to Gulf Coast Aquifer (TWDB, Groundwater Database)	5	2.5	12.5
Net Recharge	10+ in/yr (DRASTIC)	4	9	36
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Gravelly soils to gravelly loamy sand (USGS Web Soil Survey)	2	10	20
Topography	~ 6% (USGS site topographic maps)	1	5	5
Impact Vadose Zone	Sand and gravel with significant silt and clay (DRASTIC)	5	6	30
Hydraulic Conductivity	1,000 – 2,000 gpd/ft^2 (DRASTIC)	3	8	24
			INDEX	**151.5**

Colorado 3				
Groundwater region = 10 (Atlantic and Gulf Coastal Plain) Groundwater subregion = Ba (River Alluvium with Overbank Deposits) Underlying Basin = Colorado River Basin Predicted groundwater classification = Class IIA / IIB Potential evapotranspiration exceeds annual precipitation by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	42 ft bgs to Gulf Coast Aquifer (TWDB, Groundwater Database)	5	5	25
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Clay loam (USGS Web Soil Survey)	2	3	6
Topography	~ 1% (USGS site topographic maps)	1	10	10
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	700 – 1,000 gpd/ft^2 (DRASTIC)	3	6	18
			INDEX	**130**

South Texas Project				
Groundwater region = 10 (Atlantic and Gulf Coastal Plain) Groundwater subregion = Ba (River Alluvium with Overbank Deposits) Underlying Basin = Colorado-Lavaca River Basin Predicted groundwater classification = Class IIA / IIB Potential evapotranspiration exceeds annual precipitation by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	15 ft bgs to Gulf Coast Aquifer (TWDB, Groundwater Database)	5	8	40
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Clay (USGS Web Soil Survey)	2	3	6
Topography	~ 1% (USGS site topographic maps)	1	10	10
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	700 – 1,000 gpd/ft^2 (DRASTIC)	3	6	18
			INDEX	**145**

Allens Creek				
Groundwater region = 10 (Atlantic and Gulf Coastal Plain) Groundwater subregion = Ba (River Alluvium with Overbank Deposits) Underlying Basin = Brazos River Basin Predicted groundwater classification = Class IIA / IIB Annual precipitation exceeds potential evapotranspiration by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	24 ft bgs to Alluvium/Gulf Coast Aquifer (TWDB, Groundwater Database)	5	7	35
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Fine sandy loam (USGS Web Soil Survey)	2	5	10
Topography	~ 1% (USGS site topographic maps)	1	10	10
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	700 – 1,000 gpd/ft^2 (DRASTIC)	3	6	18
			INDEX	**144**

Malakoff				
Groundwater region = 10 (Atlantic and Gulf Coastal Plain) Groundwater subregion = Ba (River Alluvium with Overbank Deposits) Underlying Basin = Trinity River Basin Predicted groundwater classification = Class IIA / IIB Potential evapotranspiration exceeds annual precipitation by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	19 ft bgs to Carrizo-Wilcox Aquifer (TWDB, Groundwater Database)	5	7	35
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Clay (USGS Web Soil Survey)	2	1	2
Topography	~ 1% (USGS site topographic maps)	1	10	10
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	700 – 1,000 gpd/ft^2 (DRASTIC)	3	6	18
			INDEX	**136**

Trinity 2				
Groundwater region = 10 (Atlantic and Gulf Coastal Plain) Groundwater subregion = Ba (River Alluvium with Overbank Deposits) Underlying Basin = Trinity River Basin Predicted groundwater classification = Class IIA / IIB Potential evapotranspiration exceeds annual precipitation by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	60 ft bgs to Carrizo-Wilcox Aquifer (TWDB, Groundwater Database)	5	3	15
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Loamy fine sand (USGS Web Soil Survey)	2	5	10
Topography	~ 7% (USGS site topographic maps)	1	5	5
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	700 – 1,000 gpd/ft^2 (DRASTIC)	3	6	18
			INDEX	**119**

Sulphur 1				
Groundwater region = 6 (Nonglaciated Central Region) Groundwater subregion = Fa (River Alluvium with Overbank Deposits) Underlying Basin = Sulphur River Basin Predicted groundwater classification = Class IIA / IIB Annual precipitation exceeds potential evapotranspiration by 5-15 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	15 ft bgs to Nacatoch Aquifer (TWDB, Groundwater Database)	5	8	40
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Silty clay (USGS Web Soil Survey)	2	2	4
Topography	~ 1% (USGS site topographic maps)	1	10	10
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	1,000 – 2,000 gpd/ft^2 (DRASTIC)	3	8	24
			INDEX	**149**

Red 1				
Groundwater region = 6 (Nonglaciated Central Region) Groundwater subregion = Fa (River Alluvium with Overbank Deposits) Underlying Basin = Red River Basin Predicted groundwater classification = Class IIA / IIB Potential evapotranspiration exceeds annual precipitation by 5-15 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	62 ft bgs to Alluvium (TWDB, Groundwater Database)	5	3	15
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Loam (USGS Web Soil Survey)	2	5	10
Topography	~ 4% (USGS site topographic maps)	1	9	9
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	1,000 – 2,000 gpd/ft^2 (DRASTIC)	3	8	24
			INDEX	**129**

Red 2				
Groundwater region = 6 (Nonglaciated Central Region) Groundwater subregion = Fa (River Alluvium with Overbank Deposits) Underlying Basin = Red River Basin Predicted groundwater classification = Class IIA / IIB Annual precipitation exceeds potential evapotranspiration by 0-10 inches/yr				
DRASTIC Variable	**Range and Source of Information**	**Weight**	**Rating**	**Number**
Depth to Water	37 ft bgs to Alluvium (TWDB, Groundwater Database)	5	5	25
Net Recharge	7-10 in/yr (DRASTIC)	4	8	32
Aquifer Media	Sand and gravel (DRASTIC)	3	8	24
Soil Media	Fine sandy loam to loam (USGS Web Soil Survey)	2	5	10
Topography	~ 5% (USGS site topographic maps)	1	9	9
Impact Vadose Zone	Silt/Clay (DRASTIC)	5	3	15
Hydraulic Conductivity	1,000 – 2,000 gpd/ft^2 (DRASTIC)	3	8	24
			INDEX	**139**

DRASTIC indexes for all typical hydrogeologic settings range from 65 to 223 (Aller et al. 1987, p. 82). This range of indexes was used to develop a ranking system to compare vulnerability of sites, as follows:

DRASTIC Index Range	Relative Vulnerability	Rating
65 – 80	Low	5
81 – 110	Low to Moderate	4
111 – 140	Moderate	3
141 – 170	High	2
171+	Very High	1

Based on these DRASTIC Index Ranges for qualitative vulnerability, sites were ranked as follows:

Site	DRASTIC Index	Rating
Guadalupe 2	151.5	2
Colorado 3	130	3
South Texas Project	145	2
Allens Creek	144	2
Malakoff	136	3
Trinity 2	119	3
Sulphur 1	149	2
Red 1	129	3
Red 2	139	3

References

Aller, L., Bennett, T., Lehr, J., Petty, R. and G. Hackett. 1987. DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings. EPA/600/2-87/035, June 1987.

DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings; EPA Manual, 1987.

EPA, 1986. Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy, Office of Groundwater Protection.

Google Earth, http://earth.google.com.

Hydrologic Landscape Regions of the United States, USGS, http://water.usgs.gov/GIS/metadata/usgswrd/XML/hlrus.xml.

Physiographic Map of Texas, http://www.lib.utexas.edu/geo/physiography.html.

Sole Source Aquifer Designations in EPA, Region 6, http://www.epa.gov/region6/water/swp/ssa/maps.htm.

Texas Water Development Board, Groundwater Database, http://wiid.twdb.state.tx.us/index_apps.asp.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

USDA Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/.

D.1.3.3 Air Radionuclide Pathway

D.1.3.3.1 Topographic Effects

D.1.3.3.2 Atmospheric Dispersion

Objective – The purpose of this criterion is to address the relative suitability of sites with respect to the potential for exposure to the public from routine airborne releases from a nuclear power plant.

Evaluation approach – The criterion is composed of two suitability characteristics:

> Topographic Effects – Site ratings are based on whether there are any significant topographic features that would materially affect dispersion of the plume from plant releases (e.g., channeling of releases from a site located low in a high-banked river valley).
>
> Atmospheric Dispersion – Measured in terms of long term (e.g., annual average X/Q) dispersion characteristics. Sites with lower X/Q values are rated higher than those with less favorable dispersion conditions.

Discussion/Results – None of the sites are believed to have significant potential for negative topographic effects on long-term dispersion; however, the Malakoff site may experience some channeling of releases due area relief. Site-specific meteorological data are not available for all of the sites. Annual average wind speeds for the regions were used to estimate atmospheric dispersion effects. Should atmospheric dispersion become a sensitive criterion for site selection, site-specific meteorological data should be obtained to calculate an atmospheric dispersion function (X/Q) for more accurate site comparison.

Site	Evaluation	Rating
Guadalupe 2	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 9.0 – 9.9 mph.	5
Colorado 3	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 8.0 – 8.9 mph.	4
South Texas Project	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 8.0 – 8.9 mph.	4
Allens Creek	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 8.0 – 8.9 mph.	4
Malakoff	Atmospheric dispersion could potentially be affected by channeling effects of area topography as the site is located in the Cedar Creek/Trinity River valley (low lying area). Annual average wind speed = 8.5 – 9.5 mph.	3
Trinity 2	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 8.5 – 9.5 mph.	4
Sulphur 1	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 8.0 – 8.9 mph.	4
Red 1	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 9.0 – 9.9 mph.	5
Red 2	Atmospheric dispersion not expected to be materially affected by area topography. Annual average wind speed = 10.0 – 10.9 mph.	5

The proposed site ratings with respect to radionuclide exposure via airborne releases are as follows:

Air – Radionuclide Pathway	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	5	4	4	4	3
Air – Radionuclide Pathway	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**4**	**4**	**5**	**5**	

References

Climate Atlas of the United States, Mean Wind Speed, http://mobot.org/education/mapping/mapatlas.html.

Environmental Engineering Reference Manual, M. R. Lindeburg, 2001.

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.1.3.4 Air-Food Ingestion Pathway

Objective – The objective of this criterion is to rate sites in terms of the relative potential for exposure of humans to radioactive emissions through deposition of radioactive materials on food crops and pastures with subsequent consumption of exposed foodstuffs by individuals or through consumption of exposed livestock by individuals.

Evaluation approach – A potential exposure pathway for nuclear power plants is the emission of radionuclides into the food chain on local crops and pastures. Radiological doses and dose commitments resulting from a nuclear plant are well-known and documented. While the operational impacts on the public through food pathway exposures are negligible, sites with lower amounts of crop and pasture land uses are considered to be more suitable. No exclusionary or avoidance criteria apply to this issue. Sites with less crop production nearby are rated higher than those with larger agricultural industries. Due to significant agricultural activity in the vicinity of the primary sites, the highest rating assigned was 3.

Discussion/Results – General information regarding crop lands and pastures near the sites is summarized in the table below. Ratings have been assigned based on the location of potential sites in the extremes of area agricultural settings. All sites are located in areas intensive with agricultural operations.

Site	Evaluation	Rating
Guadalupe 2	As the proposed site is near the border of DeWitt County and Victoria County, statistics for both counties are considered in the evaluation. The site is located in DeWitt County. Agriculture (farmland) represents 576,896 acres out of 581,873 acres in DeWitt County, TX (99%). Out of the total farmland, 166,017 acres are planted in crop (29%). Other farmland is used for cattle (117,000 head), hogs and pigs (2,200 head), and sheep (500 head). Agriculture (farmland) represents 513,828 acres out of 564,798 acres in Victoria County, TX (91%). Out of the total farmland, 166,089 acres are planted in crop (32%). Other farmland is used for cattle (70,000 head), sheep (300 head), and hogs and pigs (250 head). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (livestock). 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.	2
Colorado 3	As the proposed site is near the border of Fayette County and Colorado County, statistics for both counties are considered in the evaluation. The site is located in Fayette County. Agriculture (farmland) represents 552,414 acres out of 608,017 acres in Fayette County, TX (91%). Out of the total farmland, 221,253 acres are planted in crop (40%). Other farmland is used for cattle (123,000 head), hogs and pigs (5,000 head), sheep (600 head), and poultry (1.6 million). Agriculture (farmland) represents 538,635 acres out of 616,286 acres in Colorado County, TX (87%). Out of the total farmland, 206,586 acres are planted in crop (38%). Other farmland is used for cattle (100,000 head), sheep (700 head), and hogs and pigs (600 head). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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.	2

Site	Evaluation	Rating
South Texas Project	Agriculture (farmland) represents 619,142 acres out of 713,252 acres in Matagorda County, TX (87%). Out of the total farmland, 255,195 acres are planted in crop (41%). Other farmland is used for cattle (85,000 head), sheep (300 head), and poultry (500). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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.	2
Allens Creek	As the proposed site is near the border of Austin County and Waller County, statistics for both counties are considered in the evaluation. The site is located in Austin County. Agriculture (farmland) represents 367,497 acres out of 417,656 acres in Austin County, TX (88%). Out of the total farmland, 134,793 acres are planted in crop (37%). Other farmland is used for cattle (90,000 head), hogs and pigs (200 head), sheep (500 head), and poultry (1,000). Agriculture (farmland) represents 277,000 acres out of 328,721 acres in Waller County, TX (84%). Out of the total farmland, 124,431 acres are planted in crop (45%). Other farmland is used for cattle (62,000 head), sheep (600 head), hogs and pigs (500 head), and poultry (5,000). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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.	2

Site	Evaluation	Rating
Malakoff	As the proposed site is near the border of Henderson County and Navarro County, statistics for both counties are considered in the evaluation. The site is located in Henderson County. Agriculture (farmland) represents 340,869 acres out of 559,511 acres in Henderson County, TX (61%). Out of the total farmland, 155,850 acres are planted in crop (46%). Other farmland is used for cattle (80,000 head), hogs and pigs (500 head), sheep (300 head), and poultry (1,000). Agriculture (farmland) represents 537,104 acres out of 644,900 acres in Navarro County, TX (83%). Out of the total farmland, 222,944 acres are planted in crop (42%). Other farmland is used for cattle (88,000 head), sheep (600 head), hogs and pigs (800 head), and poultry (4,000). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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.	3
Trinity 2	As the proposed site is near the border of Freestone County and Anderson County, statistics for both counties are considered in the evaluation. The site is located in Freestone County. Agriculture (farmland) represents 429,339 acres out of 561,553 acres in Freestone County, TX (76%). Out of the total farmland, 127,418 acres are planted in crop (30%). Other farmland is used for cattle (100,000 head), hogs and pigs (400 head), sheep (400 head), and poultry (1,000). Agriculture (farmland) represents 365,182 acres out of 685,303 acres in Anderson County, TX (53%). Out of the total farmland, 135,067 acres are planted in crop (37%). Other farmland is used for cattle (77,000 head) and poultry (6,000). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (livestock). 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.	3

Site	Evaluation	Rating
Sulphur 1	As the proposed site is near the border of Red River County and Titus County, statistics for both counties are considered in the evaluation. The site is located in Red River County. Agriculture (farmland) represents 422,645 acres out of 672,113 acres in Red River County, TX (63%). Out of the total farmland, 138,267 acres are planted in crop (33%). Other farmland is used for cattle (78,000 head), hogs and pigs (100 head), sheep (200 head), and poultry (1.5 million). Agriculture (farmland) represents 178,303 acres out of 262,745 acres in Titus County, TX (68%). Out of the total farmland, 69,011 acres are planted in crop (39%). Other farmland is used for cattle (36,000 head) and poultry (30 million sold). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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.	3

Site	Evaluation	Rating
Red 1	As the proposed site is near the border of Clay County, Montague County, Cotton County (OK) and Jefferson County (OK), statistics for all counties are considered in the evaluation. The site is located in Clay County. Agriculture (farmland) represents 654,342 acres out of 702,602 acres in Clay County, TX (93%). Out of the total farmland, 186,128 acres are planted in crop (28%). Other farmland is used for cattle (85,000 head), hogs and pigs (200 head), and poultry (300). Agriculture (farmland) represents 503,562 acres out of 595,620 acres in Montague County, TX (85%). Out of the total farmland, 179,756 acres are planted in crop (36%). Other farmland is used for cattle (80,000 head), sheep (400 head), hogs and pigs (100 head), and poultry (3,000). Agriculture (farmland) represents 334,328 acres out of 407,448 acres in Cotton County, OK (82%). Out of the total farmland, 195,085 acres are planted in crop (58%). Other farmland is used for cattle (66,000 head), sheep (200 head), hogs and pigs (100 head), and poultry (100). Agriculture (farmland) represents 407,194 acres out of 485,598 acres in Jefferson County, OK (84%). Out of the total farmland, 127,208 acres are planted in crop (31%). Other farmland is used for cattle (91,000 head), hogs and pigs (100 head), and poultry (200). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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. Predominant winds towards Oklahoma may present an opportunity for increased opposition.	1

Site	Evaluation	Rating
Red 2	As the proposed site is near the border of Fannin County, Grayson County, and Bryan County (OK), statistics for all counties are considered in the evaluation. The site is located in Fannin County. Agriculture (farmland) represents 483,446 acres out of 570,526 acres in Fannin County, TX (85%). Out of the total farmland, 273,137 acres are planted in crop (56%). Other farmland is used for cattle (90,000 head), hogs and pigs (100 head), sheep (900 head), and poultry (3,000). Agriculture (farmland) represents 441,246 acres out of 597,444 acres in Grayson County, TX (74%). Out of the total farmland, 232,120 acres are planted in crop (53%). Other farmland is used for cattle (70,000 head), sheep (1,300 head), hogs and pigs (1,200 head), and poultry (2,000). Agriculture (farmland) represents 458,275 acres out of 581,630 acres in Bryan County, OK (79%). Out of the total farmland, 197,947 acres are planted in crop (43%). Other farmland is used for cattle (105,000 head), sheep (2,800 head), hogs and pigs (700 head), and poultry (1,500). Aerial imagery indicates that the proposed site is in the general vicinity of agricultural operations (crop and livestock). 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. Predominant winds towards Oklahoma may present an opportunity for increased opposition.	1

Air – Food Ingestion Pathway	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	2	2	2	3
Air – Food Ingestion Pathway	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**3**	**3**	**1**	**1**	

References

Climate Atlas of the United States, Mean Wind Speed and Prevailing Direction, http://mobot.org/education/mapping/mapatlas.html.

Google Earth, http://earth.google.com.

MapStats, http://www.fedstats.gov/.

National Agricultures Statistics Service (2002 Census of Agriculture), http://151.121.3.33:8080/Census/Create_Census_US_CNTY.jsp.

D.1.3.5 Surface Water – Food Radionuclide Pathway

Objective – The purpose of this criterion is to evaluate the relative suitability of sites in terms of the specific use of irrigation water by downstream locations as a potential pathway for potential exposure.

Evaluation approach – Sites with the fewest number of downstream irrigation uses are more suitable and are rated higher than sites with a large number of downstream irrigation withdrawals. No exclusionary or avoidance criteria apply to this issue (EPRI 2001).

Discussion/Results – General information regarding irrigated lands near the sites is summarized in the table below.

Site	Evaluation	Rating
Guadalupe 2	As the proposed site is near the border of DeWitt County and Victoria County, statistics for both counties are considered in the evaluation. The site is located in DeWitt County. Total irrigated land represents 3,481 acres out of 581,873 acres in DeWitt County, TX (0.6%). 2% of all cropland in the county is irrigated. Total irrigated land represents 4,702 acres out of 564,798 acres in Victoria County, TX (0.8%). 3% of all cropland in the county is irrigated. The site is located immediately adjacent to the Guadalupe River, which is an irrigation source. Aerial imagery indicates that the proposed site is not in the general vicinity of agricultural crop operations.	5
Colorado 3	As the proposed site is near the border of Fayette County and Colorado County, statistics for both counties are considered in the evaluation. The site is located in Fayette County. Total irrigated land represents 1,447 acres out of 608,017 acres in Fayette County, TX (0.2%). 1% of all cropland in the county is irrigated. Total irrigated land represents 31,281 acres out of 616,286 acres in Colorado County, TX (5%). 15% of all cropland in the county is irrigated. The site is located immediately adjacent to the Colorado River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	3

Site	Evaluation	Rating
South Texas Project	Total irrigated land represents 43,401 acres out of 713,252 acres in Matagorda County, TX (6%). 17% of all cropland in the county is irrigated. The site is located near the Colorado River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	3
Allens Creek	As the proposed site is near the border of Austin County and Waller County, statistics for both counties are considered in the evaluation. The site is located in Austin County. Total irrigated land represents 3,541 acres out of 417,656 acres in Austin County, TX (0.8%). 3% of all cropland in the county is irrigated. Total irrigated land represents 11,908 acres out of 328,722 acres in Waller County, TX (4%). 10% of all cropland in the county is irrigated. The site is located immediately adjacent to the Brazos River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	3
Malakoff	As the proposed site is near the border of Henderson County and Navarro County, statistics for both counties are considered in the evaluation. The site is located in Henderson County. Total irrigated land represents 1,028 acres out of 559,511 acres in Henderson County, TX (0.2%). 1% of all cropland in the county is irrigated. Total irrigated land represents 172 acres out of 644,900 acres in Navarro County, TX (0.03%). 0.08% of all cropland in the county is irrigated. The site is located immediately adjacent to the Trinity River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	4
Trinity 2	As the proposed site is near the border of Freestone County and Anderson County, statistics for both counties are considered in the evaluation. The site is located in Freestone County. Total irrigated land represents 980 acres out of 561,553 acres in Freestone County, TX (0.2%). 0.08% of all cropland in the county is irrigated. Total irrigated land represents 1,169 acres out of 685,303 acres in Anderson County, TX (0.2%). 0.08% of all cropland in the county is irrigated. The site is located immediately adjacent to the Trinity River, which is an irrigation source. Aerial imagery indicates that the proposed site is not in the general vicinity of agricultural crop operations.	5

Site	Evaluation	Rating
Sulphur 1	As the proposed site is near the border of Red River County and Titus County, statistics for both counties are considered in the evaluation. The site is located in Red River County. Total irrigated land represents 3,484 acres out of 672,113 acres in Red River County, TX (0.5%). 3% of all cropland in the county is irrigated. Total irrigated land represents 285 acres out of 262,745 acres in Titus County, TX (0.1%). 0.4% of all cropland in the county is irrigated. The site is located immediately adjacent to the Sulphur River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	4
Red 1	As the proposed site is near the border of Clay County, Montague County, Cotton County (OK) and Jefferson County (OK), statistics for all counties are considered in the evaluation. The site is located in Clay County. Total irrigated land represents 1,339 acres out of 702,602 acres in Clay County, TX (0.2%). 1% of all cropland in the county is irrigated. Total irrigated land represents 761 acres out of 595,620 acres in Montague County, TX (0.1%). 0.4% of all cropland in the county is irrigated. Total irrigated land represents 69 acres out of 407,448 acres in Cotton County, OK (0.02%). 0.04% of all cropland in the county is irrigated. Total irrigated land represents 250 acres out of 485,598 acres in Jefferson County, OK (0.05%). 0.2% of all cropland in the county is irrigated. The site is located immediately adjacent to the Red River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	4
Red 2	As the proposed site is near the border of Fannin County, Grayson County, and Bryan County (OK), statistics for all counties are considered in the evaluation. The site is located in Fannin County. Total irrigated land represents 7,379 acres out of 570,526 acres in Fannin County, TX (1%). 3% of all cropland in the county is irrigated. Total irrigated land represents 2,461 acres out of 597,444 acres in Grayson County, TX (0.4%). 1% of all cropland in the county is irrigated. Total irrigated land represents 7,186 acres out of 581,630 acres in Bryan County, OK (1%). 4% of all cropland in the county is irrigated. The site is located immediately adjacent to the Red River, which is an irrigation source. Aerial imagery indicates that the proposed site is in the general vicinity of agricultural crop operations.	4

Surface Water – Food Ingestion Pathway	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	5	3	3	3	4
Surface Water – Food Ingestion Pathway	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	5	4	4	4	

References

Google Earth, http://earth.google.com.

MapStats, http://www.fedstats.gov/.

National Agricultures Statistics Service (2002 Census of Agriculture), http://151.121.3.33:8080/Census/Create_Census_US_CNTY.jsp.

D.1.3.6 Transportation Safety

Objective – The objective of this criterion is to evaluate the suitability of the sites with respect to the potential of plant cooling systems to create fog and ice hazards to local transportation. No exclusionary or avoidance criteria apply to this issue.

Evaluation approach – Potential impacts from plant operations on transportation safety could occur as a result of increased hazards from cooling towers. Both natural draft and mechanical cooling towers can increase area fogging conditions and ice formation on local roads and highways. Sites with high frequencies of naturally-occurring fog and ice events will likely be more adversely affected by cooling tower operations.

Discussion/Results – Maps delineating the mean number of days with heavy fog (<0.25 mile visibility) are available from the National Climatic Data Center. Each of the sites was sited within a mapped region, and the annual average number of days with heavy fog was reported. Ice hazards are not anticipated to be of significance in the regions where the sites are located.

Site	Evaluation	Rating
Guadalupe 2	Annual average of 30-35 days of heavy fog. Site is located ~ 2 miles northeast of US-87, which sits below the site elevation in the Guadalupe River valley.	1
Colorado 3	Annual average of 25-30 days of heavy fog. Site is located ~ 1 mile southwest of SH-71.	2

Site	Evaluation	Rating
South Texas Project	Annual average of 25-30 days of heavy fog. Site is ~ 1 mile south of FM-521 and FM-1468 (low volume roads).	3
Allens Creek	Annual average of 25-30 days of heavy fog. Site is ~ 1 mile northeast of SH-36.	2
Malakoff	Annual average of 15-20 days of heavy fog. Site is ~ 3 miles southeast of SH-31.	3
Trinity 2	Annual average of 15-20 days of heavy fog. Site is ~ 4 miles east of FM-1124 (low volume road).	4
Sulphur 1	Annual average of 10-15 days of heavy fog. Site is ~ 5 miles north of FM-71 (low volume road).	5
Red 1	Annual average of 10-15 days of heavy fog. Site is ~ 4 miles west of US-81 and ~ 1 mile southwest of FM-2332.	4
Red 2	Annual average of 10-15 days of heavy fog. Site is ~ 4 miles north of US-82 and ~ 0.5 miles west of FM-1752.	4

Transportation Safety	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	1	2	3	2	3
Transportation Safety	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**4**	**5**	**4**	**4**	

References

Climate Atlas of the United States, Mean Number of Days with Heavy Fog http://mobot.org/education/mapping/mapatlas.html.

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.2 ENVIRONMENTAL CRITERIA

D.2.1 CONSTRUCTION-RELATED EFFECTS ON AQUATIC ECOLOGY

D.2.1.1 Disruption of Important Species/Habitats

Objective – The objective of this criterion is to evaluate the sites with respect to potential construction related impacts on aquatic or marine ecology. Regulatory Guide 4.7 defines important plant and animal species if one or more of the following conditions apply.

1. the species is commercially or recreationally valuable,
2. the species is officially listed as endangered or threatened,
3. the species effects the well being of another species within (1) or (2) above,
4. the species is a critical component of the structure and function of a valuable ecosystem, or
5. the species is a biological indicator of radionuclides in the environment.

Of particular concern are potential impacts to habitat areas used by important species. These areas include those used for:

- breeding and nursery,
- nesting and spawning,
- wintering, and
- feeding.

Evaluation approach – The following siting criteria were used to evaluate the sites.

- Exclusionary – Designated critical habitat of endangered species.
- Avoidance – Areas where threatened and endangered species are known to occur.
- Suitability – Areas where limited potential impact is expected.

No information was obtained which would indicate that any of the sites under consideration would exceed the exclusionary or avoidance criteria relative to ecology. Therefore, the evaluation focused on the relative suitability of the site based on the number of areas where limited potential impact is expected. The number of potential impact areas was directly correlated to the number of rare, threatened and endangered (RTE) aquatic species that may occur in the host county, their habitat (based on existing reports and professional judgment of the amount and quality of habitat available for species), and flexibility (professional judgment of the amount of space within the site circle to avoid known locations of protected species during construction of the facility). Note that the evaluation was limited to the plant site and not existing or potential (future) transmission corridors. Data sources included the U.S. Fish and Wildlife Service listings for Texas, by county; National Oceanic and Atmospheric Administration Fisheries listings (marine and anadromous species), and the Texas Parks and Wildlife Department, Annotated County Lists of Rare Species. In cases where the listings of federally protected species differed between the state and federal databases (where state database reports historical range of species and federal database reports county sightings), the full set of identified species (from both databases) was included for completeness.

The suitability of the sites with respect to ecology (rare, threatened and endangered aquatic and terrestrial species, and critical habitat) was initially evaluated in the screening criteria evaluation (Criterion P5, which included Federally protected aquatic and terrestrial species combined). Additional site ecological information specific to aquatic resources at each site is included in the full discussion below. In the context of this discussion, vicinity refers to the county in which the site is located.

Discussion

Guadalupe 2 (DeWitt County). No Federally or State listed aquatic species.
Other aquatic species of concern, considered to be rare but with no regulatory status, include two fish species (Guadalupe bass and Guadalupe darter), one reptile (Cagle's map turtle, whose habitat includes shallow water), and six mollusk species (creeper, false spike mussel, golden orb, pistolgrip, rock pocketbook, and Texas pimpleback). [9 total]

Colorado 3 (Fayette County). No Federally or State listed aquatic species.
Other aquatic species of concern, considered to be rare but with no regulatory status, include seven mollusk species (creeper, false spike mussel, pistolgrip, rock pocketbook, Smooth pimpleback, Texas fawnsfoot, and Texas pimpleback). [7 total]
Note that a portion of the Colorado River runs through the western (central) portion of the site.

South Texas Project (Matagorda County). Seven Federally listed aquatic species.

Reptiles (5): Atlantic hawksbill *(Eretmochelys imbricate)*, E; Green (*Chelonia mydas*), T; Kemp's Ridley *(Lepidochelys kempii)*, E; Leatherback (*Dermochelys coriacea*), E; and Loggerhead (*Caretta caretta*) T
Fish (1): Smalltooth sawfish (E), *Pristis pectinata*
Mammal (1): West Indian manatee (E), *Trichechus manatus*

- Note that the smalltooth sawfish is also listed with NOAA Fisheries National Marine Fisheries Service. This species inhabits shallow coastal waters and estuaries all over the world. Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida; however, the current range of the species has contracted to peninsular Florida. The Western Indian manatee is listed as federally protected by the state, but its occurrence in Texas appears to be rare; it is not on the USFWS list of endangered species for Matagorda County.

Other aquatic species of concern, considered to be rare but with no regulatory status, include: one crustacean (A crayfish), one fish (American eel), one reptile (Gulf saltmarsh snake), one insect (Gulf Coast clubtail) – both of whose habitats include water, and five mollusks (creeper, pistolgrip, rock pocketbook, smooth pimpleback, and Texas fawnsfoot). [9 total]
[South Texas Project COLA/ER identifies blue sucker fish (State Threatened) as being caught upstream of site in 1973, but not identified by state as being in Matagorda County, so haven't included it here.]

Nearby coastal waters to the South Texas Project site have been designated as essential fish habitat for various species. Essential Fish Habitat (EFH) is special protected habitat designated by NOAA National Marine Fisheries Service. It can consist of both the water column and the underlying surface (e.g. seafloor) of a particular area. Areas designated as EFH contain habitat

essential to the long-term survival and health of our nation's fisheries. Certain properties of the water column such as temperature, nutrients, or salinity are essential to various species. Some species may require certain bottom types such as sandy or rocky bottoms, vegetation such as seagrasses or kelp, or structurally complex coral or oyster reefs. EFH includes those habitats that support the different life stages of each managed species. A single species may use many different habitats throughout its life to support breeding, spawning, nursery, feeding, and protection functions. EFH encompasses those habitats necessary to ensure healthy fisheries now and in the future. http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/index_a.htm. Essential fish habitat has been designated within the Gulf of Mexico along the Texas coastline for the following species: Reef fish, Red drum, Stone crab, Shrimp, and coastal migratory pelagic fish http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx. However, since development of additional units at the South Texas Project site would not include construction within, or water withdrawal directly from, the Gulf of Mexico, no impacts are expected to protected habitat in the Gulf or to the coastal T&E species (5 species of sea turtles and smalltooth sawfish). This is reflected in the site ratings.

Allens Creek (Austin County): One Federally listed amphibian species and one Federally proposed (candidate) fish species.

Amphibian (1): Houston toad (*Bofo houstonensis*), E
Fish (1): Sharpnose shiner *(Notropis oxyrhunchus)*, Candidate species (USFWS database)

Other aquatic species of concern include a state threatened alligator snapping turtle; and the following species that are considered to be rare but with no regulatory status: one insect (mayfly with aquatic larval stage) and five mollusk species (False spike mussel, Pistolgrip, Rock pocketbook, Smooth pimpleback, Texas fawnsfoot). [1 state, 6 other]

Malakoff (Henderson County): No Federally listed species.
Other aquatic species of concern include the state threatened alligator snapping turtle; and the following species that are considered to be rare but with no regulatory status: Sabine map turtle and 12 mollusk species (creeper, fawnsfoot, Little spectaclecase, Louisiana pigtoe, pistolgrip, rock pocketbook, sandbank pocketbook, Southern hickorynut [but not in Trinity River], Texas heelsplitter, Texas pigtoe, Wabash pigtoe, and Wartyback [but not in Trinity River]). [1 state, 13 other]

Trinity 2 (Freestone County): One Federally listed amphibian species

Amphibian (1): Houston Toad (*Bufo Houstonensis),* E

Other aquatic species of concern include the state threatened Alligator snapping turtle and the following ten mollusk species that are considered to be rare but with no regulatory status: Creeper, fawnsfoot, Little spectaclecase, Louisiana pigtoe, pistolgrip, rock pocketbook, sandbank Texas heelsplitter, Texas pigtoe, and Wabash pigtoe. [1 state, 10 other]

Sulphur 1 (Red River County): One Federally listed aquatic species

Mollusk (1): Ouachita rock pocketbook *(Arkansia wheeleri),* E

Other aquatic species of concern include the state threatened Alligator snapping turtle and four state threatened fish species: Blackside darter, Creek chubsucker, Paddlefish, and Shovelnose sturgeon. In addition, the following aquatic species are considered to be rare but with no regulatory status: four fish species (Goldeye, Orangebelly darter, Taillight shiner, and Western

sandarter); and eight mollusk species (Common pimpleback, fawnsfoot, Pistolgrip, Plain pocketbook, Rock pocketbook, Sandbank pocketbook, Wabash pigtoe, and White heelsplitter). [5 state, 12 other]

Red 1 (Clay County): No Federal or State listed aquatic species or other aquatic species of concern.

Red 2 (Fannin County): No Federally listed aquatic species.
Other aquatic species of concern include the State threatened alligator snapping turtle and five state threatened fish species: Blackside darter, Blue sucker, Creek chubsucker, Paddlefish, and Shovelnose sturgeon. In addition, the following aquatic species are considered to be rare but with no regulatory status: four fish species (Goldeye, Orangebelly darter, Taillight shiner, and Western sandarter); and seven mollusk species (Common pimpleback, fawnsfoot, Pistolgrip, Plain pocketbook, Rock pocketbook, Wabash pigtoe, and White heelsplitter). [6 state, 11 other]

Results

No critical habitat was identified for any of the aquatic species; and essential fish habitat identified along the coast is not assumed to be impacted at the South Texas Project site given the existing and planned cooling water source at this site. With respect to the ratings for the T&E species component, ratings were based on the total number of Federal and State species that may be present (highest ratings for sites with fewest species). In terms of habitat, all of the sites are assumed to draw from freshwater rivers and no protected habitat has been identified at any site. As such, the habitat sub-rating is based on the presence of other aquatic species of concern that may affect final siting requirements/locations. Sites with the greatest number of "other" species received the lower ratings; Red 1 received the highest rating since no aquatic species of concern were identified in Clay County. The rating for flexibility followed a similar logic, given that all sites appear to have sufficient area and flexibility in locating plant and water intake structures. The only change was that Red 1 and Sulphur 1 received slightly lower flexibility ratings because potential impacts to aquatic resources could extend beyond the state to adjacent or downstream states (Arkansas or Oklahoma).

Aquatic Species/Habitat	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
T&E Species (aquatic)	5	5	4*	4	5
Habitat	4	4	4	4	3
Flexibility	4	4	4	4	3
OVERALL RATING	4	4	4	4	4

Aquatic Species/Habitat	Trinity 2	Sulphur 1	Red 1	Red 2
T&E Species (aquatic)	4	3	5	4
Habitat	3	3	5	3
Flexibility	3	2	5	2
OVERALL RATING	3	3	5	3

*Higher rating would be assigned if based on site specific conditions, given that no Federally listed T&E aquatic species are known to occur at the site; current rating based on county-level data.

References

NOAA Fisheries Service, Southeast Regional Office, Office of Protected Resources. An Overview of Protected Species Commonly Found in the Gulf of Mexico. Revised February 2008. http://sero.nmfs.noaa.gov/pr/pdf/Protected%20Species%20In%20GOM-web%20version%202-7-08.pdf.
http://www.nmfs.noaa.gov/pr/species/fish/smalltoothsawfish.htm

Texas Parks and Wildlife Department, Annotated County Lists of Rare Species (for selected counties). Rare, Threatened and Endangered Species of Texas by County (last modified, March 20, 2009).
http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species/
http://gis.tpwd.state.tx.us/TpwEndangeredSpecies/DesktopDefault.aspx.

U.S. Fish and Wildlife Service, Southwest Region. Threatened and Endangered Species List (by State and County). Last updated January 9, 2009.
http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm.

D.2.1.2 Bottom Sediment Disruption Effects

D.2.1.2.1 Contamination

D.2.1.2.2 Grain Size

Objective – The objective of the criterion is to evaluate the potential short-term impacts to aquatic/marine resources resulting from construction related dredging activities at the sites.

Evaluation approach – The evaluation sought available data on the amount of contaminated sediments near the sites and the grain size of sediments in the area. In general, sites with the lowest concentration of heavy metals and toxic organic compounds and the highest sediment grain size are considered to be the most suitable.

Little information exists regarding the site specific level of sediment contamination that exists in water bodies near the sites. The majority of the available information was obtained from the EPA's National Sediment Quality Survey (2004). Information in the EPA report addresses sediment contamination levels as Tier I (adverse impacts to aquatic life are probable) and Tier II (adverse impacts to aquatic life are possible but infrequent). Using best professional judgment, the following evaluation considered the results of the EPA's Tier I/Tier II study results to determine the relative contamination potential for the sites.

No information regarding sediment grain size was obtained for this evaluation. Because sediment grain size is highly variable, even within a small area of coastline or river reach, the following evaluation of potential bottom sediment disruption effects was limited to available information regarding sediment contamination levels in principle water bodies at the sites.

Discussion/Results – An updated EPA study (EPA 2004) evaluated 1,489 sampling stations in the EPA Region 6. Within the four watersheds containing Areas of Probable Concern (APC) for sediment contamination – two of which are in Texas, Austin-Travis Lakes and the lower west fork of the Trinity River (west of Dallas) – seventeen water bodies were identified as having at least one Tier 1 sampling station and three have 10 or more Tier 1 sampling stations [Tier 1 is defined as associated adverse effects on aquatic life or human health are probable]. Based on these results the top three water bodies having the most significant sediment contamination in the region include the Mississippi River (out of study area), Mountain Creek Lake (west Dallas area with 11 Tier 1 stations) and the Colorado River (14 Tier 1 stations), which is the source water for Colorado 3 and South Texas Project. The west fork of the Trinity River (4 Tier 1 stations), Gulf of Mexico (3 Tier 1 stations) and Lake Austin (Colorado River watershed, Travis County, with 1 Tier 1 station) were also included in the list of 17, although none of these are in close proximity to any of the sites.

Elevated levels of mercury have been identified along the Gulf of Mexico coastal areas (e.g., Superfund Program in Lavaca Bay, TX), although given its significant distance from the Guadalupe 2 and South Texas Project sites, it is not considered to be an indicator of potential sediment contamination concerns for either site (South Texas Project site is closest to the coast). In addition, selection of the South Texas Project site is assumed to not require construction (and associated dredging) of an extensive water intake line beneath Matagorda Bay and into the Gulf of Mexico.

A review of water quality data from the 2004 Texas Water Quality Inventory and Section 303(d) list (impaired water bodies) indicated that the primary water quality concerns in the potential source waters for the primary sites included chlorophyll a, nitrate, dissolved oxygen or nutrient enrichment (orthophosphorus and total phosphorus). In addition, potential water quality concerns in the Colorado River below Town Lake (Austin area) included impaired fish and macrobenthos communities. The West Fork and East Fork of the Trinity River were also identified as being impaired for total dissolved solids, and the Upper Trinity River, upstream of Cedar Creek Reservoir, was also identified as being impaired for PCBs in edible tissue. While these locations are not in the immediate vicinity of the Malakoff or Trinity 2 sites, given the concerns with the Trinity River upstream of the site, and given the past mining operations near

Malakoff and the ongoing lignite mining operations near Trinity 2, there are potential sediment contamination concerns at these sites that have been captured in the ratings.

Because dredging is not one of the parameters considered for this particular evaluation, and information on grain size was not readily available for most of the sites, the estimated potential for contaminated sediments to affect the cost and schedule of any construction related dredging operations was based on the limited information available and professional judgment.

Based on the EPA study and information provided by the Texas water quality assessment studies, and because the presence of contaminated sediments in the immediate vicinity of the sites including any onsite streams cannot be confirmed, conservative ratings of "3" are given to all the sites except sites on the Colorado River (Colorado 3 and South Texas Project). Based on the findings above, these sites are given a slightly lower rating of 2.

Bottom Sediment Disruption Effects	**Guadalupe 2**	**Colorado 3**	**South Texas Project**	**Allens Creek**	**Malakoff**
Rating	**3**	**2**	**2***	**3**	**2**
Bottom Sediment Disruption Effects	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Rating	**2**	**3**	**3**	**3**	

*Higher rating would be assigned if based on site-specific conditions, given that there are no known sediment contamination issues at the South Texas Project site, and dredged material from existing units is disposed of at an upland location; current rating based on limited water quality information available on the Colorado River (resulting in consistent ratings for Colorado 3 and South Texas Project).

References

2008 Texas 303(d) List, March 19, 2008. http://www.tceq.state.tx.us/assets/public/compliance/monops/water/08twqi/2008_303d.pdf.

2008 Texas Water Quality Inventory: Water bodies with concerns for use for use attainment and screening levels (March 19, 2008). http://www.tceq.state.tx.us/assets/public/compliance/monops/water/08twqi/2008_concerns.pdf.

The Incidence and Severity of Sediment Contamination in Surface Waters of the United States. National Sediment Quality Survey. Second Edition. Office of Science and Technology. EPA 823-R-04-007. November 2004. http://epa.gov/waterscience/cs/report/2004/nsqs2ed-complete.pdf.

D.2.2 CONSTRUCTION-RELATED EFFECTS ON TERRESTRIAL ECOLOGY

D.2.2.1 Disruption of Important Species/Habitats and Wetlands

D.2.2.1.1 Important Species/Habitats
D.2.2.1.2 Groundcover/Habitat
D.2.2.1.3 Wetlands

Objective – The objective of this criterion is to evaluate the sites with respect to potential construction related impacts on important species and terrestrial ecology. Regulatory Guide 4.7 defines important plant and animal species if one or more of the following conditions apply.

1. the species is commercially or recreationally valuable,
2. the species is officially listed as endangered or threatened,
3. the species effects the well being of another species within (1) or (2) above,
4. the species is a critical component of the structure and function of a valuable ecosystem, or
5. the species is a biological indicator of radionuclides in the environment.

Of particular concern are potential impacts to habitat areas used by important species. These areas include those used for:

- breeding and nursery,
- nesting and spawning,
- wintering, and
- feeding.

Evaluation approach – The following siting criteria were used to evaluate the sites.

- Exclusionary – Designated critical habitat of endangered species.
- Avoidance – Areas where threatened and endangered species are known to occur.
- Suitability – Areas where limited potential impact is expected.

No information was obtained which would indicate that any of the sites under consideration would exceed the exclusionary or avoidance criteria relative to ecology. Therefore, the evaluation focused on the relative suitability of the site based on the number of areas where limited potential impact is expected. The number of potential impact areas was directly correlated to the number of rare, threatened, and endangered terrestrial species that may occur in the host county, their habitat (based on existing reports and professional judgment of the amount and quality of habitat available for species), and flexibility (professional judgment of the amount of space within the site circle to avoid known locations of protected species during construction of the facility). Note that the evaluation was limited to the plant site and not existing or potential (future) transmission corridors. Data sources included both the U.S. Fish and Wildlife Service listings for Texas, by county and the Texas Parks and Wildlife Department, Annotated County Lists of Rare Species. In cases where the listings of federally protected species differed between the state and federal databases, the data source with the higher number of species was included in the total species count (with discrepancies note). Observations relating to current land uses are based on satellite imagery (Google Earth), although resolution is not clear at some sites (e.g., Sulphur 1) and the images are not necessarily current.

Another sub-criteria evaluated was the total acreage of wetlands within a 2,000 acre site area, not including the lake or reservoir that would be the primary source of cooling water. This was also broken out into three components: total wetlands (acres), total acreage of higher quality wetlands, and flexibility, or the ability to avoid wetlands during construction.

The relative suitability of the sites with respect to ecology (rare, threatened and endangered aquatic and terrestrial species, and critical habitat) and wetlands was evaluated in the screening criteria evaluation (Criterion P5, aquatic and terrestrial species combined; and Criterion P6, wetlands). Additional site ecological information specific to terrestrial resources at each site is included in the full discussion below.

Discussion/Results

Guadalupe 2 (DeWitt County): 3 Federally listed terrestrial species [9 state, 6 other]

Birds (2): endangered interior least turn (*Sterna antillarum athalassos*) and whooping crane (*Grus americana*)
Mammal (1): endangered red wolf (*Canis rufus*)

- Note that USFWS database shows only 2 Federally listed species: bald eagle (DM) and whooping crane (E, EXPN) in DeWitt County. [DM refers to Delisted taxon, recovered, being monitored for first 5 years; EXPN refers to experimental population]

State listed (threatened) terrestrial species include: 6 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; white-faced ibis, white-tailed hawk, and wood stork); and three reptile species (Texas horned lizard, Texas tortoise, and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 3 birds (Henslow's sparrow, mountain plover, western burrowing owl); 1 insect (Leonora's dancer damselfly); 1 mammal (plain spotted skunk); and 1 plant species (Shinner's sunflower).

Guadalupe 2 is located on the Gulf Coast Plain in southeastern Texas about 45 miles inland from Copano Bayou. The eastern corner of DeWitt County (where site located) falls in the Southern Post Oak Savannah. This ecoregion is characterized by more woods and forests than the adjacent prairie ecoregions and consists mostly of hardwoods (e.g., oak and elm). Historically a post oak savannah is a mixture of post oak woods, improved pasture, and rangeland. Most of the county is drained by the Guadalupe River and its tributaries. Most of the site area appears to be forested (evidence of past timbering operations); onsite streams include Price Creek and Reed's Branch.

Colorado 3 (Fayette County): 4 Federally listed terrestrial species [6 state, 7 other]

Birds (2): endangered interior least turn (*Sterna antillarum athalassos*) and whooping crane (*Grus americana*)
Mammal (1): endangered red wolf (*Canis rufus*)
Plant (1): endangered Navasota ladies'-tresses (*spiranthes parksii*)

- Note that USFWS database does not show the interior least tern or red wolf as being Federally listed in Fayette County; it also shows the bald eagle (DM) and whooping crane (E, EXPN)

State listed (threatened) terrestrial species include: 4 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; and wood stork); and two reptile species (Texas horned lizard and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 3 birds (Henslow's sparrow, mountain plover, western burrowing owl); 2 mammals (Cave myotis bat and plain spotted skunk); and 2 plant species (Shinner's sunflower and Texas meadow-rue).

The Colorado River, which bisects the county from northwest to southeast, is fed by several major creeks: Rabb's, Cedar, and Baylor on the east and Buckner's and Williams on the west. Cummins Creek flows through the eastern part of the county and the East and West Navidad rivers through the southern part. Potable groundwater is readily available from the Carrizo-Wilcox and Catahoula-Oakville aquifers at relatively shallow depths. The county covers 950 square miles and is composed of three land resource areas—Blackland Prairies (63 percent), the Post Oak Belt (30 percent), and the Colorado river bottom (7 percent). Site appears to be located in the Blackland prairies region of Texas (also known as the Fayette prairie). Vegetation is a mixture of post oak savannah, and blackland prairie region with tall grasses, oak and elm predominating. Land cover is more complex and there is more post oak woods and pasture (and less extensive areas of cropland). Some hickory, walnut, mesquite, and yaupon grow in diverse areas. Also commonly found are eastern red cedars, pecans, cottonwoods, and sycamores. Southern bald eagles traverse the county, especially along the Colorado River. Note that most of the site area appears to have been cleared/open space and there is evidence of some type of mining south of the site (perhaps sand and gravel). The Colorado River runs through the western portion of the site.

South Texas Project (Matagorda County): 8 Federally listed terrestrial species (including one proposed for delisting) [13 State, 13 other]

Birds (5): Brown pelican (*Pelecanus occidentalis*) E, proposed for delisting; Eskimo curlew (*Numenius borealis*) E, Northern, Aplomado falcon (*Falco femoralis septentrionalis*) E, piping plover (*Charadrius melodus*) T – including critical habitat, and whooping crane (*Grus americana*) E
Mammals (3): Louisiana black bear (*Ursus americanus luteolus*), T; ocelot (*Leopardus paradalis*) E; and red wolf (*Canis rufus*) E

- Note that USFWS database does not show the curlew or any of the mammal species as being Federally listed in Matagorda County; it also shows the bald eagle (DM), brown pelican (DM, E), and whooping crane (E, EXPN).

With respect to critical habitat for the piping plover, various units of critical habitat for piping plover are scattered along the Texas coastline that could be adversely affected by withdrawing cooling water from the Gulf of Mexico. This includes units near Port Aransas (Refugio County, Coastal 1 site) and Matagorda Island (Matagorda County, Coastal 2 site). However, since development of additional units at the South Texas Project site would not include construction within, or water withdrawal directly from, the Gulf of Mexico, no impacts are expected to protected habitat in the Gulf.

State listed (threatened) terrestrial species include: 8 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; reddish egret, sooty tern, white-

faced ibis, white tailed hawk, and wood stork); and five reptile species (Smooth green snake, Texas horned lizard, Texas scarlet snake, Texas tortoise, and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 7 birds (Black rail, Henslow's sparrow, mountain plover, snowy plover, southeastern snowy plover, western burrowing owl, western snowy plover); 1 mammal (plains spotted snake);Cave myotis bat and plain spotted skunk); 2 reptiles (Gulf saltmarsh snake and Texas diamondback terrapin), and 3 plant species (Coastal gay feather, Shinner's sunflower and Threeflower broomweek).

The proposed site is located adjacent to the existing South Texas Project nuclear power plant and land is already disturbed. Host Matagorda County lies within the Western Gulf Coastal Plain (Coastal Prairie region of Texas). Almost all the coastal plains have been converted to cropland, rangeland, pastureland and urban uses. The original vegetation was mostly grasslands with a few clusters of oaks; little bluestem, yellow Indiangrass, brownseed paspalum, gulf muhly, and switchgrass were the dominant grassland species. Live oak, post oak, pin oak, pecan, ash cottonwood, elm, red cedar, and mulberry grow in the county's forests; mesquite and prickly pear have invaded the Bay Prairie in patches where the land has been overgrazed. Both the Central and Mississippi flyways funnel through the southern tip of Texas and many species of birds reach their extreme northernmost range in this region. In addition, subtropical, temperate coastal and desert influences converge here, allowing for great species diversity. Nearly 500 bird species, including neotropical migratory birds, shorebirds, raptors, and waterfowl can be found here. Major water courses in the county include the Trespalacios and Colorado rivers, Live Oak and Linville bayous, and Little Robbins Slough. A number of protected wildlife habitats, including Big Boggy National Wildlife Refuge, the Mad Island Wildlife Management Area, the Runnels Family Mad Island Marsh, and the Nature Conservancy, are located in the county; Mad Island WMA is located just to the south of South Texas Project. Note that the South Texas Project cooling reservoir has been identified as a valuable avian rookery by the State; however, the reservoir will continue to be used by the new units and no adverse effects to the reservoir or associated rookery are anticipated.

Allens Creek (Austin County): 5 Federally listed terrestrial species [9 state, 6 other]

Birds (3), Endangered: Attwater's Greater prairie-chicken *(Tympanuchus cupido attwateri)*, interior least tern (*Sterna antillarum athalassos*), and whooping crane.(*Grus americana*)
Mammals (2): Louisiana black bear (*Ursus americanus luteolus*), T;and red wolf (*Canis rufus*) E.

- Note that USFWS database does not show the interior least tern or any of the mammal species as being Federally listed in Austin County; it also shows the bald eagle (DM) and whooping crane (E, EXPN).

State listed (threatened) terrestrial species include: 6 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; white-faced ibis, white tailed hawk, and wood stork); and three reptile species (Smooth green snake, Texas horned lizard and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 3 birds (Henslow's sparrow, mountain plover, western burrowing owl); 1 mammal (plains spotted skunk); and 2 plant species (Shinner's sunflower and Texas meadow-rue).

Austin County covers 656 square miles on the boundary between the Post Oak Savannah and the Coastal Prairie regions of Texas. The terrain varies from rolling hills in the northern, western, and central sections to a nearly level coastal prairie in the south where site is located. In the south the coastal prairie exhibits wide expanses of open grassland fringed by stands of oak and elm. Although the timber and grassland were almost equal in extent during the nineteenth century, the woodland has been reduced in the twentieth century by advancing urbanization. On the coastal prairie the dominant species are marsh and salt grasses, bluestems, and coarse grasses. Onsite streams include Allens Creek. The site appears to be farmed, with forests found to the north of the site.

Malakoff (Henderson County): 5 Federally listed terrestrial species [9 state, 6 other]

Birds (3): Interior least tern (*Sterna antillarum athalassos*) E, Piping plover (*Charadrius melodus*) T, and whooping crane.(*Grus americana*) E
Mammals (2): Black bear (*Ursus americanus*) T (because of similar appearance to threatened Louisiana black bear) – also a state threatened species; and red wolf (*Canis rufus*) E.

- Note that USFWS database does not show any of the bird or mammal species as being Federally listed; it only shows the bald eagle (DM) for Matagorda County.

State listed (threatened) terrestrial species include: 5 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; Bachman's sparrow, and wood stork); one mammal (black bear as noted above) and three reptile species (Northern scarlet snake, Texas horned lizard and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 1 bird (Henslow's sparrow); 2 mammals (plains spotted skunk and southeastern myotis bat); and 3 plant species (Chapman's yellow-eyed grass, Rough-stem aster, Small-headed pipewort).

Henderson County is located in East Texas between the Neches and Trinity Rivers, referred to as the East Central Texas Plains. Henderson County is in a transitional region between East and Central Texas. It is within the East Central Texas Plains. Two major lakes are partly in the county: Cedar Creek Reservoir on the northwest and Lake Palestine on the southeast; the Malakoff site lies just south of Cedar Creek Reservoir. The county has different land-resource areas that run almost parallel to the two river boundaries in a northwesterly to a southeasterly direction. Along the Trinity River, the western border of the county, lie the bottomlands of the flood plain, where the vegetation features mixed hardwoods and a dense undergrowth of scrubs and vines typical of the East Texas mixed forests. The site appears to lie in the Northern Post Oak Savannah ecoregion. The deciduous forest or woodland is composed mostly of post oak, blackjack oak, eastern redcedar and black hickory. Throughout these regions are native grasses that include little and big bluestem, Indian grass, switch grass, grama, and Virginia wild rye.

Cedar Creek Reservoir is three miles northeast of Trinidad on Cedar Creek in the Trinity River Basin in Henderson County. The reservoir is owned and operated by the Tarrant County Water Control and Improvement District No. 1 for municipal water supply. The reservoir has a capacity of 679,200 acre-feet and a surface area of 34,000 acres. The surrounding flat to rolling terrain is surfaced by sandy and clay loams that support water-tolerant hardwoods, conifers, and grasses. The site sits west of the Malakoff abandoned mining land (AML) that has since been reclaimed. Current land use at the site appears to include a mixture of forest and cleared/open

space, with scattered drill pads located throughout the area. Major onsite drainages include Cedar Creek and Walnut Creek.

Trinity 2 (Freestone County): 6 Federally listed terrestrial species [8 state, 6 state]

Birds (3): Interior least tern (*Sterna antillarum athalassos*) E, Piping plover (*Charadrius melodus*) T, and whooping crane.(*Grus americana*) E
Mammals (1): red wolf (*Canis rufus*) E.
Plants (2): Large fruited sand-verbana (*Abronia macrocarpa*), E; and Navasota ladies'-tresses (*Spiranthes parksii*), E

- Note that USFWS database does not show the piping plover or red wolf as being Federally listed in Freestone County; it also shows the bald eagle (DM) and whooping crane (E, EXPN).

State listed (threatened) terrestrial species include: 5 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; Bachman's sparrow, and wood stork); one mammal (black bear as noted above) and two reptile species (Texas horned lizard and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 1 bird (Henslow's sparrow); 2 mammals (plains spotted skunk and southeastern myotis bat); 1 reptile (Texas garter snake); and 2 plant species (Chapman's yellow-eyed grass, Rough-stem aster).

Freestone County covers 888 square miles of coastal plain upland; the area is timbered with the eastern half (where site located) includes almost every variety of oak, hickory, and walnut; there is a also scattering of pine groves on the western bank of the Trinity River, which provides drainage for the entire county, with the exception of a small area in the southwest, where runoff finds its way to the Navasota River. The site is in the Southern Post Oak Savanna ecoregion with more woods and forests than the adjacent prairie ecoregions, and consists mostly of hardwoods. Current cover appears to be a mix of post oak woods, improved pasture, and rangeland. Current land use appears to be am ixture of forests and cleared/open area. The site sits just east of Lake Fairfield and the Big Brown power plant and lignite mind. Scattered drill pads also appear to be scattered throughout the area. Onsite drainages include Big Brown Creek and Rock Springs.

Sulphur 1 (Red River County): 5 Federally listed terrestrial species [8 state, 5 other]

Birds (2): Interior least tern (*Sterna antillarum athalassos*) E, Piping plover (*Charadrius melodus*) T
Mammals (2): Black bear (*Ursus americanus*) T (because of similar appearance to threatened Louisiana black bear) – also a state threatened species; and red wolf (*Canis rufus*) E
Invertebrate (1): American burying beetle (Nicrophorus americanus), E

- Note that USFWS database does not show the piping plover or any of the mammal species as being Federally listed in Red River County; it also shows the bald eagle (DM).

State listed (threatened) terrestrial species include: 5 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; Bachman's sparrow, and wood stork); one mammal (black bear as noted above) and two reptile species (Texas horned lizard and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 2 bird species (Cerulean warbler and Henslow's sparrow); 1 mammal species (plains spotted skunk); 1 reptile species (Texas garter snake); and 1 plant species (Arkansas meadow-rue).

The county is drained by the Red River and the Sulphur River, which form its northern and southern boundaries. Red River County is separated from Oklahoma by the Red River and from Arkansas by Bowie County. Red River County occupies 1,054 square miles of the East Texas timberlands within the East Central Texas Plains. This area includes the Northern Post Oak Savannah ecoregion, characterized as generally more level and gently rolling. The deciduous forest or woodland is composed mostly of post oak, blackjack oak, eastern redcedar and black hickory. Along the Sulphur River the ecoregion contains wide floodplains and the bottomland forests contain water oak, post oak, elms green ash, pecan, and willow oak. The northern floodplains of the Sulphur tend to have more forested land cover than cropland and pasture (found to the south). The terrain is gently rolling with an elevation ranging from 300 to 500 feet above sea level. Current land use at the site appears to be a mix of open space and forest. Onsite streams include Maples Creek and Flat Creek.

Red 1 (Clay County): 4 Federally listed terrestrial species [5 state, 6 other]

Birds (2): Interior least tern (*Sterna antillarum athalassos*) E, Whooping crane (*Grus americana*) E
Mammals (2): Gray wolf (*Canis lupus*) E; and red wolf (*Canis rufus*) E

- Note that USFWS database does not show the mammal species as being Federally listed in Clay County; it also shows the bald eagle (DM) and whooping crane (E, EXPN).

State listed (threatened) terrestrial species include 3 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted); one mammal (Texas kangaroo rat); and one reptile species (Texas horned lizard).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 3 bird species (Baird's sparrow, mountain plover, and western burrowing owl); and 3 mammal species (Black-tailed prairie dog, Cave myotis bat, and plains spotted skunk).

The flora of most of the county is typical of the Cross Timbers and prairie, with grasses predominating. Clay County is in the Central Great Plains. The topography is more irregular and shrub covered although the presence of honey mesquite may be the result of grazing pressure. The prairie type is transitional between tallgrass and shortgrass growth forms. Besides honey mesquite, wolfberry, sand sagebrush, yucca and prickly pear cacti may be mixed with the grasses. Riparian vegetation includes cottonwood, hackberry, cedar, elm, pecan and a little walnut. The Broken Red Plains of this ecoregion (where site located) is used mainly for grazing. Trees, including mesquite, blackjack, post oak, and elm, are scattered throughout the county, but are more numerous along the streams. Current land use appears to be open space, with some shrubs and perhaps used as pasture land (note that satellite imagery/resolution was not good at this site). Onsite drainages include Smith Creek.

Red 2 (Fannin County): 6 Federally listed terrestrial species [7 state, 3 other]

Birds (3): Eskimo curlew (Numenius borealis), E; (Interior least tern (*Sterna antillarum athalassos*) E, Piping plover (*Charadrius melodus*) T
Mammals (2): Black bear (*Ursus americanus*) T (because of similar appearance to threatened

Louisiana black bear) – also a state threatened species; and red wolf (*Canis rufus*) E
Invertebrate (1): American burying beetle (Nicrophorus americanus), E

- Note that USFWS database does not show the curlew, piping plover, red wolf or the beetle as being Federally listed in Fannin County; it also identifies the Louisiana black bear as being Federally listed rather than the black bear), and the bald eagle (DM).

State listed (threatened) terrestrial species include: 4 birds (American peregrine falcon, bald eagle, and peregrine falcon which are delisted Federal species; and wood stork); one mammal (black bear as noted above) and two reptile species (Texas horned lizard and Timber/Canebrake rattlesnake).

Other terrestrial species of concern that are considered rare but with no regulatory status include: 1 bird species (Cerulean warbler); 1 mammal species (plains spotted skunk); 1 reptile (Texas garter snake)

Fannin County comprises 895 square miles of mainly Northern Blackland Prairie, characterized by rolling to nearly level plains. The land is drained by the Red River and Bois D'Arc Creek and is watered by numerous springs. The natural flora consists of oak, hickory, ash, walnut, pecan, cottonwood, elm, cedar, and Bois D'Arc trees, as well as redbud, spicewood, dogwood, pawpaw, and dwarf buckeye. Most of the prairie has been converted to cropland and non-native pasture. The site is located in a cleared, agricultural area to the north of the Valley plant. The major water feature at this site is Valley Lake (site is located on north end of the lake); onsite streams include Brushy Creek, Sheep Creek and Patillo Branch.

Terrestrial Species/Habitat	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
T&E Species (terrestrial)	3	3	2*	3	3
Habitat	3	3	4	3	3
Flexibility	3	3	5	3	3
OVERALL RATING	3	3	4	3	3

Terrestrial Species/Habitat	Trinity 2	Sulphur 1	Red 1	Red 2
T&E Species (terrestrial)	3	3	4	3
Habitat	3	3	3	4
Flexibility	3	3	3	4
OVERALL RATING	3	3	3	4

* T&E species rating based on county-level data.

Ratings for T&E species based on total number of federal and state listed species that could potentially occur in the site area, where: 5 = Less than 5 species; 4 = < 10 species; 3 = < 15 species; 2 < 21 species. Habitat and flexibility ratings are based on best professional judgment, with habitat taking into account existing site land use, the amount of acreage to be impacted, and the number of protected species (now including total with other species of concern). Note that no critical habitat has been identified or would be adversely affected by construction of the plant at any site. In addition, all sites appear to have been previously disturbed (e.g., past timbering, pasture, farming), and several are near an existing plant site and/or active mining operations. Nonetheless, all but South Texas Project are considered greenfield sites that would need large reservoirs, so the potential for impact to terrestrial ecosystems is much higher at the greenfield sites than at the South Texas Project site. Given this and the fact that all sites had a similar total of sensitive species – 15-20 species including other species of concern), all received a conservative habitat rating of 3 except for South Texas Project. In the case of South Texas Project, while host county Matagorda has the highest number of sensitive species (34 total) compared to the other sites, including migratory birds, it is given a slightly higher habitat rating since the impacts to these species are expected to be minimal. The site is an existing nuclear plant site that has already been disturbed, and the total land acres that would be affected at this site is significantly less than the other sites. Regarding flexibility, the ratings followed a similar logic, given that all sites appear to have sufficient area and no protected habitats appear to be found on the sites. In the case of South Texas Project, the original plant was designed to accommodate two additional units, so no siting constraints or flexibility concerns have been identified for this site, and it receives a 5.

Wetlands

The flexibility associated with the final location of the plant area and the presence of higher quality wetlands such as forested wetlands were considered in addition to the overall acreage of mapped wetlands indicated by NWI; the area of interest for each site is assumed to be 2,000 acres at this stage; previous screening results based on a 6,000-acre area are provided in Appendix C.

Guadalupe 2: Very few wetlands were found in the eastern portion of the site 6,000-acre area, which is digitized for wetlands; and this portion includes one of the larger onsite drainages (Price Creek). Within the 2,000-acre area, there are no wetlands in the digitized eastern portion of the site (and thus no high quality forested wetlands). With respect to the other 75% of the site that is non-digitized for wetlands (Verhelle Quad map), a hard copy wetlands inventory map was requested but not available, although the adjacent Quad (Fordtran) was obtained (with digitized wetlands). By doing a close comparison of the two Quad maps (one showing wetlands and one without), and comparing topography and onsite water bodies and other features between the two maps and within the site area, the only wetlands in the eastern portion appear to be associated with small freshwater ponds, 1 to 5 acres in size (10-20 acres total) scattered around the area. The topography on the western side of the site is fairly steep, similar to the eastern portion along Price Creek where no wetlands were identified (from digitized database). So no other significant wetland areas are assumed to occur. With respect to flexibility, it appears to be good in that the wetlands are small and few in number and are not considered to be high quality wetlands.

Colorado 3: The two largest wetland features within the 2,000-acre area are a portion of a 36-acre oxbow lake (estimated at 15 acres) in the southern portion of the site, and a 30-acre freshwater emergent wetland in the middle of the site area. The remaining wetlands are small, numerous freshwater emergent wetlands and freshwater ponds scattered throughout the site (each less than one acre). Their total acreage is conservatively estimated 30 acres, resulting in site total of approximately 75. Several other small scattered high quality forested wetlands were also identified (1 to 3 acres each), with a total estimate of 10 acres. With respect to flexibility, the wetlands are numerous and scattered throughout the site, mostly near onsite streams and primarily in the western half of the site; they are mostly large enough to be avoided, including the forested wetland areas (which are few in number and acreage). But given their general abundance and distribution, a conservative rating of 3 is given for flexibility.

South Texas Project: Within the smaller 2,000-acre area, the primary surface water features on the site are associated with the main cooling reservoir, which comprises just over one third of the site area, and the 46-acre essential cooling pond to the north of the reservoir. These are both man-made and not considered to be wetlands. They also would not be affected by construction of two new units. There are several small scattered wetlands just to the east of the lake and in the northern most part of the site. These are the same wetlands that were identified within the 6,000-acre area and total just below 10 acres. All are freshwater (palustrine) emergent and none are high quality forested wetlands. Note that total South Texas Project ownership at site is 12,220 acres. Flexibility is considered high since the few wetlands that are found there are small, can easily be avoided, and are not considered high quality.

Allens Creek: Similar to the results in evaluating the 6,000-acre area, the 2,000-acre area includes an extensive wetland area in the northern portion of the site (about 10% of the total site area, or 200 acres), however all are forested/shrub wetlands and considered high quality. One other 2-acre isolated forested wetland area occurs near the middle of the site. Total acreage is estimated at just over 200 acres. Flexibility is generally good since the wetlands are essentially confined to the top northern portion of the site. However, they are all considered high quality (forested) and so a conservative flexibility rating of 4 has been given.

Malakoff: No digitized wetlands were available for the site, but hard copies were ordered and evaluated as part of the GSC evaluations of the 2,000-acre site area. These included NWI wetland mapping on the Malakoff and Cresslan Ranch Quads (1988 and 1989) so somewhat dated, especially given site is near Malakoff AML that appears to have since been reclaimed. Note that some wetlands identified on maps may no longer be present. Estimate is considered to be conservative, but assumed to be suitable for purposes here. Most of the high quality wetland areas are found around the two major onsite drainages, Cedar Creek and Walnut Creek (cuts across largest portion of site). In addition, numerous freshwater ponds and freshwater emergent wetlands are found scattered throughout the site area. Total wetland acreage is conservatively estimated at 280 acres, of which 140 acres is forested and considered high quality. Flexibility is considered poor given the larger number and wide distribution of wetlands across the site area.

Trinity 2: No digitized wetlands were available for the site, but a hard copy of the Young Quad (containing 75% of the site area) was ordered and evaluated as part of the GSC evaluation of the

2,000-acre site area; and the adjacent Yard Quad map was evaluated (without wetlands identified) to identify similar features to support a wetlands estimate. Note that the Young map is 1988 and also dated, however, it is assumed to be suitable for purposes here. Within the 2,000-acre area, on the Young Quad, wetlands appear to be mostly limited to the northern portion of the site, most of which are forested wetlands, with several small freshwater ponds also scattered in the north. Total acreage of the digitized wetlands is estimated at 100 acres, including 80 acres of high quality forested wetlands. In addition, the eastern portion of the site (found in the non-digitized Yard Quad) appears to include steep terrain, no streams or drainages and only a few small freshwater ponds, estimated at 5 acres total. No additional wetlands were assumed to be found on the far eastern portion given the similar topography and findings (no wetlands) of this portion to the digitized adjacent portion on the Young Quad. Therefore, total acreage is 105 acres with 80 acres considered high quality. Flexibility in terms of wetlands is good given they are mostly concentrated in the northern portion of the site. However, this area does include a large number of high quality wetlands, so a flexibility rating of 4 is assigned.

Sulphur 1: Within the 2,000-acre area, only one large linear segment of wetland lies along Flat Creek across the southern portion of the site. All of this wetland area is forested/shrub wetlands and considered high quality. Total acreage is estimated at 100 acres+ acres. Flexibility is high since the wetland is confined to one location; however, because it crosses the entire site and consists of high quality wetland, a rating of 4 is assigned.

Red 1: Within the 2,000-acre area, there are numerous small wetlands scattered throughout, mostly on the western half of the site. Most are freshwater ponds that range in size from 0.1 acres to 3 to 4 acres in size. Total acreage is estimated at less than 20 acres. None are forested and considered to be high quality. Flexibility is considered to be highest at this site given the wetlands are few in number and not of high quality.

Red 2: The major water feature within the 2,000-acre area is Valley Lake in the extreme southwestern portion (estimated at 100 acres). Other wetland areas are associated with numerous small freshwater ponds scattered throughout the site area (total acreage estimated at 50 acres), and a couple of freshwater emergent wetland areas totaling less than 1 acre. No high quality forested wetlands were identified in the site area. Flexibility is considered good. There are no high quality wetlands, but there are over 30 freshwater ponds and Valley Lake to the south; the site is given a conservative rating of 3 for flexibility.

Wetlands	Total acreage mapped over 2,000 acre	Total acreage/percentage of high quality wetlands* over 2,000 acre area
Guadalupe 2	20	0
Colorado 3	75	10
South Texas Project	<10	0
Allens Creek	202	202
Malakoff	280	140
Trinity 2	105	80
Sulphur 1	100	100
Red 1	20	0
Red 2	150	0

* High quality wetlands refer to forested/shrub wetlands (PFO and PSS wetlands mapper codes].

Wetlands	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Total acreage/ percentage of wetlands mapped over 2,000 acre area	**5**	**4**	**5**	**2**	**2**
Total acreage/ percentage of high quality wetlands over 2,000 acre area	**5**	**4**	**5**	**1**	**2**
Flexibility	**4**	**3**	**5**	**4**	**2**
OVERALL RATING	**5**	**4**	**5**	**2**	**2**

Wetlands	Trinity 2	Sulphur 1	Red 1	Red 2
Total acreage/ percentage of wetlands mapped over 2,000 acre area	3	4	5	3
Total acreage/ percentage of high quality wetlands over 2,000 acre area	3	2	5	5
Flexibility	4	4	5	3
OVERALL RATING	3	3	5	4

The screening metric for wetlands in the table reflects a 2,000-acre site. The metric is as follows:

5 = ≤ 20 acres (1%)
4 = ≤ 100 acres (5%)
3 = < 200 acres (10%)
2 = < 400 acres (20%)
1 = > 400 acres (> 20%)

Metric for high quality wetlands is as follows:

5 = 0
4 = < 20 (1%)
3 = < 100 acres (5%)
2 = < 200 acres (10%)
1 = > 200 acres

Composite Site Ratings

Taking into account the above wetlands identified, the sites were given the following composite ratings:

Terrestrial Species/Habitat	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Terrestrial Species	3	3	4	3	3
Wetlands	5	4	5	2	2
OVERALL RATING	4	3	4	2	2

Terrestrial Species/Habitat	Trinity 2	Sulphur 1	Red 1	Red 2
Terrestrial Species	3	3	3	4
Wetlands	3	3	5	4
OVERALL RATING	3	3	4	4

References

http://www.fws.gov/wetlands/Data/Mapper.html

Google Earth [http://earth.google.com] April 2009 (provides overhead view of croplands, streams, and other features)

Handbook of Texas Online (by county): http://www.tshaonline.org/handbook/online/articles

NWI website: http://wetlandsfws.er.usgs.gov/

NWI Wetlands Mapper [http://wetlandsfws.er.usgs.gov/imf/imf.jsp] July 2007 (digitized wetland areas).

Texas Department of Parks and Wildlife, The Vegetation Types of Texas. 1994 [website] http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_bn_w7000_0120/

U.S. Fish and Wildlife Service National Wetlands Inventory Maps (hard copy); base map provided by U.S. Geological Survey; as provided by Texas Natural Resources Information System for following USGS Quads: Malakoff (1989) and Creslenn Ranch (1989) (Malakoff site); Young (1988) (Trinity site; Yard quad, the other half was not available at 1:24,000 scale); Fordtran Quad, 2000 (Guadalupe 2 site; Verhelle quad, other half was not available at 1;24,000 scale). http://www.tnris.state.tx.us/OrderForms/orderNWI.htm
Note: USFWS produces the NWI maps which show information on characteristics, extent and status of Nation's wetlands and deepwater habitats. NWI maps are same scale as USGS topo maps (1:24,000), cover the same area, and have the same names.

U.S. Geological Survey, Ecoregions of Texas, 2004. Color Poster with Map, Descriptive text and photographs (1:2,500,000), as found on EPA website at ftp://ftp.epa.gov/wed/ecoregions/tx/tx_back.pdf; and http://www.epa.gov/wed/pages/ecoregions/tx_eco.htm

D.2.2.2 Dewatering Effects on Adjacent Wetlands

D.2.2.2.1 Depth to Water Table

D.2.2.2.2 Proximal Wetlands

Objective – The objective of this criterion is to evaluate the sites with respect to potential impacts from construction related dewatering activities on area wetlands.

Evaluation approach – The evaluation included a review of information related to the depth of the water table and the distance to nearby wetlands. A determination of the extent of wetland acreage within the study area was limited. National Wetland Inventory maps were used for some sites as the basis for determining wetland acreage. Those maps include numerous areas that do not represent jurisdictional wetlands under Section 404 of the Clean Water Act, which contributed to the difficulty in making an estimate of wetland acreage. Moreover, those maps were based primarily on interpretation of aerial photography, and the amount of field validation that was performed varies according to region of the country and local terrain. Overall site elevation is being used as an indicator of depth to groundwater.

Discussion/Results – Wetlands have been evaluated previously (Section D.2.2.1 of this appendix); depth to groundwater also was identified previously for each site (Section D.1.3.2 of this report) and is summarized as follows (feet below ground surface):

Guadalupe 2: 75' (to Gulf Coast Aquifer)
Colorado 3: 42' (to Gulf Coast Aquifer)
South Texas Project: 15' (to Gulf Coast Aquifer)
Allens Creek: 24' (to alluvium/Gulf Coast Aquifer)
Malakoff: 19' (to Carrizo-Wilcox Aquifer)
Trinity 2: 60' (to Carrizo-Wilcox Aquifer)
Sulphur 1: 15' (to Nacatoch Aquifer)
Red 1: 62' (to alluvium)
Red 2: 37' (to alluvium)

Potential hydraulic connections among wetlands via groundwater are not known, however.

In light of the previous ratings and groundwater information, the site ratings are as follows:

Dewatering Effects on Adjacent Wetlands	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Total Wetland Acreage	5	4	5	2	2
Acreage of High Quality Wetlands Over 2,000-Acre Area	5	4	5	1	2
Depth to Groundwater	5	4	3	3	3
OVERALL RATING	5	4	4*	2	2

Dewatering Effects on Adjacent Wetlands	Trinity 2	Sulphur 1	Red 1	Red 2
Total Wetland Acreage	3	3	5	3
Acreage of High Quality Wetlands Over 2,000-Acre Area	3	2	5	5
Depth to Groundwater	5	3	5	4
OVERALL RATING	4	3	5	4

*Higher rating would be assigned based on site specific conditions, given subsequent confirmation that no dewatering of wetlands would occur during construction of the new units.

D.2.3 OPERATIONAL-RELATED EFFECTS ON AQUATIC ECOLOGY

D.2.3.1 Thermal Discharge Effects

D.2.3.1.1 Migratory Species Effects

D.2.3.1.2 Disruption of Important Species/Habitats

D.2.3.1.3 Water Quality

Objective – No exclusionary or avoidance criteria apply to condenser cooling water system thermal discharges on receiving water bodies (EPRI 2001, Section 3.2.3.1). The objective of this criterion is to address the relative suitability of the sites with respect to potential thermal impacts. Two specific thermal impact issues were considered:

- disruption of important species and habitats, and
- impact on water quality of the receiving water body.

Information on migratory species (also identified in EPRI criteria) was not collected at each site and therefore is not evaluated as part of this criterion.

Evaluation approach – In December 2001, the EPA published a final regulation, which affects the location, design, construction, and capacity of intake structures for new power plants (EPA 2001) [note that EPA established location, design, construction and capacity standards for cooling water intake structures at large existing power plants on Feb 16, 2004 – applicable to existing South Texas Project plant.] The EPA rule strongly encourages the use of closed-cycle designs to reduce adverse cooling water system impacts, and it is assumed that new nuclear reactors at the sites would include closed-cycle cooling water systems.

Discussion/Results – Ratings are therefore based on limited flow and water quality data for the cooling water sources and on site ratings for disruption of aquatic species/habitat. In addition, ratings were based on the use of the source water body as the receiving water for this evaluation.

In summary, the final set of ratings consisted of two composite ratings: the disruption of important species (based on number of Federally protected aquatic species), as brought forward from Section D.2.1.1 of this appendix; and existing water quality of the receiving water, based primarily on cooling water supply information, as it relates only to flow and volume, where the size of the receiving water body (heat sink) was the primary factor in assigning ratings (highest rating given to the largest heat sink). Thus, Guadalupe 2, with the lowest flow (769 cfs), received the lowest rating for the cooling water source component, and Allens Creek with the highest flow (6,834 cfs) received the highest rating for this subcomponent. The resulting ratings are provided below.

Thermal Discharge Effects	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Presence of Important Aquatic Species	5	5	4	4	5
Cooling Water Source	1	3	3	5	4
OVERALL RATING	3	4	3	4	4

Thermal Discharge Effects	Trinity 2	Sulphur 1	Red 1	Red 2
Presence of Important Aquatic Species	4	3	5	5
Cooling Water Source	4	2	2	4
OVERALL RATING	4	2	3	4

References

EPA 2001. Fact sheet: cooling water intake structures at new facilities – final rule. EPA-821-F-01-017.

EPA 2004. Fact sheet; cooling water intake structures at large existing electric generating plants – final rule. EPA-831-F-04-003. http://www.epa.gov/waterscience/316b/phase2/phase2final-fs.htm.

D.2.3.2 Entrainment/Impingement Effects

D.2.3.2.1 Entrainable Organisms

D.2.3.2.2 Impingable Organisms

Objective – No exclusionary or avoidance criteria apply to entrainment and impingement impacts from the operation of condenser cooling water systems (EPRI 2001, Section 3.2.3.1). The objective of this criterion is to address the relative suitability of the sites with respect to potential entrainment and impingement impacts.

The withdrawal of cooling water removes billions of aquatic organisms from waters of the U.S. each year, including fish, fish larvae and eggs, crustaceans, shellfish, sea turtles, and many other forms of aquatic life. Most impacts are to early life stages of fish and shellfish.

When cooling water is pumped from water bodies, several environmental impacts can occur. Entrainment refers to the removal of small, drifting organisms with the cooling water. Small fish, fish eggs, phytoplankton, zooplankton, and other aquatic/marine organisms experience high mortality rates as they pass through cooling water pumps and heat exchangers. Impingement refers to larger organisms that are screened out of the cooling water at the intake structure. Impinged organisms can include large fish, crustaceans, turtles, and other aquatic/marine organisms that cannot avoid high intake velocities near the intake structure and are trapped on the intake screens.

When the quantity of water withdrawn is large relative to the flow of the source water body, more organisms will be affected. Intakes in coastal waters, estuaries, and tidal rivers tend to have greater ecological impacts than those in freshwater lakes and offshore ocean intakes, since

these areas are usually more biologically productive and have more aquatic organisms in early life stages.

Evaluation approach – Concerns about entrainment and impingement losses are resource dependent and vary on a site-to-site basis. Typically, power plants with once-through cooling water systems have higher entrainment and impingement impacts than power plants with closed-cycle cooling water systems. The EPA issued a final rule in December 2001 affecting the design of intake structures for new power plants (EPA 2001), and for large existing power plants in February 2004 (EPA 2004) (applicable to South Texas Project). These rules encourage the use of best technology (i.e., closed-cycle systems, which is the type of system assumed to be used at each of the sites) to protect aquatic organisms from being killed or injured by impingement or entrainment. Developers of new power plants who choose certainty and faster permitting over greater design flexibility, will be encouraged to limit intake water capacities and velocities and incorporate specific intake screen designs to reduce entrainment and impingement losses.

Discussion – The sites were evaluated with respect to relative potential for entrainment and impingement impacts for the closed-cycle cooling water system. Proposed facilities at each site will include cooling towers that will reduce the amount of cooling water withdrawal required for plant operation. In addition, water intake structure design and construction considerations can further diminish the potential for adverse impacts. In NUREG 1437, NRC concludes that, with cooling towers and appropriate intake design, potential adverse impacts due to entrainment or impingement of aquatic organism are minor and do not significantly disrupt existing populations. Assuming a two unit closed-cycle plant at the site, and 100 percent of the local plankton passing through the plant, it appears that there would be no discernible effect on the plankton population in existing rivers and reservoirs at each site. This is due to the very small volume of water used by the plant relative to the total volume in the river or reservoir at the site. Because of the low flow velocities of a closed cycle plant at the site, impingement of adult fish would be expected to be minimal. Use of a deep water intake would have a minimal effect on entrainment of larval fish.

Results – Although there is a lack of site-specific data, the majority of sites have very few Federally or state listed aquatic species – and even fewer fish species. Based on the few species present and the general assumptions identified above, all of the sites received relatively high ratings. The lowest ratings of 3 were given to Allens Creek (proposed fish species) and Sulphur 1 (mollusk species) sites since each site has at least one Federally listed aquatic fish or mollusk species; the other sites either had no Federally listed aquatic species or an amphibian species that is assumed to not be present (smalltooth sawfish, a marine species) or not be as big a concern (Houston toad at Trinity 2). While the South Texas Project site also includes several species of marine turtles, the site is not located on the coast and there is no cooling water intake on the Gulf that would affect these species. Rather, water is diverted from the Colorado River into a large onsite cooling reservoir. All other sites received a conservative high rating of 4, to account for the lack of site specific data at each site.

Entrainment/ Impingement Potential Impact (closed cycle cooling system design)	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	4	4	4	3	4
Entrainment/ Impingement Potential Impact (closed cycle cooling system design)	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	4	3	4	4	

References

EPA 2001. Fact sheet: cooling water intake structures at new facilities – final rule. EPA-821-F-01-017.

EPA 2004. Fact sheet; cooling water intake structures at large existing electric generating plants – final rule. EPA-831-F-04-003. http://www.epa.gov/waterscience/316b/phase2/phase2final-fs.htm.

NRC, 1996. NUREG-1437 Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Nuclear Regulatory Commission. May.

D.2.3.3 Dredging/Disposal Effects

D.2.3.3.1 Upstream Contamination Sources

D.2.3.3.2 Sedimentation Rates

Objective – The purpose of the section is to evaluate the sites for potential environmental impacts related to maintenance dredging at the intake structure. No specific exclusionary or avoidance criteria apply to this issue. The following evaluation, therefore, is a summary of available information related to the relative suitability of the sites.

Evaluation approach – Sites with high levels of contaminated sediment deposition at the intake structure will experience higher maintenance costs for the removal and disposal of the dredged material. Two factors were considered in performing the evaluation:

- The level of upstream contamination, and
- The rate of sedimentation at the site.

As addressed in Section D.2.1.2 (Contaminated Sediments), no site-specific information about the level of sediment contamination at the sites was identified. Results in Section D.2.1.2 were based on EPA and state water quality data, which addressed general trends in levels of

contamination in the water bodies at the sites, and general water quality information for the major water bodies on which the sites are located. All sites are assumed to have relatively low fine sediment deposition rates (which are preferred), and the coastal sites are expected to have even better deposition rates given their proximity to the sandy beaches.

Based on available information, the sites were rated according to the expected levels of contamination and sedimentation rates for the general area of the sites. Sites with the lowest concentration of heavy metals and toxic organic compounds and the lowest sediment rates are the most suitable and were assigned a score of 5. In general, ratings in section D.2.1.2 were carried forward for the upstream contamination sources component of the rating for this criterion.

Discussion/Results – The results are summarized in the table below.

Dredging/Disposal Effects	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Upstream Contamination Sources	3	2	2*	3	2
Sedimentation Rates	4	3	4	3	3
OVERALL RATING	3	2	3	3	2

Dredging/Disposal Effects	Trinity 2	Sulphur 1	Red 1	Red 2
Upstream Contamination Sources	2	3	3	3
Sedimentation Rates	3	3	3	3
OVERALL RATING	2	3	3	3

*Higher rating would be assigned if based on site-specific conditions, given that there are no known sediment contamination issues at the South Texas Project site, and dredged material from existing units is disposed of at an upland location; current rating based on limited water quality information available on the Colorado River (resulting in consistent ratings for Colorado 3 and South Texas Project).

D.2.4 OPERATIONAL-RELATED EFFECTS ON TERRESTRIAL ECOLOGY

D.2.4.1 Drift Effects on Surrounding Areas

D.2.4.1.1 Important Species/Habitat Areas
D.2.4.1.2 Source Water Suitability

Objective – The objective of this criterion is to evaluate the relative suitability of the sites with respect to potential concerns with cooling tower drift effects. This evaluation considered the potential effects on surrounding areas and the suitability of the cooling water source (EPRI 2001). Because closed-cycle cooling utilizing a cooling water reservoir was assumed for all site locations, similar to the main cooling reservoir at the existing South Texas Project site, this issue should not apply to any of the sites. However, given the uncertainties associated with the proposed water supply at the other greenfield sites, the potential need to use a storage reservoir/cooling tower combination still exits. Therefore, drift is being considered in the evaluation for all sites except the South Texas Project site – where the existing cooling water reservoirs are sufficiently sized to support two new units. Because drift is not an issue at the South Texas Project site, it is given the highest rating of 5.

Cooling Tower Drift

In every cooling tower, there is a loss of water to the environment in the form of pure water, which results from the evaporative cooling process. This evaporated water leaves the tower in a pure vapor state, and thus presents no threat to the environment. Drift, however, is the undesirable loss of liquid water to the environment, via small unevaporated droplets that become entrained in the exhaust air stream of a cooling tower. These water droplets carry with them minerals, debris and microorganisms and water treatment chemicals from the circulating water, thus potentially impacting the environment. High drift losses are typically caused by fouled, inefficient or damaged drift eliminators, excessive exit velocities or imbalances in water chemistry.

Minimizing drift losses in a cooling tower reduces the risk of impacting the environment. The principle environmental concern with cooling tower drift impacts are related to the emission and downwind deposition of cooling water salts (EPA 1987). Salt deposition can adversely affect sensitive plant and animal communities through changes in water and soil chemistry.

Evaluation approach – Sites considered with the most sensitive environments were assigned lower rating values. Sites with highest concentrations of dissolved solids and other potential contaminants in cooling tower makeup were also assigned lower rating values.

Discussion/Results – Information regarding important terrestrial plant and animal communities, habitats, and wetlands in the vicinity of the sites were previously addressed in Section D.2.2.1 (Disruption of Important Species/Habitats and Wetlands). Cooling water makeup water quality is also taken into account. It is assumed that all sites would draw their water from freshwater rivers; however, the South Texas Project site was given a slightly lower rating due to its proximity to the ocean and greater likelihood of its cooling water being brackish (tidal influence on Colorado River in vicinity of South Texas Project site). Malakoff and Trinity 2 were also

given slightly lower ratings given the mining that has occurred near the sites and the high levels of total dissolved solids found upstream in the West fork and East Fork of the Trinity River.

Given all the above information, the following ratings were assigned:

Drift Effects on Surrounding Area	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Important Species Habitat Areas – Terrestrial	4	3	5	2	2
Important Species Habitat Areas – Aquatic	4	4	5	4	4
Source Water	4	4	5	4	3
OVERALL RATING	4	4	5	3	3
Drift Effects on Surrounding Area	**Trinity 2**	**Sulphur 1**	**Red 1**	**Red 2**	
Important Species Habitat Areas – Terrestrial	3	3	4	4	
Important Species Habitat Areas – Aquatic	3	3	5	3	
Source Water	3	4	4	4	
OVERALL RATING	3	3	4	4	

D.3 SOCIOECONOMICS CRITERIA

D.3.1 SOCIOECONOMICS - CONSTRUCTION RELATED EFFECTS

Objective – The objective of this criterion is to evaluate the relative suitability of the sites with respect to the number of construction workers who will move into the plant site vicinity with their families; and the capacity of the communities surrounding the plant site to absorb this new temporary (in-migrant) population.

Evaluation approach – The number of in-migrant workers is dependent on labor availability within commuting distance of the plant site. If an adequate supply of workers is available within reasonable commuting distance, few, if any workers, would choose to relocate to the site. The capacity of communities to absorb an increase in population depends on the availability of sufficient resources, such as adequate housing and community services to support the influx.

Steps 1 and 2 (Exclusionary and Avoidance criteria) are not applicable to this criterion. The issue in siting is the potential socioeconomic impact associated with any temporary influx of construction workers who live too far away to commute daily from their residence. With respect to suitability of the sites under consideration by SCE, socioeconomic impacts of nuclear power plant construction are directly related to two factors:

- number of construction workers who will move into the plant site vicinity with their families; and
- capacity of the communities surrounding the plant site to absorb this new temporary (in-migrant) population.

The number of in-migrant workers is dependent on labor availability within commuting distance of the plant site. If an adequate supply of workers is available within reasonable commuting distance, few (if any) workers would choose to relocate to the site vicinity. The capacity of communities to absorb an increase in population depends on the availability of sufficient resources, such as adequate housing and community services (e.g., schools, hospitals, police, transportation systems, and fire protection) to support the influx without straining existing services. Impacts to a small community located along the commuter route(s) (e.g., food, lodging, gas, and congestion) can also be significant and should be considered. The information that should be considered in rating sites from the perspective of construction impacts includes labor requirements, location of labor pool, number of immigrants, and the economic structure of affected communities.

Before the data could be compared between sites and the sites rated, certain assumptions were made regarding the construction labor requirements and construction schedule, labor pool, and affected area. Many of these assumptions were made based on the construction workforce requirements estimated for South Texas Project in the COLA/ER. For purposes of this report, assumptions are based on professional judgment, the South Texas Project COLA/ER, and information contained in the U.S. Nuclear Regulatory Commission's *Generic Environmental Impact Statement for License Renewal for Nuclear Plants* (NUREG 1437) (May 1996).

Assumptions

According to the South Texas Project COLA/ER, the plant workforce (construction) includes a monthly maximum construction workforce requirement of 5,950 for two units. Construction of a nuclear power plant is very labor-intensive and for the ABWR, skilled and unskilled construction workers would likely be needed over a 4 to 5 year period. The following assumptions were used in this analysis.

- Ratings are based on the assumption that two units would be constructed at a given site.
- Construction would require a peak construction work force of 5,950 workers (2,875 per unit); this estimate is assumed to be a "realistic" estimate for purposes of site comparison.
- Analysis assumes that no other major construction project would occur in the site vicinity concurrently with the plant construction and operation. Thus, sites were rated without consideration of potential cumulative impacts of other potential demands for labor.

Available population and economic data were obtained from the U.S. Census Bureau for each site. The data were collected by county and major metropolitan area where appropriate. It was assumed that workers would commute within a distance of 50 miles from their homes.

The study of economic structure examines employment because of its pre-eminent role in determining economic well-being of an area. Specifically, impacts are determined by comparing the number of direct and indirect jobs created by plant's construction with total employment of the local study area at the time of construction. Sites were rated according to economic impacts based on the following criteria: economic effects were considered small if peak construction related employment accounted for less than 5 percent of total study area employment; moderate if it accounted for 5 to 10 percent of total study area employment; and large if it accounted for more than 10 percent of total study area employment.

Note that the study area for evaluating socioeconomic impacts from construction included the host county, adjacent counties and any other nearby counties with a major population center within a reasonable commuting distance from the site.

Discussion – The available population and work force data are presented in the following tables. Projected growth rates to 2014 (peak construction) were based on same growth rates from 2000 to 2007 using U.S. Census data. With respect to the total construction workforce, the smaller construction industry workforce statistical data/estimates were used, rather than the estimates for workers in the construction, extraction and maintenance occupations, in order to conservatively bound the evaluation.

Guadalupe 2 Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
DeWitt	20,013 (with -1.4% decline in population between 2000 and 2007).	19,453	7,893 [5.8% unemployment of civilian labor force]	629
Lavaca	19,210 (-2.4% decline)	18,304	8,677 (2.4%)	763
Wharton	41,188 (-0.7% decline)	40,610	17,563 (6.0%)	1,056
Jackson	14,391 (-2.1% decline)	13,780	6,034 (5.0%)	474
Victoria	84,088 (2.6% increase)	88,534	38,464 (4.7%)	3,311
Calhoun	20,647 (-1.4% decline)	20,067	8,246 (7.4%)	1,246
Goliad	6,928 (3.3% increase)	7,390	2,949 (3.2%)	357
Gonzales	18,628 (3.1% increase)	19,805	7,906 (4.8%)	670
Karns	15,446 (-2.5% decline)	14,690	4,705 (6.5%)	389
Wilson	32,408 (21.2% increase)	47,588	13,939 (4.9%)	1,557
Total	**252,934**	**290,501**	**116,376**	**10,452**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Colorado 3 Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Fayette	21,804 (with 3.4% increase between 2000 and 2007)	23,303	10,039 (3.4%)	878
Bastrop	57,733 (25.2% increase)	90,454	26,529 (3.9%)	3,555
Lee	15,657 (4.5% increase)	17,092	7,309 (2.6%)	837
Washington	30,373 (5.5% increase)	33,796	13,497 (4.3%)	1,074
Austin	23,590 (12.8% increase)	30,016	10,768 (4.4%)	929
Colorado	20,390 (1.4% increase)	20,955	8,721 (5.1%)	724
Lavaca	19,210 (-2.4% decline)	18,304	8,677 (2.4%)	763
Caldwell	32,194 (14.0% increase)	41,844	13,403 (5.5%)	1,374
Gonzales	18,628 (3.1% increase)	19,805	7,906 (4.8%)	670
Total	**239,579**	**295,569**	**106,849**	**10,804**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

South Texas Project Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Matagorda	37,957 (-2.5% decline in population between 2000 and 2007)	36,098	15,054 (8.4%)	1,758
Brazoria	241,767 (21.7% increase)	358,082	106,662 (5.4%)	12,264
Wharton	41,188 (-0.7% decline)	40,610	17,563 (6.0%)	1,056
Jackson	14,391 (-2.1% decline)	13,797	6,034 (5.0%)	474
Calhoun	20,647 (-1.4% decline)	20,067	8,246 (7.4%)	1,246
Victoria County	84,088 (2.6% increase)	88,534	40,345 (4.7%)	3,311
Total	**440,038**	**557,188**	**193,904**	**20,109**

- annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Allens Creek Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Austin	23,590 (12.8% increase in population between 2000 and 2007)	30,016	10,768 (4.4%)	929
Harris	3,400,578 (15.7% increase)	4,553,784	1,545,933 (6.4%)	135,121
Waller	32,663 (10% increase)	39,526	13,699 (13.8%)	1,566
Fort Bend	354,452 (43.8% increase)	733,124	166,172 (4.9%)	10,888
Colorado	20,390 (1.4% increase)	20,955	8,721 (5.1%)	724
Wharton	41,188 (-0.7% decline)	40,611	17,563 (6.0%)	1,056
Washington	30,373 (5.5% increase)	33,796	13,497 (4.3%)	1,074
Fayette	21,804 (3.4% increase)	23,303	10,039 (3.4%)	878
Total	**3,925,038**	**5,474,115**	**1,786,932**	**152,236**

* annual growth rate between 2007 and 20104based on annual growth rate between 2000 and 2007
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Malakoff Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Henderson	73,277 (7.7% increase in population between 2000 and 2007)	84,972	29,594 (6.5%)	3,548
Anderson	55,109 (3.0% increase)	58,462	17,046 (7.5%)	1,012
Freestone	17,867 (5.2% increase)	19,774	6,967 (4.2%)	575
Navarro	45,124 (9.5% increase)	54,089	18,477 (7.8%)	1,281
Van Zandt	48,140 (8.1% increase)	56,271	19,942 (5.9%)	2,158
Kaufman	71,313 (35.1% increase)	130,200	33,242 (4.5%)	3,587
Ellis	111,360 (28.8% increase)	163,123	53,528 (5.2%)	5,060
Smith	174,706 (13.7% increase)	225,927	77,518 (6.5%)	5,691
Cherokee	46,659 (3.2% increase	49,710	18,691 (5.6%)	1,578
Total	**643,555**	**842,528**	**275,005**	**24,490**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Trinity 2 Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Freestone	17,867 (5.2% increase in population between 2000 and 2007)	19,774	6,967 (4.2%)	575
Anderson	55,109 (3.0% increase)	58,462	17,046 (7.5%)	1,012
Leon	15,335 (7.3% increase)	17,664	6,012 (5.4%)	716
Houston	23,185 (- 1.8% decline)	22,359	7,958 (6.1%)	535
Cherokee	46,659 (3.2% increase)	49,710	18,691 (5.6%)	1,578
Henderson	73,277 (7.7% increase)	84,972	29,594 (6.5%)	3,548
Navarro	45,124 (9.5% increase)	54,089	18,477 (7.8%)	1,281
Ellis	111,360 (28.8% increase)	163,123	53,528 (5.2%)	5,060
Total	**387,196**	**470,153**	**158,273**	**14,305**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Sulphur 1 Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Red River	14,314 (-8.4% decline in population between 2000 and 2007)	11,011	5,942 (5.9%)	509
Bowie	89,306 (2.5% increase)	93,842	35,947 (6.9%)	2,361
Lamar	48,499 (1.6% increase)	50,043	20,416 (5.6%)	1,652
Titus	28,118 (4.5% increase)	30,715	11,265 (5.9%)	839
Franklin	9458 (17.3% increase)	13,013	3,874 (4.5%)	427
Cass	30,438 (-3.5% decline)	28,334	11,875 (5.7%)	1,112
Morris	13,048 (0.1% increase)	13,077	5,118 (6.5%)	317
Wood	36,752 (14.3% increase)	48,010	14,431 (8.4%)	1,371
OK: McCurtain**	34,402 (-2.5% decline)	32,700	13,236 (7.4%)	1,059
OK: Choctow**	15,342 (-2.2% decline)	14,681	5,690 (7.1%)	498
AR: Miller**	40,443 (5.5% increase)	45,000	16,858 (6.8%)	1,448
Total	**269,933 (TX only)** **319,677 (TX and OK)** **360,120 (TX, OK, AR)**	**288,045 (TX)** **335,426 (TX/OK)** **380,426 (TX/ OK/AR)**	**108,868 (TX)** **127,794 (TX and OK)** **144,652 (TX, OK, AR)**	**8,588 (TX)** **10,145 (TX and OK)** **11,593 (TX, OK and AR) (25% from out of state)**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
** Willingness of workers to commute across state lines is not known at this time; therefore, the evaluation considers both totals under both scenarios.
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Red 1 Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Wichita	131,664 (-2.8% decline in population between 2000 and 2007)	124,824	54,394 (5.9%)	3,273
Archer	8,854 (1.7% increase)	9,157	4,341 (3.3%)	359
Clay	11,006 (1.0% increase)	11,230	5,307 (3.5%)	445
Montague	19,117 (2.8% increase)	20,206	8,090 (5.6%)	774
Cooke	36,363 (5.8% increase)	40,718	16,443 (4.6%)	1,355
Jack	8,763 (0.8% increase)	89,036	3,331 (4.0%)	267
Young	17,943 (-1.4% decline)	17,435	7,875 (5.2%)	573
OK: Jefferson**	6,818 (-8.0% decline)	5,771	2,604 (5.5%)	189
OK: Cotton **	6,614 (- 4.8% decline)	5,997	2,667 (4.8%)	221
OK: Tillman **	9,287 (-12.3% decline)	7,146	3,483 (4.3%)	255
Total	**233,710 (TX)** **256,429 (TX/OK)**	**312,606 (TX)** **331,520 (TX/OK)**	**99,781 (TX)** **108,535 (TX/OK)**	**7,046 (TX)** **7,711 (TX/OK)**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
** Willingness of workers to commute across state lines is not known at this time; therefore, the evaluation considers both totals under both scenarios.
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Red 2 Site Population and Work Force

County	Total Pop (2000)	Total Pop (2014)*	Total Employed Workforce (2000)	Total Construction Workforce (2000)
Grayson	110,595 (7.3% increase in population between 2000 and 2007)	127,338	50,801 (4.7%)	4,029
Fannin	31,242 (5.8% increase)	34,985	12,327 (5.2%)	1,115
Lamar	48,499 (1.6% increase)	50,038	20,416 (5.6%)	1,652
Cooke	36,363 (5.8% increase)	40,718	16,443 (4.6%)	1,355
Collin	491,675 (48.6% increase)	1,085,805	266,999 (3.0%)	14,426
Hunt	76,596 (8.3% increase)	89,829	34,539 (5.8%)	2,943
OK: Marshall**	13,184 (12.5% increase)	16,684	5,295 (4.2%)	403
OK: Bryan**	36,534 (8.3% increase)	42,847	15,643 (6.5%)	972
Total	**794,970 (TX only)** **844/688 (TX/OK)**	**1,428,713 (TX)** **1,488,244 (TX/OK)**	**401,525 (TX)** **422,463 (TX/OK)**	**25,520 (TX)** **26,895 (TX/OK)**

* annual growth rate between 2007 and 2014 based on annual growth rate between 2000 and 2007
** Willingness of workers to commute across state lines is not known at this time; therefore, the evaluation considers both totals under both scenarios.
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Results – The results show the highest population and workforce numbers available at Allens Creek, followed by Red 2 and Malakoff. Five sites show a percentage increase less than 5% when compared to **total study area workforce**, and low impacts would be expected at Allens Creek (less than 1% increase), Red 2, Malakoff, South Texas Project, and Trinity 2. The remaining four sites – Guadalupe 2, Colorado 3, Sulphur 1 and Red 1 – all show an increase between 5% and 6% (4.1% for Sulphur 1 if include workforce from both OK and AR), which would be expected to result in moderate impacts. However, the percentage increases when compared to the **total construction workforce** show significant variation between sites, with 4 sites showing an increase in excess of 50%: Guadalupe 2 (57%), Colorado 3 (55.1%), Sulphur 1 (51.3% to 69.3% depending if OK and AR construction workers are included in the totals), and Red 1 (77.1% to 84.4% depending if OK construction workers are included in the total). Trinity 2 follows close behind with a 41.6% increase; and the increases in construction workforce at South Texas Project (30%), Malakoff (24.3%), and Red 2 (22.1% to 23.3% depending if OK construction workers are included in total) are all slightly less although still significant. Only Allens Creek shows an increase of less than 5% (3.7%) in the total construction workforce. Because the willingness of workers to commute across state lines is not known at this time, the evaluation looked at both scenarios, although it would only appear to make a significant

difference for Sulphur 1 site where the out of state workers could comprise up to 25% of the plant construction workforce.

The assumptions regarding which major population centers are considered to be within commuting distance of each site, as well as the results in terms of workforce percentage increases, are summarized in the table below.

Site	Major population centers within commuting distance of site	Percent increase in total workforce	Percent increase in total construction workforce
Guadalupe 2	Victoria Corpus Christi and San Antonio are more than 70 miles away and assumed to be too far for workers to commute.	5.1%	57%
Colorado 3	Brenham. No major population centers or metropolitan areas within commuting distance of site. Austin, Houston and Bryan/College Station are each more than 50 miles away and assumed to be too far for workers to commute.	5.5%	55.1%
South Texas Project	Only one population center, Lake Jackson, within 40 miles. Closest towns are Bay City (12.4 miles); other towns between 25 and 40 miles include El Campo (29.8 miles), Wharton (34.4 miles) and Port Lavaca (36.8 miles). Note that Houston, at over 50 miles, is assumed to be too far for workers to commute.	3.1%	30%
Allens Creek	Multiple towns within 20 miles (e.g., Katy, Richmond, Rosenberg) and Houston (western suburbs) is within 40 miles.	0.3%	3.9%
Malakoff	Multiple towns within 50 miles including Corsicana and Tyler, and southern suburbs of Dallas in Ellis County. Note that Dallas County itself was not included in construction workforce totals.	2.2%	24.3%
Trinity 2	Corsicana and Palestine and southern suburbs of Dallas in Ellis County. Note that Dallas County itself was not included in construction workforce table given its greater distance from the site (over 50 miles).	3.8%	41.6%

Site	Major population centers within commuting distance of site	Percent increase in total workforce	Percent increase in total construction workforce
Sulphur 1	No population centers or major metropolitan areas. Closest large town is Texarkana at 50 miles. Longview (65 miles) and Tyler (75 miles) are each over 60 miles away.	4.1% (including TX and OK workers) to 5.5% (TX workers only)	with 51.3% to 69.3% depending on inclusion of OK workers or not
Red 1	Closest large town is Wichita Falls at 26 miles.	5.5% (including TX and OK workers) to 6.0% (TX workers only)	77.1% to 84.4% depending on inclusion of OK workers or not
Red 2	Denison-Sherman MSA, and northern suburbs of Dallas also included (within 50 miles).	1.4% (including TX and OK workers) to 1.5% (TX workers only)	22.1% to 23.3% depending on inclusion of OK workers or not)

*While it is understood that construction workers may be willing to commute farther than 50 miles, the study conservatively assumes a maximum daily commuting distance of less than 50 miles (each way), particularly given a lengthy construction period of four to five years.
** Percentages based on peak construction workforce requirement of 5950 workers for 2 units.

Because of the large population projections and available workforce at the Allens Creek site (given its proximity to the Houston metro area), it was assumed that 100% of the workforce at this site would commute from within the area and there would be no in-migrant workforce population. As such, there would be no demands on housing and community services. Based on this information alone, Allens Creek would receive a rating of 5.

Because of their proximity to the Dallas metropolitan area/suburbs and, in the case of Red 2, the Sherman – Denison MSA, it was assumed that a large percentage of construction workers (up to 50%) would commute from one of the nearby metropolitan areas, thereby resulting in a smaller workforce having to in-migrate into the study region. In addition, the overall population levels for Red 2 and Malakoff study regions are significantly higher than the other sites and are considered to be sufficiently large such that the impact on study area employment from construction of two new units would be low at each site. As a result, these sites are both given a rating of 4.

For the remaining 6 sites (Guadalupe 2, Colorado 3, South Texas Project, Trinity 2, Sulphur 1 and Red 1), an additional analysis was conducted to consider the impacts of workers in-migrating to the areas given (1) the rural nature of the site study areas; (2) their significantly lower population estimates compared to the other sites; and (3) the significantly higher percentage increases resulting to the construction workforce within these site study areas. We have identified the following assumptions to help address potential impacts on local community services and housing:

- 95% of workers will in-migrate (5,650 workers) [this assumption is consistent with that made in South Texas Project COLA for the South Texas Project site]
- 50% of these workers bring their families (2.7 persons per household, Texas average) (2,825 x 1.7 additional = 4,802 family members)

- Influx of direct workers also brings in influx of indirect workers (0.4 ratio of direct to indirect workers – in absence of site-specific information) pertaining to the Regional Industrial Multiplier System direct/indirect ratios calculated for each plant (as found in NUREG/CR-2749) (2,260 indirect workers)
- 50% of these indirect workers bring their families (1.7 additional persons per family) (1,130 x 1.7 = 1,921 family members)

Thus an influx of 5,650 workers is predicted to results in a total population influx of 14,633 persons.

When this population influx is compared to the total population projections in 2014 for the six sites and their potentially affected areas, the increase is as follows: Guadalupe 2 (5%), Colorado 3 (4.9%), South Texas Project (2.6%), Trinity 2 (3.1%), Sulphur 1 (3.8% to 5.1%) and Red 1 (4.4 to 4.7%) – a range of two to five percent. When the workforce influx (5,650) is compared to the total workforce for the same six sites, the increases range from three to six percent (similar to those shown in table above but now compared against a slightly smaller workforce, 5,650 workers), as follows: Guadalupe 2 (4.8%), Colorado 3 (5.3%), South Texas Project (2.9%), Trinity 2 (3.6%), Sulphur 1 (3.7% to 5.3%) and Red 1 (5.3% to 5.6%), with Guadalupe 2 and Trinity 2 following below 5%. In addition, when the workforce influx is compared to the total construction workforce for the six sites, the increase is significant, ranging from 29% (at South Texas Project) to 80% (at Red 1 excluding OK workforce); note that these percentages are slightly lower than those shown in table above since this calculation is based on a workforce influx of 5,650 workers. In general, despite the low percentage increases in overall population and total workforce in the site regional area, the actual impacts on the region are likely to be potentially more significant than these percentages might indicate, particularly at the more rural sites where there no (or fewer) nearby towns (closest to the sites), within which the majority of in-migrating workers are likely to reside. The immigration of a large number of workers and their families would result in a noticeable strain on housing, schools, health care, and other community services at these smaller towns. For these reasons, the most rural of the remaining sites are considered significantly less suitable, and this situation is reflected in the site ratings. Colorado 3 and Sulphur 1 receive the lowest ratings of 1 since there are no large nearby towns to help support a large population influx. Guadalupe 2, Trinity 2, and Red 1 receive a slightly higher rating of 2 since they are near the larger towns of Victoria (Guadalupe 2) and Wichita Falls (Red 1); and Trinity 2 is located near (less than 30 miles) several medium sized towns including Athens, Palestine, and Corsicana. Also note that the Town of Fairfield (Freestone County seat, near Trinity 2) website indicates that it has additional housing outside the city limits that can house more than 5 times its current population (3,300 persons). South Texas Project is given a slightly higher rating of 3 given that the South Texas Project study area already supports an existing nuclear power plant (and the earlier construction of this plant), the study area includes several cities within Matagorda and the more heavily populated Brazoria Counties that support the current nuclear plant operations workforce, and the percentage increases to the total workforce, construction workforce, and overall population levels within the South Texas Project study area are the lowest of the six remaining sites.

Finally, this evaluation also incorporates findings from a study conducted by Dominion Energy Inc., Bechtel Power Corporation, TLG, Inc., and MPR Associates for the U.S. Department of

Energy (2004) entitled: *Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs.* This report includes a more accurate and up-to-date assessment of labor availability that takes into account a U.S. labor pool that is aging and diminishing in number and skill level (with retirement of the baby boom generation that constructed the first set of nuclear power plants). It recognizes that attracting craft with the high skill levels and regulatory employment criteria for new nuclear plant construction is expected to be difficult given that the group of craft currently doing nuclear work is significantly smaller than the total construction craft population, and is in higher demand because of the higher skill levels and greater capability to meet strict employment standards (e.g., scrutiny of NRC background check). However, in an effort to reduce or minimize the labor supply concerns associated with new nuclear plant construction projects, a new strategy has been identified that would shift portions of the work force to areas of the country where skills and craft are available in sufficient quantity (national workforce). This would most effectively be done through modularizing portions of the plants to be built, and providing aggressive training of craftsmen before and during the construction phase of the project. Modularization is anticipated to become an important aspect of new nuclear construction. Although this latest information regarding a national work force would serve to minimize site differences with respect to local construction workforce needs, a set of more conservative ratings has been assigned based on the primary differentiator between sites: total population (host county), percent increase in existing workforce and percent increase in existing construction workforce at each site. In addition, even with a national workforce, the potential impacts on the local infrastructure and community services of any substantive worker influx to the more rural sites noted above are expected to be significantly more than impacts to sites located closer to major population centers and metropolitan areas.

Socioeconomic Construction	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	1	3	5	4
Socioeconomic Construction	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	2	1	2	4	

D.3.2 SOCIOECONOMICS – OPERATION

Socioeconomic impacts of operation relate primarily to the benefits afforded to local communities as a result of the plant's presence (e.g., tax plans, local emergency planning support, educational program support). These benefits tend to be a function of negotiations between the plant owner and local government; they are not indicative of inherent site conditions that affect relative suitability between sites. This criterion is not applicable to a comparison of the sites, and in accordance with guidance in the Siting Guide, suitability scores were not developed.

D.3.3 ENVIRONMENTAL JUSTICE

Objective – The objective of this criterion is to ensure that the effects of proposed actions do not result in disproportionate adverse impacts to minority and low-income communities. In comparing sites, this principle is evaluated on the basis of whether any disproportionate impacts to these communities are significantly different when comparing one site to another.

Evaluation approach – The first step in this evaluation is to collect and compare population data for minorities and low-income populations across sites.

However, two additional questions comprising this evaluation also are relevant:

1. Does the proposed action result in significant adverse impacts?
2. Are impacts to minority or low-income populations significantly different between sites?

If the answer to the first question is "no" for all sites (i.e., no significant health and safety impacts are identified), then there would be no environmental justice concerns, regardless of the percentage of minority or low-income populations found within the surrounding communities of a site(s). If the answer to the first question is "yes" (i.e., significant health and safety impacts are expected), environmental justice concerns are relevant to site selection only if the answer to the second question is also "yes" (i.e., disproportionate adverse impacts on minority or low-income populations are identified at one or more sites, thereby resulting in significant differences between sites).

Note that the study area for evaluating environmental justice concerns included the host county and immediately surrounding counties. In the case of Sulphur 1, Red 1 and Red 2 sites whose study areas include another state(s) (Arkansas and Oklahoma), it was assumed that any adverse impacts to minority and low income populations at these sites would be limited to Texas counties only, where the majority of the workforce were assumed to reside.

Discussion – With regard to the sites under consideration, related environmental justice information is summarized for each site below. Population data are for 2000 except for low income (percentage of population below poverty line) which is for 2007 – as provided in U.S. Census Bureau website. To facilitate the evaluation, the 2007 below poverty line percentage was applied to the total 2000 study area population (by county) to estimate the low income population percentage for the entire study area. The results are assumed to be representative of low income conditions within each site study area for purposes of making site comparisons and determining ratings. With respect to the minority populations, the minority breakout includes the following: Black, Other (encompassing American Indian and Alaskan Native, Asian, Native Hawaiian and other Pacific Islander, some other race, and two or more races), and Hispanic or Latino (of any race) – Hispanic Ethnicity.

Guadalupe 2 Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
DeWitt	20,013	11.0% (2,209)	12.5% (2,511)	27.2% (5,452)	19.4% (3,882)
Lavaca	19,210	6.8% (1,305)	6.3% (1,219)	11.4% (2,183)	13.2% (2,536)
Wharton	41,188	15.0% (6,159)	16% (6,606)	31.3% (12,888)	15.7% (6,467)
Jackson	14,391	7.6% (1,099)	15.9% (2,284)	24.7% (3,551)	14.6% (2,101)
Victoria	84,088	6.3% (5,297)	19.4% (16,385)	39.2% (32,959)	16.2% (13,622)
Calhoun	20,647	2.6% (542)	19.4% (3,993)	40.9% (8,448)	15.7% (3,242)
Goliad	6,928	4.8% (334)	12.4% (870)	35.2% (2,439)	15.8% (1,095)
Gonzales	18,628	8.4% (1,563)	19.4% (3,607)	39.6% (7,381)	18.6% (3,465)
Karns	15,446	10.8% (1,667)	20.7% (3,191)	47.4% (7,324)	26.5% (4,093)
Wilson	32,408	1.2% (392)	17.5% (5,705)	36.5% (11,834)	11.0% (3,565)
Total	**252,934**	**20,567 (8.1%)**	**46,371 (18.3%)**	**94,459 (37.3%)**	**44,068 (17.4%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX
Population and percentages from U.S. Census Bureau – some rounding.

Colorado 3 Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Fayette	21,804	7.0% (1,528)	8.5% (1,834)	12.8% (2,786)	12.4% (2,704)
Bastrop	57,733	8.8% (5,072)	11.1% (6,334)	24% (13,845)	12.6% (7,274)
Lee	15,657	12.1% (1,892)	11.3% (1,773)	18.2% (2,848)	12.3% (1,926)
Washington	30,373	18.7% (5,669)	6.7% (2,022)	8.7% (2,647)	14.3% (4,543)
Austin	23,590	10.6% (2,509)	9.2% (2,157)	16.1% (3,805)	10.9% (2,571)
Colorado	20,390	14.8% (3,017)	12.4% (2,532)	19.7% (4,024)	14.9% (3,038)
Lavaca	19,210	6.8% (1,305)	6.3% (1,219)	11.4% (2,183)	13.2% (2,536)
Caldwell	32,194	8.5% (2,735)	21.3% (6,882)	40.4% (13,018)	16.7% (5,376)
Gonzales	18,628	8.4% (1,563)	19.4% (3,607)	39.6% (7,381)	18.6% (3,465)
Total	**239,579**	**25,290 (10.6%)**	**28,360 (11.8%)**	**52,537 (21.9%)**	**30,733 (12.8%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

South Texas Project Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Matagorda	37,957	12.7% (4,829)	19.5% (7,383)	31.3% (11,898)	22.5% (8,540)
Brazoria	241,767	8.5% (20,540)	14.3% (34,844)	22.8% (55,063)	9.8% (23,693)
Wharton	41,188	15.0% (6,159)	16% (6,606)	31.3% (12,888)	15.7% (6,467)
Jackson	14,391	7.6% (1,099)	15.9% (2,284)	24.7% (3,551)	14.6% (2,101)
Calhoun	20,647	2.67% (542)	19.4% (3,993)	40.9% (8,448)	15.7% (3,242)
Victoria County	84,088	6.3% (5,297)	19.4% (16,385)	39.2% (32,959)	16.2% (13,622)
Total	**440,038**	**89,481 (20.3%)**	**71,495 (16.2%)**	**124,807 (28.4%)**	**57,575 (13.1%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Allens Creek Site Minority and Low Income Population/Percentages

County	Population (2000)	Black	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity	Low Income (2007)
Austin	23,590	10.6% (2,509)	9.2% (2,157)	16.1% (3,805)	10.9% (2,571)
Harris	3,400,578	18.5% (628,619)	22.8% (774,836)	32.9% (1,119,751)	16.3% (554,294)
Waller	32,663	29.2% (9,553)	13% (4,221)	19.4% (6,344)	19.9% (6,500)
Fort Bend	354,452	19.8% (70,356)	23.2% (82,200)	21.1% (74,871)	8.4% (29,774)
Colorado	20,390	14.8% (3,017)	12.4% (2,532)	19.7% (4,024)	14.9% (3,038)
Wharton	41,188	15.0% (6,159)	16% (6,606)	31.3% (12,888)	15.7% (6,421)
Washington	30,373	18.7% (5,669)	6.7% (2,022)	8.7% (2,647)	14.3% (4,543)
Fayette	21,804	7.0% (1,528)	8.5% (1,834)	12.8% (2,786)	12.4% (2,704)
Total	**3,925,038**	**727,410 (18.5%)**	**876,408 (22.3%)**	**1,227,116 (31.3%)**	**609,845 (15.5%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Malakoff Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Henderson	73,277	6.6% (4,842)	4.9% (3,585)	6.9% (5,071)	15.5% (11,358)
Anderson	55,109	23.5% (12,941)	10.0% (5,551)	12.2% (6,705)	18.9% (10,416)
Freestone	17,867	18.9% (3,378)	5.6% (988)	8.2% (1,465)	13.6% (2,430)
Navarro	45,124	16.8% (7,577)	12.4% (5,581)	15.8% (7,113)	18.5% (8,348)
Van Zandt	48,140	2.9% (1,416)	5.1% (2,456)	6.6% (3,201)	14.3% (6,884)
Kaufman	71,313	10.5% (7,511)	8.4% (5,965)	11.1% (7,925)	11.0% (7,844)
Ellis	111,360	8.6% (9,626)	10.8% (11,945)	18.4% (20,508)	10.7% (11,915)
Smith	174,706	19.1% (33,298)	8.2% (14,555)	11.2% (19,521)	14.3% (28,983)
Cherokee	46,659	16% (7,446)	9.7% (4,528)	13.2% (6,178)	18.6% (8,679)
Total	**643,555**	**88,035 (13.7%)**	**55,154 (8.6%)**	**77,687 (12.1%)**	**94,670 (14.7%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Trinity 2 Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Freestone	17,867	18.9% (3,378)	5.6% (988)	8.2% (1,465)	13.6% (2,430)
Anderson	55,109	23.5% (12,941)	10.0% (5,551)	12.2% (6,705)	18.9% (10,416)
Leon	15,335	10.4% (1,593)	6.1% (933)	7.9% (1,213)	15.4% (2,562)
Houston	23,185	27.9% (6,476)	3.6% (810)	7.5% (1,739)	24% (5,564)
Cherokee	46,659	16% (7,446)	9.7% (4,528)	13.2% (6,178)	18.6% (8,679)
Henderson	73,277	6.6% (4,842)	4.9% (3,585)	6.9% (5,071)	15.5% (11,358)
Navarro	45,124	16.8% (7,577)	12.4% (5,581)	15.8% (7,113)	18.5% (8,348)
Ellis	111,360	8.6% (9,626)	10.8% (11,945)	18.4% (20,508)	10.7% (11,915)
Total	**387,196**	**53,879 (13.9%)**	**33, 921 (8.8%)**	**49,992 (12.9%)**	**61,272 (15.8%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Sulphur 1 Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Red River	14,314	17.8% (2,548)	4.2% (596)	4.7% (669)	19.0% (2,720)
Bowie	89,306	23.4% (20,913)	3.3% (2,969)	4.5% (3,992)	17.9% (15,986)
Lamar	48,499	13.5% (6,534)	4.1% (1,975)	3.3% (1,614)	16.2% (7,857)
Titus	28,118	10.7% (3,008)	19.1% (5,386)	28.3% (7,960)	14.6% (4,105)
Franklin	9,458	3.9% (373)	6.9% (649)	8.9% (842)	14.4% (1,362)
Cass	30,438	19.5% (5,927)	2.3% (710)	1.7% (526)	19.3% (5,875)
Morris	13,048	24.1% (3,148)	4.2% (543)	3.7% (477)	17.5% (2,283)
Wood	36,752	6.1% (2,250)	4.8% (1,753)	5.7% (2,102)	11.9% (4,373)
Total	**269,933**	**44,701 (16.6%)**	**14,581 (5.4%)**	**18,182 (6.7%)**	**44,561 (16.5%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Red 1 Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Clay	11,006	0.4% (46)	4.2% (466)	3.7% (404)	12.0% (1,321)
Wichita	131,664	10.2% (13,466)	11.0% (14,493)	12.2% (16,097)	15.6% (20,540)
Archer	8,854	0.1% (7)	4.4% (388)	4.9% (431)	8.1% (717)
Montague	19,117	0.2% (34)	3.9% (740)	5.4% (1,035)	14.9% (2,848)
Cooke	36,363	3.1% (1,112)	8.1% (2,946)	10% (3,627)	13.8% (5,018)
Jack	8,763	5.5% (486)	5.8% (506)	7.9% (691)	13.0% (1,139)
Young	17,943	1.2% (218)	7.8% (1,400)	10.6% (1,906)	16.8% (3,014)
Total	**233,710**	**15,369 (6.5%)**	**20,939 (8.9%)**	**24,191 (10.4%)**	**34,597 (14.8%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Red 2 Site Minority and Low Income Population/Percentages

County	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Fannin	31,242	8.0% (2,488)	5.5% (1,711)	5.6% (1,753)	16.5% (5,155)
Grayson	110,595	5.9% (6,471)	6.9% (7,681)	6.8% (7,519)	12.6% (13,935)
Lamar	48,499	13.5% (6,534)	4.1% (1,975)	3.3% (1,614)	16.2% (7,857)
Cooke	36,363	3.1% (1,112)	8.1% (2,946)	10% (3,627)	13.8% (5,018)
Collin	491,675	4.8% (23,561)	13.8% (67,933)	0.3% (50,510)	6.2% (30,484)
Hunt	76,596	9.5% (7,242)	6.9% (5,341)	8.3% (6,366)	16.4% (12,562)
Total	**794,970**	**47,408 (6.0%)**	**87,587 (11.0%)**	**71,389 (9.0%)**	**75,011 (9.4%)**

Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/ for TX

Results – Environmental justice data for the sites are summarized below.

Site	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Guadalupe 2	252,934	8.1%	**18.3%**	**37.3%**	**17.4%**
DeWitt	20,013	11.0%	12.5%	27.2%	**19.4%**
Colorado 3	239,579	10.6%	11.8%	21.9%	12.8%
Fayette	21,804	7.0%	8.5%	12.8%	12.4%
South Texas Project	440,038	**20.3%**	16.2%	28.4%	13.1%
Matagorda	37,957	**12.7%**	**19.5%**	31.3%	**22.5%**
Allens Creek	3,925,038	**18.5%**	**22.3%**	31.3%	15.5%
Austin	23,590	10.6%	9.2%	16.1%	10.9%

Site	Population (2000) in Site Study Area	Percentage Black Population in Site Study Area	Other Minority (including Some Other Race and Two or more races)	Hispanic Ethnicity Percentage in Site Study Area	Low Income Percentage (2007) in Site Study Area
Malakoff	643,555	**13.7%**	8.6%	12.1%	14.7%
Henderson	73,277	6.6%	4.9%	6.9%	15.5%
Trinity 2	387,196	**13.9%**	8.8%	12.9%	15.8%
Freestone	17,867	**18.9%**	5.6%	8.2%	13.6%
Sulphur 1	269,933	**16.6%**	5.4%	6.7%	**16.5%**
Red River	14,314	**17.8%**	4.2%	4.7%	**19.0%**
Red 1	233,710	6.5%	8.9%	10.4%	14.8%
Clay	11,006	0.4%	4.2%	3.7%	12.0%
Red 2	794,970	6.0%	11.0%	9.0%	9.4%
Fannin	31,242	8.0%	5.5%	5.6%	16.5%
TEXAS		11.5%	17.6%	32%	16.3%

A comparison of the minority and low income populations within the study areas and the host counties to the state (Texas) average for each of these population leads to the following conclusions:

- Overall, Colorado 3, Red 1 and Red 2 study areas and host counties have the lower percentages of minority and low income populations. All percentages are below the state average and no environmental justice concerns would be anticipated at these sites.
- Five of the nine sites have high percentages of black populations that exceed the state average, either for the study area or both the study area and host county, although none by a significant margin. They are as follows: South Texas Project, Trinity 2 and Sulphur 1 (study area and host county), Allens Creek and Malakoff (study area only). South Texas Project study area has the highest percentage at 20.3%.
- Two sites, Guadalupe 2 and Sulphur 1, have the highest percentages of low income populations in both their study areas and host counties; a third site's host county (South Texas Project's Matagorda County) has the highest percentage of low income population at 22.5%.
- The percentage of Hispanic or Latino (or any race) populations is low for all sites (well below state average) except for Guadalupe 2, South Texas Project and Allens Creek (study area only) where the percentages range between 28.4% (South Texas Project) and

37.3% (Guadalupe 2). Only Guadalupe 2 exceeds the state average of 32% for Hispanic ethnicity.

- With respect to other minority populations (including American Indian and Alaskan Native, Asian, Native Hawaiian and other Pacific Islander, some other race, and two or more races), all site have low percentages well below the state average except for Guadalupe 2 and Allens Creek – whose study areas have the highest percentages (18.3% and 22.3%) and exceed the state average; and South Texas Project whose study area approaches but does not exceed the state average (16.2%) and whose host county (Matagorda) percentage at 19.5% does exceed the state average.
- No significant health impacts to human populations were identified at any of the sites under consideration.
- Low-income population in other counties across the U.S. that host a nuclear power plant has directly benefited from economic impacts of the existing plant, including South Texas Project and Comanche Peak nuclear plants in Texas. Similar beneficial economic impacts are expected to occur for new units at other sites with large minority populations as well.

Based on professional judgment in factoring in the above percentages alone, and the uncertainties surrounding the responses of the nearby tribal populations, the site ratings are as follows:

Environmental Justice	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	3	5	3	3	4
Environmental Justice	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	4	3	5	5	

D.3.4 LAND USE

D.3.4.1 Construction- and Operation-Related Effects

Objective – The objective of this criterion is to evaluate the suitability of the sites with respect to potential conflicts in existing land uses at each site. No exclusionary or avoidance criteria apply to this issue.

Evaluation approach – The evaluation is based on the compatibility of a new nuclear station with existing land uses, including existing and future land uses and zoning ordinances, as well as any significant historic and ecological resources. Historic resources include those currently listed on the National Register of Historic Places (NRHP), or known (active) archaeological sites or Native American lands. This analysis is based on publicly available data.

Discussion – Relevant land use data are provided in the table below.

Site	Special Land Use Features in Vicinity of Site
Guadalupe 2 DeWitt County	Historic: 59 sites NRHP sites: All in Cuero, including various buildings/structures, historic districts and state highway 27 bridge at Guadalupe River [also known as US-87 bridge at Guadalupe River, Cuero Hydro plant (also known as Guadalupe plant)] Historic Districts: 5 sites – water works structure in Cuero (less than 1 acre); Cuero Commercial Historic District (210 acres, 59 buildings); Cuero 1 Archaeological District 570,000 acres (3 buildings, current agricultural fields); East Main Street Residential Historic District (170 acres, 28 buildings); Terress-Reuss Streets Historic District (650 acres, 63 buildings), also in Cuero. Guadalupe River a focal point of life for Indians and Anglo American colonization. Land Use of immediate site area: mostly forested, evidence of past clear-cutting/timber operations. Other land uses in county: agribusiness – crops and livestock. In the early twenty-first century wood, furniture plants, a textile mill, and agribusiness (crops and livestock) were key elements of the area's economy. In 2002 the county had 1,786 farms and ranches covering 576,896 acres, 64 percent of which were devoted to pasture, 29 percent to crops, and 6 percent to woodlands. Cattle, dairy, poultry, swine, corn, and sorghum were the chief agricultural products. More than 336,700 barrels of oil and 16,322,074 cubic feet of gas-well gas were produced in the county in 2004. Recreation/Ecological: Guadalupe Delta WMA located to south of the site, in the Bay. Texas Handbook online: http://www.tshaonline.org/handbook/online/articles/DD/hcd7.html

Site	Special Land Use Features in Vicinity of Site
Colorado 3 Fayette County	Historic: 19 NRHP Sites, including buildings or structures in Round Top (2), Flatonia (1), Dubina (Historic District, building), La Grange (Fayette County Courthouse Square Historic District and 3 other buildings, church, state highway 71 bridge at Colorado River), Schulenburg (Mulberry Creek Bridge and cotton compress), High Hill (St. Mary's church), Warrenton (homestead/building), Ammansville (church), Praha (church), Winedale (building), Fayetteville (building) Historic District: Dubina Historic District (cemetery in Dubins), 190 acres – 2 buildings. Land use in immediate site area: mostly cleared. Mining (sand and gravel) operation to the south, and farmland to the north of the site. General county land use: Economic development of the county was largely dependent on its natural resources in the 1980s and 1990s. Construction gravel and sand, grinding pebbles, clays, and fuller's earth were mined. Oil, first discovered in 1943, was an important source of income. Due to new horizontal drilling techniques Fayette County experienced a dramatic rise in oil and gas production in the early 1990s. As a highly active part of the Giddings oilfield of the Austin Chalk trend, the county produced 14,044,733 barrels of oil and 72,469,984 million cubic feet of gas in 1992. Timber is selectively cut for commercial purposes from 28,200 acres of privately owned woodlands. Agribusiness plays a major role in the economy. Light industry includes shops, a cabinet factory, plastic recycling, gas processing, and other manufacturing. The Lower Colorado River Authority Fayette Power Project is the largest employer in the county, with around 500 workers. Other large employers include drilling and pipeline management. Recreation/Ecological: Rice-Osborne Bird and Nature Trail, Cedar Creek Reservoir [Oak Thicket and Park Prairie are found next to the existing power plant reservoir (Cedar Creek Reservoir)]; site is just south of the plant and reservoir. The cooling pond of the Fayette Power Project has been developed into a stocked fishing lake of 2,400 surface acres, averaging a depth of thirty feet. It is open to the public and has become especially popular with bass fishermen. Monument Hill-Kreische Brewery State Historic Site, the historic Henkel Square in Round Top, and Winedale Historical Center draw visitors year round. Antique fairs, the International Festival-Institute at Round Top, ethnic and town festivals, and the County Fair are popular special events. The "painted churches" at Dubina, Praha, Ammansville, and High Hill offer popular historic-preservation tours, and each of the four major towns has a museum actively preserving county history.

Site	Special Land Use Features in Vicinity of Site
South Texas Project Matagorda County	Historic: 1 NRHP site in Matagorda County, located in Town of Blessing. Archeological research has revealed a pattern of relatively dense occupation near inland water sources in the upper Texas coastal region, and projectile points from the early Paleo-Indian period (10,000-6,000 B.C.) have been found thinly scattered along the Texas coastal plain. Land use immediately surrounding site: Existing South Texas Project nuclear plant. General County land use: Bay City is the center of petrochemical production in the area. Major tourist attractions included fishing and water sports. The Texas Independence Trail runs through Matagorda County, and an annual cattle drive across the Colorado River to summer pastures on Matagorda Peninsula, which began in 1919 still drew tourists in 1994. In 1982, 80 percent of Matagorda County was in farms and ranches, and of this, 28 percent was cultivated. The county derives 67 percent of its agricultural receipts from crops, especially rice, sorghum, soybeans, wheat, hay, and cotton. Potatoes, peaches, and pecans were also grown there. Cattle ranching has been important to the local economy. Mineral resources include salt domes, brine, petroleum, and natural gas. In 1982, 97,440,000,000 cubic feet of gas well gas, 6,781,000,000 cubic feet of casinghead gas, and 2,903,000 barrels of petroleum were produced in the county. The Colorado Barge Canal, completed in 1959, extends fifteen miles along the Colorado River from the Gulf Intracoastal Waterway to a turning basin below Bay City and links the county to deep water at Freeport and Galveston. Recreation/Ecological: Matagorda County is in the Coastal Prairie region of Texas bordered on the south by the Gulf of Mexico and Tres Palacios, Matagorda, and East Matagorda bays. Crossed by the once highly flood-prone Colorado River, which bisects it from north to south, the county extends across 1,612 square miles of mostly open prairie. Matagorda Peninsula, a narrow barrier island formed less than 5,000 years ago, protects Matagorda Bay and is cut in half by the Colorado River channel twenty-four miles from the pass. Matagorda County has secluded, extensive forests, wetlands, prairie and coast; this gulf coastal floodplain area has several conditions conducive to a variety ecosystems and recreational activities evident by its having the highest count of migrating birds in the United States. The South Texas Project cooling reservoir has been identified as a sensitive avian rookery in the oil spill responders database. https://gisweb1.glo.state.tx.us/website/Oilspill7/viewer.htm Fishing on & offshore, hunting and scuba diving are large parts of the recreation industry due to the Colorado river, its forests and Matagorda bay. As well as having the Rio Colorado Golf Course and a birdwatching park on the Colorado River and Hwy 35, there are a significant number of wildlife preserves around the county, a portion of which is land bought for that purpose by the 3 major plants in the county. A number of protected wildlife habitats, including Big Boggy National Wildlife Refuge (east of South Texas Project site), the Mad Island Wildlife Management Area (south of South Texas Project site), the Runnels Family Mad Island Marsh, and the Nature Conservancy, are located in the county.

Site	Special Land Use Features in Vicinity of Site
Allens Creek Austin County	Historic: 7 NRHP sites in Austin County, including church in Wesley, structure in Nelsonville, lodge in Bellville, Austin County Jail in Bellville, Church in Wallis, rec/cultural (museum) in Shelby; and the Allens Creek Ossary Site (grave/burials). Land use in immediate site area: farmland/cleared area with forests to the north. Note that site is currently owned by NRG but there is a restriction on future use of the land – no nuclear development. General County Land use: In the early twenty-first century agribusiness, tourism, and some manufacturing were key elements of the area's economy, and many residents commuted to work in Houston. Between 11 and 20 percent of the land in the county is regarded as prime farmland. In 2002 the county had 2,086 farms and ranches covering 367,497 acres, 51 percent of which were devoted to pasture and 37 percent to crops. Beef, hay, cotton, corn, grain sorghum, and pecans were the chief agricultural products. Substantial reserves of petroleum and natural gas are by far the most significant of the county's limited mineral resources. Recreation/Ecological: Areas include the 667-acre Stephen F. Austin State Historical Park at San Felipe, which attracts thousands of visitors annually, and Attwater Prairie Chicken NWR just west of site
Malakoff Henderson County	Historic: 1 NRHP site in Henderson County, located in town of Athens. Texas Heritage Trail (Texas Lake Trail) runs immediately north of the site. Land use in immediate site area: Site is west of the Malakoff abandoned mine land (AML) that appears to have since been (mostly) reclaimed. Current land use at site is mixture of forest and cleared land; site area includes patchwork of linear features with new growth – presumably from reclamation of previous mining operations. Many white lines and pads also noted on satellite imagery (presumably drill pads). General County Land Use: Two major lakes are partly in the county: Cedar Creek Reservoir on the northwest (where site is located) and Lake Palestine on the southeast. Because of its favorable climate, the county's recreation areas are popular retirement centers. Mineral resources include oil and gas reserves, sulfur, lignite coal, sand and gravel, and clay used for making bricks and pottery. Recreation/Ecology: Recreation, hunting and fishing bring people to the county along the Texas Forest Trail and the Texas Lakes Trail. Texas Lake Trail runs just north of the site. The Old Fiddlers Reunion is held in May, and the Black-Eyed Pea Jamboree in July, both in Athens.

Site	Special Land Use Features in Vicinity of Site
Trinity 2 Freestone County	Historic: 1 NRHP site: Trinity and Brazos Valley Railroad Depot and Office Building in Teague Land use in Immediate site area: Site is east of Lake Fairfield and the Big Brown power plant and mine (now known as TXU Electric Generating and TXU Mining Company); land use at site area itself is mixture of cleared land and forested area. Possible development of land east of Lake Fairfield (near site) by Luminant for lignite mine (status and proposed location are not known). General County Land Use: Farming, ranching, natural resources, natural gas and coal are important sectors of the economy. At the present time, a second power plant owned by Calpine Corporation in California is under construction in the Fairfield area. In the early twenty-first century natural gas, mining, quarries, various manufacturing concerns, and agribusiness were the key elements of the local economy. More than 263,851,000 cubic feet of gas-well gas were produced in the county in 2004. In 2002 the county had 1,468 farms and ranches covering 429,339 acres, 53 percent of which were devoted to pasture, 30 percent to crops, and 16 percent to woodlands. Beef cattle, hay, fruits, vegetables, melons, pecans, and corn were the chief agricultural products. Farming and ranching are important part of Fairfield, TX (county seat), as well as natural gas and coal. In 1969 a steam electric station was located near Fairfield to use lignite resources in area. The plant required construction of Fairfield state lake. Peach production and cattle ranching have replaced king cotton. Natural resources and natural gas and coal remain important. Fairfield pop is 3,349 but there are several housing additions outside city that increase number to around 16,712. In recent years, gas production has boomed with rigs being erected only feet apart in some areas. Gravel roads and pads replace grassland to extent that cattle production has suffered. [this is likely the large number of white pads and roads leading to them noted on satellite imagery]. Recreation/Ecological: Catfish Creek Gus Engeling WMA NE of site; Richland Creek WMA just north of site. Near Richland chambers Reservoir. Fairfield Lake is a popular fishing lake in the state, and provides recreation for residents and visitors, and many historic sites are preserved throughout the county. Fairfield Lake State Park (1460 acres northeast of the City of Fairfield), Big Brown Creek Trail http://www.tpwd.state.tx.us/spdest/findadest/parks/fairfield_lake/ http://www.fairfieldtexaschamber.com/html/aboutfairfield.html Note: ER 9.3 said Big Brown site (next to Trinity 2) was dropped because of ecological reasons and reclaimed area next to mine is now nature preserve [hard to see that on Google Earth]. Nearby lake is site of fishing tournament. Acquisition issues for development of site. Proximity to population may cause issues for emergency planning and safety. Areas around mine now used for recreation and agriculture.

Site	Special Land Use Features in Vicinity of Site
Sulphur 1 Red River County	Historic: 6 NRHP Sites: 2 buildings in Clarksville; historic district (see below); and 3 village sites (restricted location) including Neely site (Manchester, current function is agriculture), McCarty Site (Pin Hook, current function is agriculture), and Kaufman Site (Blakeney, current function is agriculture/agricultural fields) Historic District: Kiomatia Mounds Archaeological District, address restricted; 7,700 acres, 2 buildings, 4 structures (current function: agriculture) Land use in immediate site area: forested, and surrounded by farmland. Clear cutting seems to be ongoing based on presence of logging roads. General county land use: County is very rural. In the early twenty-first century agribusinesses, lumbering, and some manufacturing were the key elements of the area's economy. In 2002 the county had 1,217 farms and ranches covering 422,645 acres, 47 percent of which were devoted to pasture, 33 percent to crops, and 18 percent to woodlands (beef cattle, hay, soybeans, and cotton were the chief agricultural products). Almost 3,568,000 cubic feet of pinewood and more than 5,222,000 cubic feet of hardwood were harvested in the county in 2003. Mineral resources include oil, gas, clay, industrial sand, and chalk. Recreation/Ecological: White Oak Creek WMA SE of site; Ouachita National Forest – NE of site just inside OK state line (McCurtain County)
Red 1 Clay County	Historic: 2 NRHP sites: Clay County Courthouse and Jail in Henrietta and State Highway; and 79 bridge at Red River (TX-OK state line, Byers) Land use in immediate site area: Poor resolution so difficult to discern from satellite imagery but area appears to be undeveloped but cleared; perhaps covered with shrubs and used as pastureland. It is surrounded by agricultural lands. General County Land Use: About a third of the county is prime farmland. In 2002 the county had 892 farms and ranches covering 654,342 acres, 68 percent of which were devoted to pasture and 28 percent to crops (beef and dairy cattle, horses, wheat, cotton, pecans, and peaches were the chief agricultural products). More than 742,000 barrels of oil and 258,589 cubic feet of gas-well gas were produced in the county in 2004. Recreation: Local attractions include hunting and fishing, Lake Arrowhead State Recreation Area, (southwest of the site) and the Pioneer Reunion Festival and Junior Stock Show, both held annually in Henrietta (13 miles SW of site).

Site	Special Land Use Features in Vicinity of Site
Red 2 Fannin County	Historic: 9 NRHP sites including 5 buildings in Bonham (including Texas and Pacific Railroad Bonham Depot), 1 building in Ladonia, lake fanning camp/historic district; 1 building in Honey Grove, and State Highway 78 bridge at the Red River across Red River (TX-OK) Ravenna. Historic Districts: Lake Fannin Organizational Camp, Caddo National Grasslands, 900 acres, 11 buildings, 2 structures. Land use in immediate site area: cleared, agricultural area north of Valley Plant. General County land use: The main natural resource is timber; consequently, wood-product manufacture has been important in the local economy. In 2002 the county had 1,976 farms and ranches covering 483,446 acres, 59 percent of which were devoted to crops, 32 percent to pasture, and 8 percent to woodland. Beef cattle, wheat, milo, corn, pecans, and hay were the chief agricultural products. Recreation/Ecological: East Coffee Mill Rec area, Lake Davy Crockett Rec Area; Caddo WMA; Caddo National Grassland) NE of site; (Ray Roberts Lake SP, Ray Roberts Lake WMA; Texas Lakes Trail) west, SW of site; Caddo National Grassland also SE of site.

Results: All sites are located in rural locations, with agricultural, lumbering or mining operations nearby, although some are in closer proximity to (past or active) mining or industrial operations than others which would appear to make them more favorable for a zoning change (e.g., agricultural to industrial). These include:

- South Texas Project (existing nuclear power plant),
- Colorado 3 (near existing Fayette power plant and possible sand/gravel mining operation to the immediate south of the site;
- Malakoff (near abandoned mine land area although it has since been reclaimed);
- Trinity 2 (near Big Brown plant and lignite mine); and
- Red 2 (near Valley plant).

It is assumed that those sites in rural areas that support heavy agricultural or lumbering operations, including Guadalupe 2 (whose host county also has the highest number of historic sites and historic districts), Sulphur 1, and Red 1, would experience more difficulty in obtaining the necessary zoning change to convert from agricultural land to industrial use. Red 1 site, in particular, is in a county where over one third of the land is considered prime farmland. They are each given ratings of 2.

Allens Creek site is owned by NRG but its current use and zoning is unknown. Based on satellite imagery it currently appears to be used as farmland. It is closer to development (Houston and western suburbs) than other sites, which may facilitate a future change in zoning. However, one of the biggest issues with development at this site is the current restriction that the land not be used to develop a nuclear plant. As such, it is given a rating of 2.

Colorado 3, Malakoff, Trinity 2 and Red 2 are all given a higher rating given their proximity to ongoing industrial operations which is presumed to facilitate any zoning change that might be required. However, a conservative rating of 3 is given for the following reasons, by site:

- Colorado 3 – Heavy fishing/recreation associated with the nearby lake as well as activities relating to the historical resources in the area.
- Malakoff – near an abandoned mine site, but area has since been reclaimed and potential subsidence from past mining operations would appear to be a concern. Also many lakes and heavy recreational use in the area.
- Trinity 2 – Lake Fairfield is nearby and includes nature preserve/state park and heavy recreational use including excellent fishing and annual fishing tournament. In addition, there are current plans to expand lignite mining operations to the general site area (east of Lake Fairfield). As such, the land may not be available for purchase or for development of nuclear power.
- Red 2 – This site is near existing Valley plant but otherwise is very rural with numerous historical sites and recreational areas nearby.

Finally, the South Texas Project site is given the highest rating of 5 since it includes the existing nuclear power plant and no additional change in land use or zoning would be required. The area is rich in ecological resources, but these are not expected to be adversely affected from development of two new units. The South Texas Project cooling reservoir is considered a valuable avian rookery by the State; however, it would not be affected by new plant development and would continue to operate and support important bird species (including migratory birds).

Land Use	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	3	5	2	3
Land Use	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	2	2	3	

References

Fairfield Recorder, January 29, 2009:
Luminant applies for new mine to fuel Big Brown power plant.
http://www.thefairfieldrecorder.net/news/2009/0129/front_page/003.html

Fairfield Texas website at http://www.fairfieldtexaschamber.com/html/aboutfairfield.html

Google Earth, http://earth.google.com.

The Handbook of Texas Online (search by county: Austin, Clay, De Witt, Fannin, Fayette, Freestone, Henderson, Matagorda, and Red river Counties)
http://www.tshaonline.org/handbook/online/

National Register of Historic Places, State Listings by County
http://www.nationalregisterofhistoricplaces.com/TX/state.html [click on county of interest for full listing]

http://www.nationalregisterofhistoricplaces.com/tx/Austin/state.html [for selected counties, NRHP sites]
http://www.nationalregisterofhistoricplaces.com/tx/Red+River/districts.html [for selected counties, Historic Districts]

D.4 ENGINEERING AND COST-RELATED CRITERIA

D.4.1 HEALTH AND SAFETY RELATED CRITERIA

D.4.1.1 Water Supply

Objective – The purpose of this criterion is to evaluate relative differences in the design and construction cost of developing water supply facilities.

Evaluation approach – Sites with local conditions that would require additional engineering costs to develop water supply capability (e.g., reservoirs to address water supply limitations or reliability issues such as low flow constraints) are rated lower than sites with no such requirements.

Discussion/Results – Site ratings are based on professional judgment – taking into account cooling water sources and the difficulties in constructing water supply facilities.

Site	Evaluation	Rating
Guadalupe 2	The source of cooling water is the Guadalupe River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). The reservoir could be located near the site (Price Creek). Design and construction costs of developing water supply facilities are predicted to be relatively high.	2
Colorado 3	The source of cooling water is the Colorado River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). Lake Fayette (cooling source for Fayette Power Project) is located ~ 4 miles north of the site. This lake could be expanded (assuming the existing plant continues operations), or a new reservoir could be located near the site (Ross Creek). Design and construction costs of developing water supply facilities are predicted to be relatively high.	3
South Texas Project	The source of cooling water is the Colorado River. The existing cooling water reservoir and supply system was initially sized for 4 nuclear units. Therefore, existing reservoir capacity and supply infrastructure exists to provide cooling water for the 2 additional units. Design and construction costs of developing water supply facilities are predicted to be relatively low.	5

Site	Evaluation	Rating
Allens Creek	The source of cooling water is the Brazos River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). The reservoir could be located near the site at a location previously identified as a site for a new reservoir (City of Houston). Design and construction costs of developing water supply facilities are predicted to be relatively high.	2
Malakoff	The source of cooling water is the Trinity River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). The reservoir could be located near the site (Cedar Creek or Walnut Creek). Design and construction costs of developing water supply facilities are predicted to be relatively high.	2
Trinity 2	The source of cooling water is the Trinity River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). Fairfield Lake (cooling source for Big Brown power plant) is located ~ 2 miles west of the site. This lake could be expanded (assuming the existing plant continues operations), or a new reservoir could be located near the site (Big Brown Creek). Design and construction costs of developing water supply facilities are predicted to be relatively high.	3
Sulphur 1	The source of cooling water is the Sulphur River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). The reservoir could be located near the site (Cuthand Creek). Design and construction costs of developing water supply facilities are predicted to be relatively high.	2
Red 1	The source of cooling water is the Red River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). The reservoir could be located near the site (Little Wichita River). Design and construction costs of developing water supply facilities are predicted to be relatively high.	2
Red 2	The source of cooling water is the Red River. Construction of a cooling water reservoir will be required; size of the reservoir is dependent on the cooling technology selected (cooling towers, reservoir circulation). Valley Lake (cooling source for Valley power plant) is located ~ 1 mile south of the site. This lake could be expanded (assuming the existing plant continues operations), or a new reservoir could be located near the site (Brushy Creek and Sheep Creek). Design and construction costs of developing water supply facilities are predicted to be relatively high.	3

Water Supply	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	3	5	2	2
Water Supply	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	2	2	3	

References

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.1.2 Pumping Distance

Objective – The purpose of this criterion is to evaluate relative differences in the operational costs associated with conveying cooling water supply from the source water location to the proposed site of the plant.

Evaluation approach – Sites located large distances from their water supply source are rated lower than those located adjacent to the source. In general, the cost differential is expected to be a linear function of distance from the water source.

Discussion/Results – Precise groundwater pumping locations and potential right-of-way obstacles have not yet been determined for sites as final intake locations, reservoir locations, and plant locations have yet to be determined. However, the region of interest was constrained to candidate areas and potential sites within 5 miles of the cooling water source. Therefore, pumping distances are expected to be minimal, and differences between the sites are slight.

Site	Evaluation	Rating
Guadalupe 2	The site is located ~ 3 miles east of the Guadalupe River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
Colorado 3	The site is located ~ 1 mile east of the Colorado River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
South Texas Project	The site is located ~ 4 miles west of the Colorado River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4

Site	Evaluation	Rating
Allens Creek	The site is located ~ 4 miles west of the Brazos River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
Malakoff	The site is located ~ 4 miles east of the Trinity River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
Trinity 2	The site is located ~ 2 miles west of the Trinity River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
Sulphur 1	The site is located ~ 3 miles north of the Sulphur River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
Red 1	The site is located ~ 3 miles west of the Red River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4
Red 2	The site is located ~ 3 miles south of the Red River, and elevation differences are not significant. Operational costs associated with conveying cooling water supplies are expected to be similar to other sites.	4

Pumping Distance	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	4	4	4	4	4
Pumping Distance	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	4	4	4	4	

References

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.1.3 Flooding

Objective – The purpose of this criterion is to rate sites with respect to differential costs associated with construction of flood protection structures necessary to address probable maximum floods at the sites under consideration.

Evaluation approach – Sites with the largest differences between site-grade elevation and likely flood elevations are rated highest; sites with plant grade at or near flood level are rated lowest.

Discussion/Results – Although final plant layout locations have not been set for all sites, an initial comparison of potential site locations with floodplain information indicate that some proposed plant facilities may require protection from flooding.

Site	Evaluation	Rating
Guadalupe 2	The site is not located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5
Colorado 3	The site is located on the border of the 100 year flood zone. As such, construction of flood protection features is likely.	3
South Texas Project	The site is not located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5
Allens Creek	The site is not located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5
Malakoff	The site is located in the 100 year flood zone. As such, construction of flood protection features is likely to be necessary and could be extensive.	2
Trinity 2	The site is not located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5
Sulphur 1	The site is assumed to not be located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5
Red 1	The site is not located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5
Red 2	The site is assumed to not be located in the 100/500 year flood zone. No other neighboring flooding concerns exist. As such, construction of flood protection features would be minimal.	5

Flooding	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	5	3	5	5	2
Flooding	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	5	5	5	5	

References

FEMA Digital Flood Insurance Rate Maps, http://www.msc.fema.gov.

Google Earth, http://earth.google.com.

NOAA Stream and Flood Data, http://www.weather.gov/ahps/.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.1.4 Vibratory Ground Motion – *Deleted from evaluation*

The objective of this criterion is to provide a relative measure of cost associated with designing to different seismic requirements at different sites. Because all of the sites under consideration are expected to meet the site parameters for seismic design of the standardized designs under consideration, this criterion is not applicable to the site selection process.

D.4.1.5 Civil Works

Objective – The objective of this criterion (formerly titled "soil stability") is to rate sites according to differences in the cost of civil works (e.g., non-flood related berms, stabilizing of graded slopes and banks) necessary to prepare the site for nuclear plant development.

Evaluation approach – Landslides are commonly defined as the downward and outward movement of earth materials on a slope. Typically, landslides involve the falling, sliding, or flowing of rock and/or soil. Causes of landslides may include earthquakes, reservoir draw-downs, heavy precipitation, and floods. Sites are rated highest to lowest according to the estimated level of cost of civil works required at each site based on past incidence and future susceptibility of area landslides.

Discussion/Results – Given the generally low incidence of landslides in Texas, ratings were favorable across all sites. The Sulphur 1 site is located near an area with higher susceptibility to landslides and is rated slightly lower than other sites.

Site	Evaluation	Rating
Guadalupe 2	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.	5
Colorado 3	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.	5

Site	Evaluation	Rating
South Texas Project	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.	5
Allens Creek	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.	5
Malakoff	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.	5
Trinity 2	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.	5
Sulphur 1	Site is in an area having low landslide incidence (<1.5% of area involved in landslides). However, an area having moderate susceptibility to landsliding and low landslide incidence is located ~ 1.5 miles north of the site. Compounded with minimal area sloping, costs associated with civil works (slope stability) are estimated to be low, but may be higher than other sites.	4
Red 1	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.	5
Red 2	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.	5

Civil Works	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	5	5	5	5	5
Civil Works	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	5	4	5	5	

References

Godt, Jonathan W., 2001/2002, Landslide Incidence and Susceptibility in the Conterminous United States: U.S. Geological Survey Open-File Report 97-289, U.S. Geological Survey, Reston, VA. http://nationalatlas.gov/mld/lsoverp.html

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.2 TRANSPORTATION OR TRANSMISSION-RELATED CRITERIA

D.4.2.1 Railroad Access

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with providing rail access.

Evaluation approach – Sites are rated from highest to lowest in accordance with the estimated construction costs required to provide rail access to the site. The following unit cost estimates are assumed:

- Right-of-Way, Grading, and Rail Construction - $1.5M per mile
- Large Open Deck Tressel (major river crossing) - $14M each
- Small Open Deck Tressel (major stream crossing) - $100K each
- Box Culvert (minor stream crossing) - $25K each
- Crossing Protection with Lights and Gates - $150K each
- Mainline Turnout - $65K each

The site-specific condition of abandoned rail lines is unknown and could range from removed/revegetated to present and operable with minimal upgrade. Therefore, distances used in this analysis are to the nearest rail line in service and assume abandoned rail lines have been removed/revegetated. Should rail access become a sensitive criterion for site selection, site-specific conditions of abandoned rail lines should be more fully evaluated.

Discussion/Results – Distances to rail service at each of the sites were measured in the Preliminary Screening Evaluation. Assuming that (1) passenger lines may be used for delivery of plant equipment to the site and (2) abandoned lines have been removed/revegetated, ratings for the sites are assigned in the table below.

Site	Evaluation	Rating
Guadalupe 2	Rail is located ~ 2.3 miles southwest of the site. This rail line is operated by Union Pacific RR (Kansas City Southern Railway and Texas Mexican Railway have trackage rights) and does not support passenger service. Line length = 2.8 miles Major river crossings = 0 Major stream crossings = 0 Minor stream crossings = 4 Road crossings = 0 Estimated construction costs = $4.365M	4

Site	Evaluation	Rating
Colorado 3	Rail is located ~ 1.8 miles west of the site. This rail line is operated by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. Line length = 4.3 miles Major river crossings = 0 Major stream crossings = 0 Minor stream crossings = 0 Road crossings = 1 Estimated construction costs = $6.665M	4
South Texas Project	Rail is located ~6.7 miles north of the site. This rail line is served by Union Pacific RR (Burlington Northern Santa Fe has trackage rights) and does not support passenger service. A rail spur connecting the main track to the existing STP plant exists but has not been maintained. However, a barge slip is located on the Colorado River adjacent to the existing plant to facilitate transportation of large and/or heavy items. Construction of rail access to the site is not anticipated. Estimated construction costs < $1.0M	5
Allens Creek	Rail is located ~ 0.5 miles southwest of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Line length = 0.7 miles Major river crossings = 0 Major stream crossings = 1 Minor stream crossings = 0 Road crossings = 0 Estimated construction costs = $1.215M	5
Malakoff	Rail is located ~ 2.4 miles north of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Line length = 2.6 miles Major river crossings = 0 Major stream crossings = 0 Minor stream crossings = 3 Road crossings = 0 Estimated construction costs = $4.04M	4
Trinity 2	Rail is located ~ 18.1 miles west of the site. This rail line is operated by Burlington Northern Santa Fe and does not support passenger service. Line length = 19.5 miles Major river crossings = 0 Major stream crossings = 1 Minor stream crossings = 4 Road crossings = 13 Estimated construction costs = $31.465M	1

Site	Evaluation	Rating
Sulphur 1	Rail is located ~ 23.6 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. A rail line located ~ 10.7 miles north of the site was abandoned in 1996. Line length = 18.8 miles Major river crossings = 1 Major stream crossings = 2 Minor stream crossings = 2 Road crossings = 6 Estimated construction costs = $43.415M	1
Red 1	Rail is located ~ 6.4 miles southeast of the site. This rail line is operated by Union Pacific RR and does not support passenger service. Line length = 7.2 miles Major river crossings = 0 Major stream crossings = 1 Minor stream crossings = 1 Road crossings = 2 Estimated construction costs = $11.29M	2
Red 2	Rail is located ~ 3.7 miles south of the site. This rail line is jointly operated by Dallas, Garland and Northeastern RR and Texas Northeastern Division and does not support passenger service. A rail line located ~ 3.3 miles west of the site was abandoned in 1988. Line length = 4.2 miles Major river crossings = 0 Major stream crossings = 0 Minor stream crossings = 3 Road crossings = 3 Estimated construction costs = $6.89M	4

Railroad Access	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	4	4	5	5	4
Railroad Access	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	1	1	2	4	

References

Google Earth, http://earth.google.com.

North American Railroad Map, version 3.0, http://www.RailroadMap.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.2.2 Highway Access

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with providing highway access.

Evaluation approach – Sites are rated from highest to lowest in accordance with the length of additional or new highway construction required to provide car and truck access. New construction of an undivided 3 lane road (including center turn lane) from the nearest active roadway is assumed. Additional site road construction of 0.5 miles is also assumed. New construction costs are estimated at $3M per mile, and existing road improvement costs are estimated at $1.5M per mile.

Discussion/Results – The following table evaluates the existing roads serving the site areas.

Site	Evaluation	Rating
Guadalupe 2	The site is located ~ 2 miles northeast of US-87. New road construction = 3.2 miles Upgrades to existing roads = 1.5 miles Estimated construction costs = $11.85M	2
Colorado 3	The site is located ~ 1 mile southwest of SH-71. New road construction = 1.5 miles Upgrades to existing roads = 0 miles Estimated construction costs = $4.5M	4
South Texas Project	The site is located adjacent to existing South Texas Project Nuclear Generating Station. New road construction = 0.5 miles Upgrades to existing roads = 0 miles Estimated construction costs = $1.5M	5
Allens Creek	The site is located ~ 1 mile northeast of SH-36. New road construction = 1.2 miles Upgrades to existing roads = 0 miles Estimated construction costs = $3.6M	4
Malakoff	The site is located ~ 3 miles southeast of SH-31. New road construction = 3.2 miles Upgrades to existing roads = 0 miles Estimated construction costs = $9.6M	3
Trinity 2	The site is located ~ 3 miles east of FM-2570 near the Big Brown power plant. New road construction = 3.0 miles Upgrades to existing roads = 1.1 miles Estimated construction costs = $10.65M	2
Sulphur 1	The site is located ~ 3 miles south of SH-412. New road construction = 3.6 miles Upgrades to existing roads = 0 miles Estimated construction costs = $10.8M	2

Site	Evaluation	Rating
Red 1	The site is located ~ 1 mile southwest of FM-2332. New road construction = 1.5 miles Upgrades to existing roads = 0 miles Estimated construction costs = $4.5M	4
Red 2	The site is located ~ 0.5 miles west of FM-1752. A portion of FM-1752 will need to be rerouted to avoid the site exclusion zone. New road construction = 2.2 miles Upgrades to existing roads = 0 miles Estimated construction costs = $6.6M	3

Highway Access	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	4	5	4	3
Highway Access	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	2	2	4	3	

References

Estimated Costs per Mile, July 2005, http://www.arkansashighways.com/Roadway/Costs%20per%20Mile.pdf

Generic Cost per Mile Models, 2006, http://www.dot.state.fl.us/estimates/LaneMilecosts/LaneMilecosts.htm

Google Earth, http://earth.google.com.

Rand McNally Road Atlas.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.2.3 Barge Access

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with providing barge access.

Evaluation approach – Sites are rated from highest to lowest in accordance with estimated cost of facilities construction required to provide barge access.

Discussion/Results – The following table evaluates the area geography permitting barge access to the sites.

Site	Evaluation	Rating
Guadalupe 2	The site is located ~ 25 miles northwest of the Victoria Barge Canal piers. The Victoria Barge Canal is approximately 125 feet wide and 12 feet deep. Rail connectivity is immediately accessible at the piers. Should this port be inaccessible due to minimal depths, the nearest deep water port is the Port of Port Lavaca-Point Comfort (~ 45 miles southeast of the site).	4
Colorado 3	The site is located ~ 85 miles north of the Port of Port Lavaca-Point Comfort. Intermodal transport of heavy/large items would then be required for site delivery.	3
South Texas Project	A barge slip exists on the Colorado River near the South Texas Project site (~ 3 miles east of the site).	5
Allens Creek	The site is located ~ 50 miles west of the Port of Houston and ~ 70 miles northwest of the Port of Freeport. Intermodal transport of heavy/large items would then be required for site delivery.	3
Malakoff	The site is located ~ 170 miles northwest of the Port of Houston. Intermodal transport of heavy/large items would then be required for site delivery.	2
Trinity 2	The site is located ~ 150 miles northwest of the Port of Houston. Intermodal transport of heavy/large items would then be required for site delivery.	2
Sulphur 1	The site is located ~ 250 miles north of the Port of Houston. Intermodal transport of heavy/large items would then be required for site delivery.	1
Red 1	The site is located ~ 340 miles north of the Port of Houston. Intermodal transport of heavy/large items would then be required for site delivery.	1
Red 2	The site is located ~ 280 miles north of the Port of Houston. Intermodal transport of heavy/large items would then be required for site delivery.	1

Barge Access	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	4	3	5	3	2
Barge Access	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	2	1	1	1	

References

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.2.4 Transmission Cost and Market Price Differentials

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with construction of power transmission systems and issues related to market price differentials.

Evaluation approach – Sites are rated from highest to lowest in accordance with estimated transmission system construction costs and consideration of other identified issues related to power transmission. Because all sites are located within the Electric Reliability Council of Texas (ERCOT), no electricity market price differentials are expected between the sites, and this sub-criterion was not evaluated.

Discussion/Results – Transmission access is evaluated in terms of surrogate of costs to construct transmission access based on the sum of distances to the three nearest 345kV transmission lines.

Site	Evaluation	Rating
Guadalupe 2	Site is ~ 5 miles south of 345kV line (E/W) between STP plant and Elm Creek substation. Line is a double-circuit line. Site is ~25 miles northeast of 345kV line (E/W) between Pawnee and Coleto substations. Site is ~ 35 miles northwest of 345kV line (NE/SW) between STP plant and White Point substation. Total combined distance ~ 65 miles.	2
Colorado 3	Site is ~ 5 miles southeast of 345kV line (NE/SW) between Fayette power plant and Holman substation. Line is a double-circuit line. Site is ~ 5 miles north of 345kV line (NW/SE) between Holman and Hill substations. Site is ~ 10 miles south of 345kV line (SE/NW) between Fayette power plant and Lost Pines power plant. Line is a double-circuit line. Total combined distance ~ 20 miles.	4
South Texas Project	Site is located at the existing South Texas Project nuclear power plant. Multiple 345kV connections are available at the site.	5
Allens Creek	Site is ~ 20 miles west of 345kV connection at O'Brien substation. This substation connects to multiple double-circuit lines. Site is ~ 30 miles northwest of 345kV line (NE/SW) between W.A. Parish power plant and Hill Substation. Line is a triple-circuit line. Site is ~ 35 miles northeast of 345kV line (NW/SW) between Holman and Hill substations. Total combined distance ~ 85 miles.	2

Site	Evaluation	Rating
Malakoff	Site is ~ 5 miles east of 345kV line (N/S) between Trinidad substation and Richland power plant. Line is a double-circuit line. Site is ~ 5 miles south of 345kV line (W/E) between Trinidad substation and Stryker Creek power plant. Line is a double-circuit line. Site is ~ 30 miles south of 345kV line (W/E) between Tricorner and Elkton substations. Total combined distance ~ 40 miles.	3
Trinity 2	Site is ~ 5 miles east of 345kV connection at Big Brown power plant. Multiple 345kV connections are located at this point.	5
Sulphur 1	Site is ~ 20 miles north of 345kV connection at the Moses power plant. Multiple 345kV connections are located at this point.	4
Red 1	Site is ~ 25 miles east of 345kV connection at Fisher Road substation. Site is ~ 40 miles north of 345kV line (W/E) between Jacksonboro and West Denton substations. Site is ~ 90 miles northwest of 345kV connection at Anna substation. Total combined distance ~ 155 miles.	1
Red 2	Site is ~ 5 miles north of multiple 345kV connections at the Valley power plant.	5

Transmission	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	2	4	5	2	3
Transmission	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	5	4	1	5	

References

ERCOT Transmission System Map.

Google Earth, http://earth.google.com.

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.3 CRITERIA RELATED TO LAND USE AND SITE PREPARATION

D.4.3.1 Topography

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with site preparation (e.g., grading, blasting, and earth-moving) necessary to prepare the site for construction of a nuclear power plant.

Evaluation approach – Ratings are based on the amount of topographic relief currently found at the site (approximately 500 acres), with the most severe relief resulting in the highest estimated grading costs and therefore the poorest rating. Sites are rated from highest to lowest in accordance with estimated grading costs. Areas with mean slopes greater than 12% or relief greater than 400 feet are undesirable.

Discussion/Results – Given the generally flat topography found in Texas, ratings were favorable across most sites.

Site	Evaluation	Rating
Guadalupe 2	The site is located above the Guadalupe River floodplain in an area with minimal to moderate relief. The site slopes from east to west towards the Guadalupe River. Costs associated with site preparation are expected to be relatively low, but higher than other sites. Approximate slope ~ 6%. Approximate relief = 70 feet.	4
Colorado 3	The site is located near the Colorado River floodplain in an area with minimal relief. The site slopes from east to west towards the Colorado River. Costs associated with site preparation are expected to be relatively low. Approximate slope ~ 1%. Approximate relief = 55 feet.	5
South Texas Project	The site is located in an area with minimal relief. The site slopes from west to east towards the Colorado River. Costs associated with site preparation are expected to be relatively low. Approximate slope ~ 1%. Approximate relief = 15 feet.	5
Allens Creek	The site is located in an area with minimal relief. The site slopes from west to east towards the Brazos River. Costs associated with site preparation are expected to be relatively low. Approximate slope ~ 1%. Approximate relief = 15 feet.	5

Site	Evaluation	Rating
Malakoff	The site is located in the Cedar Creek floodplain in an area with minimal relief. The site slopes from east to west towards Cedar Creek. Costs associated with site preparation are expected to be relatively low. Approximate slope ~ 1%. Approximate relief = 55 feet.	5
Trinity 2	The site is located in an area with moderate relief. The site slopes from south to north. Costs associated with site preparation are expected to be moderate. Approximate slope ~ 7%. Approximate relief = 80 feet.	3
Sulphur 1	The site is located above the Sulphur River floodplain in an area with minimal relief. The site slopes from north to south towards the Sulphur River. Costs associated with site preparation are expected to be relatively low. Approximate slope ~ 1%. Approximate relief = 30 feet.	5
Red 1	The site is located above the Red River floodplain in an area with minimal to moderate relief. The site slopes from west to east towards the Red River. Costs associated with site preparation are expected to be relatively low, but higher than other sites. Approximate slope ~ 4%. Approximate relief = 70 feet.	4
Red 2	The site is located above the Red River floodplain in an area with minimal to moderate relief. The site slopes from south to north towards the Red River. Costs associated with site preparation are expected to be relatively low, but higher than other sites. Approximate slope ~ 5%. Approximate relief = 70 feet.	4

Topography	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	4	5	5	5	5
Topography	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	5	4	4	

References

USGS Topographic Maps (1:100,000 and 1:24,000 scale).

D.4.3.2 Land Rights

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with purchasing land required to construct and operate a nuclear station on the site.

Evaluation approach –This criterion was evaluated previously in the screening criteria (Appendix C); the results are provided below for completeness. Local land costs continue to be based on U.S. Census of Agriculture data (value of land, farmland) for 2007. Other potential acquisition issues, such as ownership and mineral rights/oil and gas leases, etc., are also considered to the extent possible. Final ratings were based largely on best professional judgment in evaluating current land use patterns.

Discussion/Results – Results are provided below.

Site	Evaluation	Rating
Guadalupe 2	DeWitt County Cost: **$1,856** per acre (2007); $1,199 (2002); average farm size (303 acres in 2007, 323 acres in 2002). Other costs/issues: Land requirements could be significant assuming the need for a reservoir to support plant operations (none present now); this would add to the total land cost. In addition, Texas General Land Office (TGLO) interactive land/lease mapping system database indicates that multiple oil and gas leases are found in DeWitt County, indicating areas of potential or historic mineral development. Therefore, it is assumed that mineral rights and water rights would also have to be acquired with the property and at significant additional cost. Ownership: Majority of site area appears to be forested and a part of past timber operations, with some cleared areas also noted. Farmland is found on the west side near Route 87. Owner(s) are unknown. Given the fairly consistent land use, the number of owners is expected to be small.	3 Significant land acquisition requirements, including purchase of mineral and water rights

Site	Evaluation	Rating
Colorado 3	Fayette County Cost: **$2,757** per acre (2007), $1,879 (2002); average farm size (189 acres in 2007, 186 acres in 2002). Other costs/Issues: Land requirements could be significant assuming the need for a reservoir to support plant operations; it is assumed that either a new reservoir close to a new nuclear plant would have to be constructed or use of the existing Cedar Creek reservoir to the north of the site would require significant expansion (existing capacity insufficient to support a second nuclear plant). TGLO database identifies a significant number of oil and gas leases in Fayette County, indicating areas of potential or historic mineral development. Therefore, it is assumed that mineral rights and water rights would also have to be acquired with the property and at significant additional cost. Ownership: Site area is mostly cleared and ownership, including number of owners, is uncertain. The site sits north of a mining operation (sand and gravel) based on satellite imagery, and the south of the Fayette power plant; Lake Fayette serves as a cooling pond for the plant. [Note that Fayette plant was dropped in original siting study, as stated in ER, because of water and land acquisition problems.]	2 Significant land acquisition requirements, including purchase of mineral and water rights. Average county land costs one of highest among sites.
South Texas Project	Matagorda County Cost: None identified. Site sits on an existing nuclear plant site (12,220 acres) owned by STPNOC/NRG utility. [For comparison, average cost per acre for this county: **$1,380** per acre (2007), $1,014 (2002)] Other costs/issues: No reservoir requirement since current reservoir constructed with additional capacity for 2 more units. TGLO database indicates that Matagorda County has the largest number of leases (all types – oil and gas, coastal, structure, surface) of all the sites/host counties. However, this is not a concern with this site since it is already owned by the utility, including the necessary water and mineral rights. Ownership: STPNOC and NRG [and City Public Service Board of San Antonio/CPS Energy, and City of Austin also partial owners; NRG and CPS will own new units 3 & 4]	5

Site	Evaluation	Rating
Allens Creek	Austin County Cost: NRG already owns substantive land at the site (1722 acres), however, additional land would be required to construct a reservoir for the plant. Average farm cost in Austin County is **$3,412** in 2007 and $2,176 in 2002. Other costs/issues: There is a restriction on the NRG land that it cannot be developed as a nuclear site. It is not clear whether this restriction could be lifted in the future (and at what cost). Assuming the site could be developed, it would require a large reservoir; the current acreage is not sufficient to support a reservoir too. Additional land requirements would be significant. Note that City of Houston is/was planning to construct a 9,500 acre reservoir on lands the City and the Brazos River Authority currently own in site area, to meet future water supply needs (to be built between 2018 and 2030 to meet water needs for City of Houston). It is not clear whether the water rights for this reservoir could be purchased for use by the nuclear plant instead. Finally, there are 15 oil and gas leases identified in Austin County in the TGLO database; this is a smaller number than in other host counties, indicating areas of potential or historic mineral development in the county. Therefore, it is assumed that that mineral rights and water rights would have to be acquired with the property and at significant additional cost. Ownership: NRG owns 1,722 acres; however, this is not sufficient for a cooling water reservoir for the plant. Purchase of additional land would require interface with potentially multiple (and unidentified) owners. Majority of the site area appears to be currently farmed (between Route 36 and the Brazos River).	2 Additional land acquisition requirements for reservoir, including purchase of mineral and water rights. Restriction on NRG property that cannot be developed for nuclear.

Site	Evaluation	Rating
Malakoff	Henderson County Cost: NRG owns 5,239 acres at this site. It is not clear whether there is sufficient acreage to support a new reservoir that may be required. For comparison, price per acre in this county is $2,446 per acre (2007) and $1,636 (2002). Note that site is located between two large reservoirs – Cedar Creek Reservoir to the north and the Richland Chambers Reservoir to the south, but neither of these are assumed to be available by a new nuclear plant given their current capacities and/or uses. Other costs/issues: Mineral rights are not a concern here (even though TGLO database identifies numerous oil and gas leases in Henderson County and the Henderson AML is found nearby), since it is assumed that NRG also owns the mineral rights. [Note that mineral resources for the county include not only oil and gas but sulfur, lignite, coal, sand and gravel, and clay for making bricks and pottery.] It is not clear whether NRG also owns the water rights and these could be an additional and significant cost if required. Ownership: Owned by NRG. Site is west of the Malakoff abandoned mine land (AML), much of which appears to have been reclaimed. Numerous pads (gas) noted in the area of the site. If additional land were required for a reservoir, purchase of additional mineral rights would be a concern.	4 Not clear whether NRG owns water rights and may also have to purchase additional land for reservoir, including mineral rights.

Site	Evaluation	Rating
Trinity 2	Freestone County Cost: **$1,744** per acre (2007), $900 (2002); average farm size (271 acres in 2007, 292 acres in 2002) Other costs/Issues: Land requirements could be significant assuming the need for a reservoir to support plant operations. The site sits east of Fairfield Lake and southeast of Richland Chambers Reservoir. It is assumed that neither of these water bodies would be available for use by the new plant given their current capacities and/or uses. Fairfield Lake serves as the cooling system for the Big Brown power plant located there now. TGLO database identifies a significant number of oil and gas leases, as well as one hard mineral lease and two surface leases in Freestone County, indicating areas of potential or historic mineral development. Site is also located east of the Big Brown power plant and lignite mine. Numerous white pads (drill pads) were also noted throughout the site area (based on satellite imagery). It is assumed that that mineral rights and water rights would also have to be acquired with the property and at significant additional cost. Ownership: Site is located east of Fairfield Lake. The western side of the lake includes a power plant and evidence of active mining (lignite) operations. Drill pads also seem to be scattered throughout the area that includes the site. It is not clear whether the site is also owned by the same company that operates the power plant and mine. A single owner is preferred but it is not clear whether land at the site is even available. A recent article in the Fairfield Recorder (January 29, 2009) indicated that Luminant Power plans to operate a new lignite mine east of Fairfield Lake and is currently trying to secure land (10,000 acres). This could make land acquisition at Trinity 2 more challenging or no longer an option. [Note ER 9.3 also identified land acquisition issues for development of Big Brown site, next to Trinity 2.]	2 Significant land acquisition requirements, including purchase of mineral and water rights. Land also may no longer be available given presence of lignite resources and plans to develop new mine near site. (Luminant).
Sulphur 1	Red River County Cost: **$1,329** per acre (2007), $879 (2007); average farm size (373 acres in 2007, 347 acres in 2002) Other costs/issues: Land requirements could be significant assuming the need for a reservoir to support plant operations (none present now); this would add to the total land cost. TGLO indicates that Red River County has 3 oil and gas leases; and mineral resources in the county include not only oil and gas but clay, industrial sand and chalk. It is assumed that mineral rights and water rights would also have to be acquired with the property and at significant additional cost. Ownership: Majority of site area appears to be forested with evidence of past clear cutting operations (logging). Given the fairly consistent land use, the number of owners is expected to be small but unknown.	2 Significant land acquisition requirements, including purchase of mineral and water rights; potential dealings with a second state (Arkansas)

Site	Evaluation	Rating
Red 1	Clay County Cost: **$1,322** per acre (2007), $636 (2002); average farm size (711 acres in 2007, 734 acres in 2002) Other costs/issues: Land requirements could be significant assuming the need for a reservoir to support plant operations (none present now); this would add to the total land cost. TGLO indicates that Clay County has only one oil and gas lease, however county stats for 2004 included production of more than 742,000 barrels of oil and 258,589 cubic feet of gas-well gas. It is assumed that mineral rights and water rights would also have to be acquired with the property and at significant additional cost. Ownership: Resolution of satellite imagery is poor but majority of site appears to be cleared but undeveloped with farmlands surrounding it. Given the fairly consistent land use within the immediate site area, the number of owners is expected to be small but unknown.	2 Significant land acquisition requirements, including purchase of mineral and water rights; and potential dealings with a second state (Oklahoma)
Red 2	Fannin County Cost: **$1,939** per acre (2007), $1,150 (2002); average farm size (225 acres in 2007, 245 acres in 2002) Other costs/issues: Land requirements could be significant assuming the need for a reservoir to support plant operations (none present now); this would add to the total land cost. TGLO indicates that Fannin County has no oil and gas leases (although site sits next to existing Valley natural gas plant). The main natural resource for the county is timber. Acquisition of mineral rights at this site may be less costly and complex than at other sites; however water rights would also have to be purchased. Ownership: Site sits in cleared area / agricultural lands (appear to be multiple parcels) immediately north of the existing Valley power plant. Linear features (natural gas lines) appear to cross the site area en route to the plant. It is unclear how much of the site area may be owned by the owners of the existing Valley, but the number of owners is assumed to be small.	2 Significant land acquisition requirements, including potential dealings with a second state (Oklahoma). Mineral rights not assumed to be as complex or costly as other sites but balanced out by slightly higher land costs (so given same rating as Sulphur 1 and Red 1.

Site	Evaluation	Rating

Notes:

Mineral rights also include the rights to any oil and natural gas that exist beneath a property. The rights to these commodities can be sold or leased to others. In most cases, oil and gas rights are leased. The lessee is usually uncertain if oil or gas will be found so they generally prefer to pay a small amount for a lease rather than pay a larger amount to purchase. A lease gives the lessee a right to test the property by drilling and other methods. If drilling discovers oil or gas of marketable quantity and quality it may be produced directly from the exploratory well. When buying property in areas of potential or historic mineral development, the utility will need to be sure to purchase both the surface and the mineral rights. In many areas the sale of mineral rights are recorded in the government record in a different deed book or database than the sale of surface property. This means that the deed to the surface property might not mention mineral rights that have been sold away. Mineral rights and mineral lease transactions involve large amounts of money and are very complex. The total yield (lease + royalties) or mineral sale price can often exceed the value of the surface rights.

While land ownership has been considered, insufficient information is available at this time pertaining to ease or difficulty of acquisition and actual purchase price to be accounted for in the ratings. Regarding the number of land parcels or owners involved, acquisition from multiple landowners is considered less suitable than from one (or a smaller number of) landowners. Additional costs with respect to reservoir requirements as well as the purchase of mineral and water rights have also been considered to the extent possible.

References:

County-specific land use info from land use section. Fairfield Recorder January 29 article

Google Earth, http://earth.google.com

Mineral rights information: http://geology.com/articles/mineral-rights.shtml

NRG Real Estate personal communication (3/19/09) relating to NRG-owned sites.

U.S. Census of Agriculture 2007 results:
http://www.agcensus.usda.gov/Publications/2007/Full_Report/index.asp

Table 8. Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002 [data available for both 2002 and 2007 available and provided for completeness, but ratings based on 2007 data. Cost based on farmland and assumed to be rural.]

Land Rights	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	3	2	5	2	4
Land Rights	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	2	2	2	2	

D.4.3.3 Labor Rates

Objective – The purpose of this criterion is to rate sites according to the relative costs associated with local labor costs that would be incurred during plant construction.

Evaluation approach – Sites are compared in accordance with estimated local labor costs, with the lower cost being preferred.

Discussion/Results – Economic data are typically available by county, but were found to be provided in a variety of forms (e.g., by hour, by week, by year; by job type) that were not necessarily consistent between counties. For purposes of consistency, this evaluation relied on data from U.S. Department of Labor, Bureau of Labor Statistics – May 2007 Metropolitan Area Occupational Employment and Wage Estimates. Average hourly rates were provided for construction and extraction workers (e.g., structural iron and steel workers; sheet metal workers; and plumbers, pipefitters and steamfitters) for the following representative MSAs:

Site/MSA	Average construction overall (mean hourly)	Pipefitter/Steamfitter* (mean hourly)	Other related category with higher mean hourly wage
Guadalupe 2 / Victoria	$15.60	$19.84	No category with higher wage except for supervisors and inspectors
Colorado 3 (Austin / College Station)	$14.71 / $14.60	$21.51 / $20.52	No category with higher wage except for supervisors and inspectors
Allens Creek, South Texas Project / Houston	$15.99	$20.78	$24.20 (boilermaker)
Malakoff, Trinity 2 / Dallas	$15.65	$21.06	$21.19 (boilermaker)
Sulphur 1 / Texarkana	$14.28	$15.96	$17.15 (sheet metal worker): this was highest sheet metal worker wage identified
Red 1 / Wichita Falls	$14.79	$19.00	No category with higher wage except for electricians (not counted), supervisors and inspectors
Red 2 / Sherman-Denison	$14.67	$15.93	No category with higher wage except for electricians (no counted), supervisors and inspectors

*Higher end hourly wage earning was used when comparing sheet metal workers and pipefitters/steamfitters, as noted; boilermaker category only included in Houston and Dallas MSAs so could not be compared across sites. Electrician category had highest mean hourly wage in many of the representative cities, but not all. It was not used as basis for comparison.

Comparisons of the above construction labor category rates, including the average construction worker roll up rate (across all construction labor categories), reveals similar rates across all sites with respect to average construction labor category, with the sites near Houston (Allens Creek and South Texas Project) and Dallas (Malakoff and Trinity) coming in slightly higher. The Sulphur 1 and Red 2 sites also had the lowest wages for plumber/pipefitter/steamfitter by at least $4.00 per hour. As a result, these two sites would seem to be slightly more favorable than the other sites, as reflected in the ratings. Differences in the other seven sites are not considered significant enough to warrant different ratings. They all received the same conservative rating of

3. Finally, it should be noted that a significant portion of the construction workforce is expected to come from a national workforce of journeymen, whose rates will be set based on supply and demand within the overall nuclear industry, rather than by local workforce rates or skill sets. This additional factor could further mitigate differences in labor costs between the sites.

Labor Rates	Guadalupe 2	Colorado 3	South Texas Project	Allens Creek	Malakoff
Rating	3	3	3	3	3
Labor Rates	Trinity 2	Sulphur 1	Red 1	Red 2	
Rating	3	3.5	3	3.5	

References

http://www.bls.gov/oes/current/oessrcma.htm.